Initial Environmental Examination Report

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Restoration and Rehabilitation of Flood Protection and Water Conservation Structures in district Pishin, Balochistan

Prepared by National Disaster Risk Management Fund for Ministry of Planning, Development & Special Initiatives for the Government of Pakistan, and the Asian Development Bank (ADB).

CURRENCY EQUIVALENTS

As of October, 2023
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NOTE{S}

(i) The fiscal year (FY) of the Government of the Islamic Republic of Pakistan and its agencies ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2011 ends on 30 June 2011.

(ii) In this report, "$" refers to United States dollars.

IRRIGATION DEPARTMENT
GOVERNMENT OF BALOCHISTAN

Restoration and Rehabilitation of Flood Protection Structures and Water Conservation Structures in district Pishin, Balochistan

INITIAL ENVIRONMENTAL EXAMINATION REPORT

October 2023

Rehman Habib Consultants (Pvt.) Limited

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ANNEXURES

ACRONYMS

ADB	Asian Development Bank
AJK	Azad Jammu Kashmir
BEPA	Balochistan Environmental Protection Agency
BHUs	Basic Health Units
BID	Balochistan Irrigation Department
BOQ	Bill of Quantities
CC	Construction Contractor
CSC	Construction Supervision Consultant
DO	Dissolved Oxygen
EA	Executing Agency
EHS	Environment Health & Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
GIS	Geographic Information System
GoB	Government of Balochistan
GRC	Grievance Redress Committee
GRM	Grievance Redressal Mechanism
IEE	Initial Environmental Examination
EHS	Environment, Health and Safety
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
MCM	Million Cubic Meter
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NOx	Oxides of Nitrogen
NTU	Nephelometric Turbidity Unit
PEPA	Pakistan Environmental Protection Act
PEPO	Pakistan Environmental Protection Ordinance
PHE	Public Health Engineering Department
PIS	Perennial Irrigation Schemes
PMD	Pakistan Meteorological Department
PPC	Pakistan Penal Code
PPEs	Personal Protection Equipment
PPTA	Project Preparatory Technical Assistance
PIU	Project Implementation Unit
BID	Baluchistan Irrigation Department
REA	Rapid Environmental Assessment

RHCs	Rural Health Centers
SOx	Oxides of Sulfur
SPS	Safeguard Policies
SC	Supervision Consultants
TA	Technical Assistance
TDS	Total dissolved solids
UNEP	United Nation Environment Program
WHO	World Health Organization

EXECUTIVE SUMMARY

A. INTRODUCTION

1. This report presents the findings of an Initial Environmental Examination (IEE) study conducted for the proposed project *"Restoration & Rehabilitation of Flood Protection Structures and water conservation structure"* in district Pishin. The project is being funded by the Asian Development Bank (ADB) through the National Disaster Risk Management Fund (NDRMF) and Baluchistan Irrigation Department (BID) is the Implementing Agency (IA).

2. The project is located in district Pishin where flood problems are peculiar and common as compared to other districts of Baluchistan due to its topographical, physiographical and demographic conditions. Flashy hill torrents emanating from steep denuded hills cause devastation in the project area due to unprecedented and high velocity of flood water. Population and cultivated land/orchard are mostly located at the edge of rivers and the toe of hills, which are in constant threat of flooding and a considerable chunk of land is eroded, sustaining great financing loss to the farmers.

3. Through the proposed project, the BID intends to ensure sustainable restoration/rehabilitation of flood protection, mitigation and water conservation structures.

4. Following are the main components of the proposed project:

a) Restoration and strengthening of water conservation structures in various area of district Pishin;
b) Restoration and strengthening of flood protection bunds.

B. Project Categorization

5. According to ADB Safeguard Policy Statement (SPS) 2009, the proposed projects are expected to have only short term, site specific and largely reversible impacts which will be primarily during the construction phase of the project and thus the project has been classified as Category 'B'.

6. In regard to the national environmental legislation, the proposed project falls under the category of "water management, dams, irrigation & flood protection" of Schedule I and thus this IEE report has been prepared to obtain the No Objection Certificate (NoC) from Balochistan Environment Protection Agency (BEPA).

C. Policy Legal and Administrative Framework

7. This report is prepared in accordance with Pakistan Environmental Protection Act, 1997, Balochistan Environmental Protection Act, 2014 and the ADB SPS, which requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sustainable.

D. DESCRIPTION OF PROJECT

8. This project will be implemented for restoration and rehabilitation of 24 sites and includes bund, small dams, delay action dams, check dams, weir, head works and flood protection walls that have been damaged during high floods in July and August, 2022. Details of the proposed sites along with damages are presented in the Table 1 below.

Table 1: Dams and damage nomenclature

Sr. No.	Name of Scheme	District	Coordinates		Name (Damage Nomenclature)
			Latitude (N)	Longitude (E)	
1.	Bund Khoshdil Khan	Pishin	30°42'38.00"	67°5'13.84"	Earthen Embankment, Gated Spillway
2.	Thora Murgha Dam	Pishin	30°46'56.18"	67°11'22.15"	Weir, Stilling Basin
3.	Weir and Earthen Bund Khanai Baba	Pishin	30°29'39.81"	67°6'32.75"	Weir, Protection Bund, F.P Wall, Flood Channel
4.	Khazoai Balozai Headwork	Pishin	30°38'40.47"	67°23'1.93"	Cutoff wall, Gabion Apron, Feeding Cannel
5.	Khazoai Delay Action Dam	Pishin	30°37'35.04"	67°20'51.83"	Dam Body, Flood Channel, Culvert
6.	Kezh Dam	Pishin	30°58'12"	67°30'3"	Dam Body, Spillway
7.	Khasro Dam	Pishin	30°59'57.46"	67°36'10.02"	Dam Body, Spillway
8.	Flood Protection Bund of Sarila Habibzai, Manzakai and Bagarzai	Pishin	30°41'59.03"	67°2'20.99"	Bund
9.	F.P Wall Poti Mangalzai Mama Nikah and Mehrab Kech	Pishin	30°45'10.36"	67°12'17.43"	F.P Wall
10.	Khoudadzai Flood Protection Scheme	Pishin	30°35'44.89"	66°56'52.89"	Abutment Wall, Bund, Stilling Basin, Weir
11.	Kar Dam	Pishin	30°55'35.60"	67°37'23"	Dam Body, Spillway, F.P Wall
12.	Surchah Delay Action Dam	Pishin	31°06'22"	67°18'26"	Dam Body
13.	Chengai Begharzai Check Dam	Pishin	30°52'16"	67°31'44"	Dam Body, Spillway
14.	Wachobi Dam	Pishin	30°58'40.29"	67°39'57.84"	Dam Body, Spillway
15.	Surkai Ghez Dam	Pishin	31°02'33.86"	67°34'15.36"	Dam Body, Spillway
16.	Pani Shakh Dam	Pishin	30°35'19"	67°37'23"	Dam Body, Spillway
17.	Aizai Dam	Pishin	30°36'42.57"	66°58'3.83"	Spillway
18.	Khchani Tamark Check Dam	Pishin	30°42'14"	67°10'09"	Spillway
19.	Mandan Dam	Pishin	30°41'12"	67°24'38"	Spillway
20.	Ghargai D.A Dam	Pishin	30°59'8.8"	67°21'0"	Dam Body, Spillway

21.	Bostan Dara Dam	Pishin	30°23'45.66"	67°1'25.54"	Spillway
22.	Dargai Delay Action Dam	Pishin	30°46'8.84"	67°7'9.54"	Dam Body
23.	Shadaka Dam Toba Kakari and Shasa Muhammadzai Dam	Pishin	30°58'20" 30°45'15.23"	67°24'47" 67°25'7.84"	Dam Body
24.	Narin Jalak Dam	Pishin	30°42'14.28"	67°21'27.64"	Spillway

E. PROJECT ALTERNATIVES

9. The "No project" option maintains the status quo, leaving the district Pishin vulnerable to water scarcity, excessive aquifer depletion, increased flood risks and damages. On the other hand, executing the proposed project offers the potential to address these challenges by restoring and rehabilitating the damaged structures by improving water management and reducing flood risks. Although the project requires initial investment that can provide long-term benefits and will contribute to the overall sustainability and resilience of the area.

F. BASELINE CONDITIONS

- **Topography:** Pishin district lies between 30°04' to 31°17' north latitude and 66°13' to 67°50' east longitude. The district is bounded by Qila Abdullah in the north, Qila Saifullah in the east, Quetta and Ziarat in the south and Afghanistan in the west. Its length form north to south is about 68 km and its width from east to west ranges from 8 to 38 km.
- **Soil:** The soil composition of the district Pishin consist of deep, well drained, strongly calcareous, moderately alkaline, medium textured soil developed in the parent material derived from shale, sandstone and a little limestone. It occupies nearly level areas in the piedmont plain.
- **Rivers and Streams:** Pishin district has a network of irrigation canals and watercourses that are primarily supplied by the Pishin Lora river. The river plays a vital role in supporting agricultural activities in the area. Flood streams/rivers overflow due to torrents/sheath run-off from mountains are another seasonal source of surface water during monsoon.
- **Groundwater:** Groundwater is vital water source in Pishin and verycrucial for survival, while urbanizationis depleting it. Karez have long served as primary irrigation and drinking sources, but increasing tube well installations harm karez function. Groundwater has declined in Pishin's four tehsils from 2005 to 2016; Huramzai tehsil suffers the worst depletion. Excessive tube well extraction surpasses natural recharge, causing a 25 to 30 ft. water table fluctuation in decades past. In 2007, water depth ranged from 67.00 to 214.98 ft. In 2013, levels were 80 to 267 ft., declining further in 2014 and reaching 300 ft. in 2015. Pishin city and Huramzai tehsil are hit hardest.
- **Precipitation:** The average annual rainfall of the Pishin is about 308.18 mm, while on the average the maximum monthly rainfall is 68.5 mm during the month of March and a minimum of 0.3 mm in June.
- **Ambient Air Quality:** The project area in Pishin is sparsely populated and rural, implying generally clean air quality. While specific data is lacking, it is likely due to the absence of major air polluters like industries and commerce. Potential minor sources of pollution may include local road traffic, occasional dust from dry weather and emissions from household wood stoves. However, due to the rural and remote location, these sources are expected to have minimal impact on air

quality. Contractor is required to conduct air quality monitoring before construction begins to confirm the localconditions.

- **Ambient Noise:** The project area, situated in the sparsely populated rural region of Pishin, typically experiences low noise levels due to its remote and rural nature. While specific noise monitoring data for this area is not available, it is reasonable to assume that noise levels in this rural setting are generally low. Conducting noise quality monitoring by Contractor before starting construction activities will be required to confirm these conditions.
- **Flora:** The major tree species found in the district are Wild Ash (*Fraxinus xanthoxyloides*), Obusht (*Juniperus excelsa polycarpos*) and Shina (*Pistacia khinjjak*), which occupy favorable sites. The main shrubs are Janglee Badaam (*Prunus spp*), Sparae (*Cotoneaster spp.*), Tharkha (*Artemisia maritime*), Crataegus spp., Kala Zira (*Carum bulbocastanum*), Oman (*Ephedra nebrodensis and Ephedra intermedia*), Makhi (*Caragana ambigua*),Khakshir (*Sisymbrium sophia*),Zralg (*Berberis lyceum*), and *Surae (Rosa spp.). Out of the above-mentioned flora, Kala Zira (Carum bulbocastanum) is used as spice and fetches high value in the market. In addition, Oman (Ephedra nebrodensis) and Khakshir (Sisymbrium sophia) are found in large quantity and have medicinal value.*
- **Fauna** of the district Pishin includes **Mammals**: Wolf (*Canis lupus*), Hill fox (*Vulpes vulpes grifithii*), Asiatic Jackal (*Canis aureus*), Stripped Hyaena (*Hyaena hyaena*) Cape hare (*Lepus capensis*), Indian Crested Porcupine (*Hystrix indica*), Afghan Hedgehog (*Hemiechinus auratus megalotis*), Afghan Pica (*Ochotona rufescens*) and Stone Marten (*Martes foina*) etc. Birds: Chukar (*Alectoris chukar*), See see partridge (*Ammoperdix griseogularis*), Kestrel (*Falco tinnunculus*), Magpie (*Pica pica*), Golden eagle (*Aquila chrysaetos daphanea*), a number of Finches, buntings, seasonal/migratory waterfowls, and hawks, etc. Reptiles: Afghan Tortoise (*Agrionemys horsfieldii*), Afghan Agama (*Trapelus megalonyx*), Indian Cobra (*Naja naja*), Saw-scale viper (*Echis carinatus*), Dwarf Dark-headed racer (*Eirenis persica walteri*) Levantine viper (*Macrovipera lebetina*), etc.
- **Aquatic Ecology:** District Pishin is characterized by its arid climate and mountainous terrain, limiting the presence of natural aquatic ecosystems. There are no perennial rivers. Water sources are typically limited to seasonal hill torrents/streams that are fed by melting snow from the nearby mountains during the spring and summer months. These water bodies flow temporarily after rainfall or snowmelt, but they are not perennial in the sense of flowing year-round, resulting in a non-existent aquatic ecology.
- **Population Size and Growth:** The population of Pishin district according to census 2017 is 736,903, which was 376,728 in 1998.
- **Castes & Tribes:** Major casts and tribes of the project area are Syed, Sanzerkhail, Bayanzai, Mehtherzai, Bazai, Ahmadkhail, Panizai, Sargari, Gharsheen, Haroonzai, Alizai and Abubakar Tareen.
- **Mother Tongue:** Pushto is the main language of the district. Those, who have settled away from Pishin, speak local languages (Pushto), such as Multani or Saraiki in Multan, Hindko in Hazara, Urdu in Bhopal and Sindhi in Sindh. Tareeno, a dialect of Pashto is spoken by Harnai Tareens.
- **Agriculture:** There are two cropping seasons in Pishin, kharif and rabbi. The important rabbi crops are Wheat, Barley, Cumin, Vegetables and Fodder etc.

The crops grown during kharif are Fruits, Melons, Vegetables, Tobacco, Potato, Fodder, onion etc.

- **Source of Drinking Water:** In the project area, as per recent household survey conducted in 2010, the piped water (52%) constitutes the major source followed by tube wells or boreholes (19%) and protected dug well (9%). Whereas, other minor improved sources include: protected springs (9%) and filter plants (0.3%). The major unimproved sources are tanker truck (4%), unprotected dug well (3%) and approximately 2% of unimproved water source. About 27% of the households have no water on their premises and have to travel distances to fetch water.
- **Irrigation:** Three main sources of irrigation including tube wells Karez/ springs and dug wells are commonly used in the district. Privately owned tube-wells are maintained by the owners themselves, whereas, the government owned tube-wells are maintained by the irrigation department.
- **Health:** The highly subsidized public healthcare system is the major provider of curative and preventive care services to the local population. The health infrastructure includes:1 Hospital, 7 Rural Health Centers (RHCs), 33 Basic Health Units (BHUs), 14 Civil Dispensaries (CDs), 4 Maternal and Child Health Centers (MCHCs), 1 School Health Unit, 1 TB Clinic and 4 Health Auxilary Units.
- **Education:** The education sector in the district comprises of public and private schools with varying quality. A total of 921 schools are operated by the public sector, which comprise of primary, middle, high and high secondary schools. 89% of these schools are in rural areas and only 11% are located in urban areas.
- **Livestock:** In the Pishin district, 22,865 households reported on the number of cattle. The number of animals reported were 91,433; the number of male cattle three years and above were 7,018, of which 3,858 were used for breeding, number of male cattle below three years were 17,914. The number of female cattle were 53,654 - 47,427 were in milk, 3,577 were dry and 2,650 had not yet calved; and the number of female cattle below three years were 12,848.

G. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

10. The risk assessment matrix is provided as Table 2 below.

Table 2: Impact Assessment Matrix

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Flooding	Likely	Major	High	Low
Seismic damage	Likely	Moderate	Medium	Low
Land Acquisition	Unlikely	Minor	Low	Low
Construction Phase				
Air Quality	Likely	Moderate	Medium	Low
Noise Pollution	Likely	Moderate	Medium	Low
Vibration impacts	Likely	Minor	Medium	Low
Solid waste generation incl. Spoil material	Likely	Moderate	Medium	Low
Resource Conservation	Likely	Minor	Medium	Low
Soil Contamination	Likely	Moderate	Medium	Low
Soil erosion/ silt run-off	Likely	Moderate	Medium	Low

Community Health and Safety	Likely	Minor	Medium	Low
Occupational Health and Safety	Likely	Moderate	Medium	Low
Traffic management	Likely	Minor	Medium	Low
Communicable diseases	Likely	Minor	Medium	Low
Flora	Likely	Minor	Medium	Low
Fauna	Likely	Moderate	Medium	Low
Use of local water resources	Likely	Moderate	Medium	Low
Contamination of water resources	Likely	Moderate	Medium	Low
Social and Cultural Conflicts	Likely	Minor	Medium	Low
Religious and Cultural Heritage	Unlikely	Minor	Low	Low
Operation Phase				
Damage to infrastructure	Likely	Major	High	Medium
Biodiversity impacts	Unlikely	Minor	Low	Low

H. ENVIRONMENTAL MANAGEMENT PLAN

11. The EMP sets out mitigation actions, monitoring actions, responsibilities, and schedules for impact mitigation and monitoring. Environmental monitoring will be undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures.

12. The EMP provides its implementation mechanism during construction and operational phases:

- **Implementation during construction phase**: The BID, having core implementation responsibility, will overall monitor the environment related activities of Supervision Consultant and Construction Contractor and report to BEPA regarding implementation status of EMP. Construction Contractor will be in direct coordination with Supervision Consultant through its HSE department and the Contractor's HSE department will be required to be on-board prior to mobilization.
- **Implementation during O&M**: The key players involved during operation of the proposed project are EA (BID) and district Environmental Officer of Pishin, who will randomly check the project operation in context of EMP and report to Balochistan EPA, Quetta office annually.

13. The EMP has been prepared taking into account the environmental consequences of the proposed action and the required mitigation measures have been proposed at different stages of the activities along with performance indicators to mitigate any potential impacts along with a comprehensive Environmental Monitoring Plan as part of the EMP. A suitable training program is also proposed to train the Contractor(s) staff, who will be involved in the construction phase and the BID staff at the project operational phase. All required permits shall be obtained from the concerned departments before starting the related activity and any grievances will be addressed promptly, as suggested in the EMP.

I. EMP Budget

14. The EMP budget for construction and operation period of the sub-projects is 12.87 million PKR.

J. Public Consultation and Information Disclosure

15. In order to ascertain the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them Consultation meetings were carried out in the month of September 2023 during the site visits with local communities in the proposed schemes sites. The comments and feedback received from the different stakeholders were incorporated into the IEE study and it was ensured that their comments and/or concerns are considered during the different stages of the proposed project activity.

K. Grievance Redressal Mechanism

16. The Grievance Redressal Mechanism (GRM) has been developed under ADB Policy (SPS 2009), to deal with complaints at any stage of the proposed project. The GRM will help to receive and resolve the concerns/complaints of any project affected persons regarding the project's social and environment performance. The measures have been identified to mitigate any potential environmental and social impacts due to implementation of proposed project and the mechanism for information disclosures has been provided in the GRM.

L. CONCLUSION

17. The report provides conclusions based on the impacts assessed and the mitigation measures suggested. It is recommended that the EMP and IEE will be made a part of all bidding/tender documents. Also, the Contractor will be bound to completely implement relevant mitigation measures set out in the EMP and the cost related to these mitigation measures will be borne by the Contractor, who shall prepare all required documentation such as the site specific EMP (SSEMP).

18. No Land acquisition and involuntary settlement is involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence.

19. Environmental impacts identified during the design phase including seismic activity, floods are of high significance. To mitigate these impacts, the project has taken specific steps based on the findings of the hydrological study. The study has estimated the discharge of streams and nullahs in the project area against a 500-year return period. To address seismic hazard challenges, the structural designs for the dam body, spillway and other related structures will adhere to the recommended criteria for Zone 4 as outlined in the Building Code of Pakistan, 2021.

20. Environmental impacts during the construction phase are largely temporary in nature and can be minimized with effective management. Construction of worker camps will not necessarily be required and/or may be very limited in size in view of the scale and scope of works while all efforts shall be made to engage locals for employment for the proposed project activities. It is concluded that the proposed project should proceed, with appropriate mitigation measures and monitoring programs identified in the IEE study.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

21. Baluchistan is the largest province of Pakistan in terms of area which is spread virtually as a plateau over 347,185 square kilometres, constituting 44% of the total area of Pakistan. The population of Baluchistan is currently estimated around 12.34 million (2017). Approximately 85% of the population live in rural areas and mainly depends on agriculture and livestock as source of living.

22. Project sites are located in district Pishin where floods more common as compared to other districts of Baluchistan due to its topographical, physiographical and demographic conditions. Flashy hill torrents emanating from steep denuded hills cause devastation in project area due to high velocity and unpredicted magnitude. The population and cultivated land/orchard are mainly located at the edge of rivers and the toe of hills, which are in constant threat of flood and during each flood season a considerable chunk of land is eroded, sustaining great financial loss to farmers.

23. During these floods. the already constructed flood protection schemes and conservation structures received heavy damages due to unprecedented rainfall and cloud bursts, which damaged/washed the protection bund's aprons, embankments, stone pitching and dam body/spillway and canal embankments in Pishin.

24. In view of the damages caused by the floods, BID intends to execute the restoration and rehabilitation of flood protection and water conservation structures in district Pishin. This document presents the findings of the IEE study for the proposed works.

1.2 NATURE, SIZE AND LOCATION OF THE PROJECT

25. The project involves the restoration and rehabilitation of the 24 sub-projects i.e. damaged dams, flood protection bunds under BID, to protect and safeguard the locals and properties in district Pishin. Location map of the project has been provided as Figure 1-1.

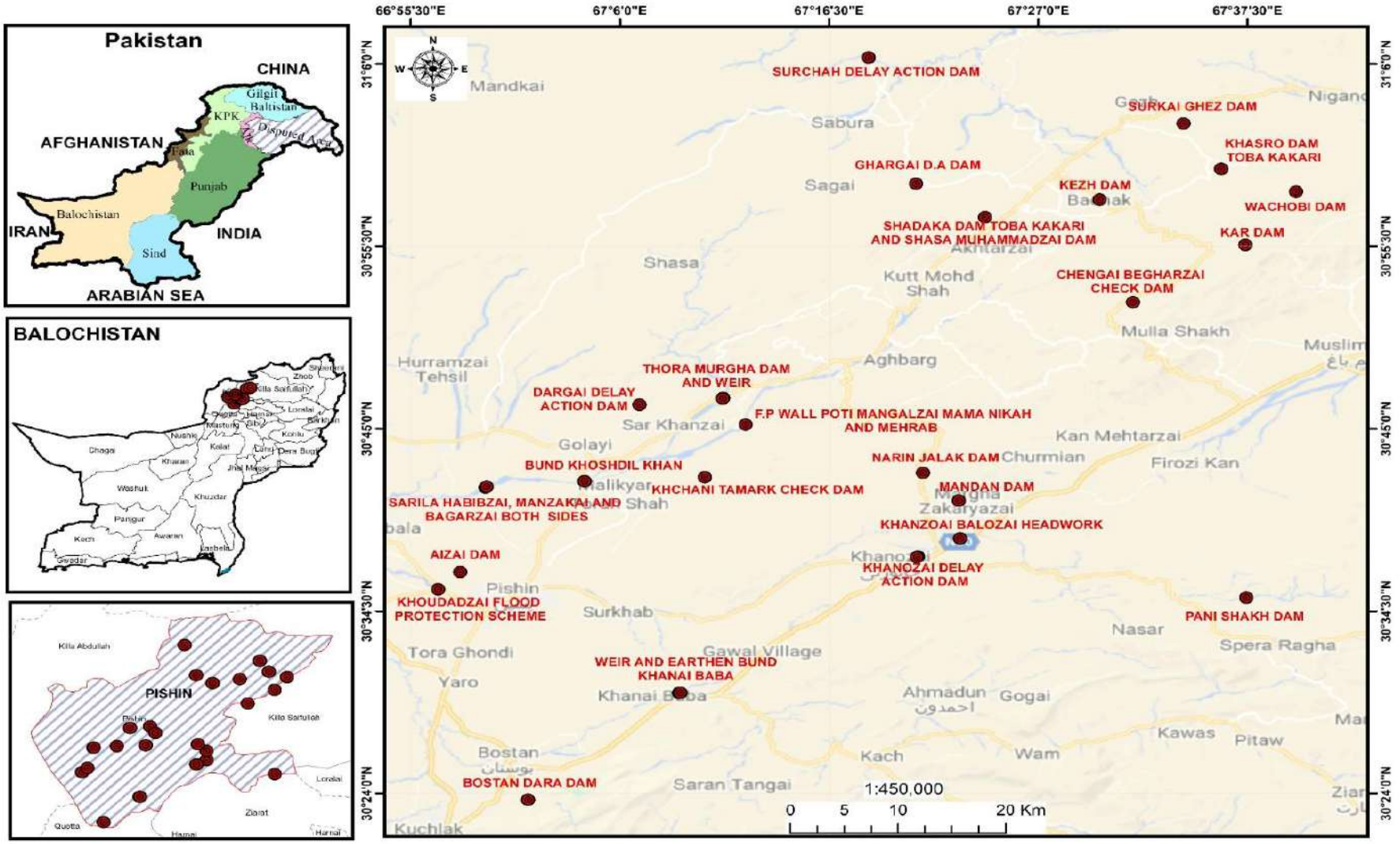

Figure 1-1 : Location of sub-projects in district Pishin

1.3 ENVIRONMENTAL CATEGORY OF PROJECT

26. After the 18th amendment of the constitution of Pakistan, environment became a provincial subject, and the environmental law governing the proposed works is the "Baluchistan Environmental Protection Act, 2012".

27. The EIA / IEE regulations of 2000 also provide categories of projects for which IEE or EIA need to be conducted. The proposed project falls under the category of "Water management, dams, irrigation & flood protection" and hence an IEE report has been prepared.

28. For ADB's SPS, all loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) and requires the completion of the environmental categorization form. REA was filled by consultants and is attached as Annexure-1.

29. The proposed project is classified as 'Category B' based on the site specific temporary medium adverse environmental impacts which will be mitigated through effective and efficient EMP monitoring and implementation.

30. This IEE report has been prepared to comply with the BEPA requirements as well as the ADB SPS, 2009.

1.4 OBJECTIVES OF IEE REPORT

31. The specific objectives of this IEE report are as follows:

(i) Meet the statutory requirements set forth by the Pakistan Environmental Protection Act (PEPA) 1997 and the Baluchistan Environmental Protection Act 2012;
(ii) Comply with ADB policies and safeguards for environmental and social management of projects;
(iii) Facilitate proponents and financiers of the project in ensuring environmental and social acceptability of the project;
(iv) Establish a baseline of existing environmental status at the project site prior to project initiation by collecting secondary and primary data/information on physical, biological and social environment of the project area;
(v) Help the project proponents to incorporate necessary measures for legally compliant and socially acceptable environmental performance of their project;
(vi) Identify significant environmental impacts (both positive and negative) during all stages of the project implementation and propose mitigation measures for negative impacts.

1.5 SCOPE OF IEE STUDY

32. The scope of this IEE study aims at collection and scrutinizing of data related to physical, biological and socio-economic environment of the project area and to prepare the baseline environmental profile. It also aims at the identification, prediction and evaluation of the possible environmental impacts of the proposed project on its immediate surroundings on both short and long-term bases. Based on the nature and scale of those impacts, appropriate mitigation measures are proposed in this IEE study.

1.6 PURPOSE OF IEE REPORT

33. The purpose of this IEE study is to assess significant adverse environmental and social impacts and to suggest mitigation and remedial measures to make the project environmental friendly and sustainable during the construction and operational stages of the project and to initiate the process of NOC from BEPA and clearance from ADB.

1.7 STUDY TEAM

34. A multidisciplinary team was formulated to conduct the study. The team comprises the following persons.

Dr. Akhtar Iqbal	:	Environment Specialist
M. Hussnain Azam	:	Jr. Environmentalist
Ahmed Hassan	:	Sociologist
Umer Raza	:	GIS Expert

1.8 METHODOLOGY

35. The following methodology was adopted for carrying out the IEE study of the proposed project:

a) Orientation

36. Meetings and discussions were held among the members of the IEE consulting team. This activity was aimed at achieving a common ground of understanding of various aspects of the study.

b) Planning for Data Collection

37. Subsequent to the concept clarification and understanding obtained in the preceding step, a detailed data acquisition plan was developed for internal use of the IEE consulting team. The plan identified specific data requirements and their sources; determined time schedules and responsibilities for their collection; and indicated the logistics and facilitation needs for the execution of the data acquisition plan.

c) Data Collection

38. In this step, primary and secondary data were gathered through field observations, concerned departments and published materials to establish baseline of physical, biological and socio-economic environmental conditions.

- Site reconnaissance
- Analysis of maps and plans
- Literature review
- Meetings with concerned department
- Public consultations

d) Physical Environment

39. Information was gathered on the existing physical environment, particularly as related to geology, topography, soils, hydrology and drainage, water quality, air quality, climate, seismology and noise through available secondary data and primary data about water, air and noise quality and field surveys.

e) Biological Environment

40. The status of the flora and fauna of the study area were determined by a review of literature of the area and an assessment of both terrestrial and aquatic environments.

Flora

41. The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species, assessment of stage of growth (mature or sapling) and assessment of canopy cover and the IBAT model was run to assess and compare the field-based survey findings.

Fauna

42. Information on fauna was gathered from existing literature on reported species as well as observations in the field. IBAT model has been used to assess the site's situation for species in the proposed sub-projects area of influence.

f) Socio-Cultural Environment

43. The consultants utilized a combination of literature, field investigations, census report, meetings, through public consultation and interviews to describe the existing social environment and assessment of the potential impact of the construction of the proposed project data was gathered on the following aspects of the social environment:

- Land use and municipal status
- Demographics
- Livelihoods
- Community facilities
- Solid waste management
- Proposed developments
- Archaeological and cultural heritage
- Identification and evaluation of environmental impacts

44. The impacts of the proposed project on the physical, biological and socio-economic environments prevalent in the project area were visualized at the design, construction and operation phases.

g) Mitigation Measures and Implementation Arrangements

45. The adequate mitigation measures and implementation framework is proposed so that the proponent could incorporate them beforehand in the design phase.

1.9 STRUCTURE OF THE REPORT

Section 1 **"Introduction"** briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2 **"Policy, Legal and Administrative Framework"** comprises policy guidelines, statutory obligations and roles of institutions concerning environmental study of the proposed Project.

Section 3 **"The Project"** furnishes information about the studied alternatives, location of the proposed project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4 **"Environmental and Social Baseline"** describes physical, biological and socioeconomic conditions prevalent in the project area.

Section 5 "**Analysis of Alternatives"** describes the proposed alternatives of the project and identified the environmentally, socially and economically viable project design.

Section 6 **"Public Consultation"** identifies the main stakeholders and their concerns raised through scoping sessions and deals with the measures to mitigate the social impacts.

Section 7 **"Environmental Impacts Assessment and Mitigation Measures"** identifies and evaluates impacts of the project activities during the construction and operation stages and recommends with the measures proposed to mitigate potential environmental impacts of the road project.

Section 8 **"Environmental Management Plan"** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements, monitoring cost etc.

Section 9 **"Conclusion and Recommendation"** describes the conclusion of this IEE report and recommendations for the proposed project.

2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 GENERAL

46. This chapter elucidates the current legal framework which is applicable on the proposed project in context of environment and sustainable development. The institutional arrangement that exists in Pakistan and may influence the environmental management of the proposed project is also discussed in this chapter. This IEE report also conforms with the guidelines as provided in ADB's SPS, 2009.

2.2 BACKGROUND

47. The enactment of PEPA 1997 took up the key issues of PEPO and in addition provided for a considerable strengthening of institutions at the national and provincial level for the formulation, execution and enforcement of environmental policies and conferred broad-based enforcement powers to the EPA. NEQS for municipal and liquid industrial effluent, industrial gaseous emissions and motor vehicle exhaust and noise, were issued by Pakistan EPA in 1994.

48. Balochistan EPA review of IEE and EIA Regulations, 2020 and Pakistan Environmental Assessment Procedures were published, to provide necessary guidelines for preparation, submission and review of IEE and EIA studies.

2.3 NATIONAL ENVIRONMENTAL POLICY

49. The National Environment Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. The policy provides broad guidelines for addressing environmental concerns and ensuring effective management of their environmental resources. The provincial, AJK, Northern Areas and local governments, however, may devise their own strategies, plans and programs in pursuit of this Policy.

50. Enforcement of the policy is being carried out through National Environmental Quality Standard (NEQS) and Self-Monitoring & Reporting Tools (SMART) in order to optimize energy and environmental resource consumption within the industries, encourage reduction, recycling and reuse of municipal and industrial solid and liquid wastes, introduce discharge licensing system for industry, devise and implement master plans for treatment of municipal and industrial wastewater in urban and rural areas. The policy has not been revised since 2005.

2.4 IWRM POLICY

51. The Integrated Water Resources Management (IWRM) Policy in Baluchistan was approved in 2006 which highlighted the reforms needed for water resources monitoring and planning in the province. The policy also enforces the adoption of IWRM approach for basin sustainability.

52. As per draft Baluchistan Comprehensive Development Strategy 2013 -2020, the water sector development will be as follows:

53. “For the irrigation water, the strategy is clear that evolving Water Resource Management System and Institutional Framework will be central to sustainable water use in the province. The theme is pillared on undertaking river basin wide management of water with greater focus on the flood irrigation Sailaba (local term) and creating water storages on all strategic locations in the river basins and handling the Sailaba irrigation and dams command area in an integrated manner. Under the Strategy, GoB will support the proposed reconstruction and rehabilitation activity in Pishin.

2.5 ENVIRONMENTAL LEGISLATIONS

54. The key environmental regulations and legislations which are applicable to the proposed project are discussed below.

2.5.1 National Regulations

55. The environmental policy framework, which will govern the project is the National Conservation Strategy (NCS) of Pakistan. The NCS is a broad-based policy statement aimed at achieving environmentally sustainable social and economic development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources
- Sustainable development
- Improved efficiency in the use and management of resources

56. Three operating principles are identified to achieve these objectives. These are:

- Greater public participation in development and environmental management
- A merging of environmental and economic decision making
- Lasting improvements in the quality of life

57. Moreover, the NCS specifies the basic guidelines for an integrated effort aimed at protecting the environment and the natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies, departments, private sector companies, financial institutions and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development.

2.5.2 Pakistan Environmental Protection Act, 1997

58. The PEPA 1997 is the apex environmental law of the country and under section 12 of the Act, it is mandatory for the proponents of the projects to execute the IEE and / or EIA (where warranted) and get the approval from provincial EPA.

59. The following rules and regulations have been issued under the Pakistan Environmental Protection Act, 1997.

Rules:

- National Environmental Quality Standards (Self-monitoring and Reporting by Industries) Rules, 2001.
- Provincial Sustainable Development Fund (Procedure) Rules, 2001.
- Pakistan Sustainable Development Fund (Utilization) Rules, 2001.

- Pollution Charge for Industry (Calculation and Collection) Rules, 2001.
- Environmental Tribunal Procedures and Qualifications Rules, 2000.
- Environmental Samples Rules, 2001.
- Hazardous Substance Rules, 2000

Regulations:

- Review of IEE / EIA Regulations, 2000.
- National Environmental Quality Standards (Certification of Environmental Laboratories)
- Regulations, 2000.

2.5.3 Baluchistan Environmental Protection Act, 2012

60. After the 18th Constitutional amendments, the subject of environment vide Notification No.4-9/2011-Min dated 29th June, 2011 stand devolved to the provinces with effect from 1st July, 2011. Even after the deletion of the subject of environment from the concurrent list, the Pakistan Environmental Protection Act 1997 remained intact as per Article 270-AA, Sub Article (6). However, there is provision that the province, through an appropriate legislature / competent authority, may alter, repeal and amend the laws related to the subject.

61. To regulate and effectively address the peculiar environmental issues of the province of Baluchistan this act namely “Baluchistan Environmental Protection Act 2012” is submitted as per provisions of the Article 270-AA, Sub-Article (6) of 18th Constitutional amendments.

62. The proposed project falls under the jurisdiction of the Baluchistan Environmental Protection Agency (BEPA).

63. This IEE report will need to be submitted to EPA (B) for grant of environmental NOC. An applicable provision of the provincial Act and is relevant for the proposed project given in section 20. The sub-section 2 of section 20 states that “When preparing water resource management plans, departments and other relevant institutions shall at least take the following into account:

- Provisions for integrated watershed management;
- Regulation of sustainable abstraction of groundwater;
- Regulation of the use of ground or surface water for agricultural, industrial, mining, and urban purposes;
- Measures to protect human health and ecosystems;
- Measures to protect wetlands and their associated ecosystems;
- Any other provision necessary for the sustainable use and management of water resources.

2.5.4 Balochistan EPA Review of IEE and EIA Regulations, 2020

64. Two types of environmental assessments can be carried out i.e. IEE and EIA. EIAs are carried out for the projects that have a potentially significant environmental impact, and IEEs are conducted for relatively smaller projects with some relatively lesser significant impacts.

65. The Review of IEE and EIA Regulations 2020, prepared by BEPA under the powers conferred upon it by PEPA-97, categorizes projects for IEE and EIA, respectively. The proposed interventions are likely to fall under the Category B as defined in Schedule – I. According to these guidelines, the proposed project would require an IEE to be conducted.

66. According to the details provided in the regulations regarding preparation, submission, and review of IEEs and EIAs, following is a brief description of the approval process.

- A project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations.
- An EIA or IEE is conducted as required and following the BEPA guidelines.
- The EIA or IEE is submitted to BEPA.
- A non-refundable review fee, depending on the cost of the project and the type of the report, is submitted along with the document as per the rates shown in Schedule III.
- The submittal is also accompanied by an application in the format prescribed in Schedule IV of the regulations.
- The BEPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, (i) confirming completeness, or (ii) asking for additional information, if needed, or (iii) returning the report requiring additional studies, if necessary.
- The BEPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, for the issue of confirmation of completeness.
- When the BEPA accord their approval subject to certain conditions:
- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from BEPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- An environmental management plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- The BEPA is required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The IEE approval is valid for three years from the date of accord. The proponents are required to complete the construction and installation within this time period and start operations. In case of any delays, the proponents are required to obtain extension from EPA.

2.5.5 Land Acquisition Act 1894

67. The primary law for acquisition of land for public purposes in Pakistan is the “Land Acquisition Act, 1894” (hereinafter referred as the Act). The land acquired under the Act vests in the Province and it is only thereafter that the Province may transfer it to someone else.

68. This law is no relevant to this project, because it involves restoration/rehabilitation of Water conservation structures within existing RoW owned by BID and land acquisition is not involved in this project.

2.5.6 Forest Act 1927

69. The Forest Act, 1927 was largely based on previous Indian Forest Acts implemented under the British. The first and most famous was the Indian Forest Act of 1878. Both the 1878 Act and the 1927 one sought to consolidate and reserve the areas having forest cover, or significant wildlife, to regulate movement and transit of forest produce, and duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest or a Village Forest.

70. This Act is not relevant as the project does not lie in any of the notified forest land of Baluchistan.

2.5.7 The Antiquities Act, 1975

71. This act basically defines how to repeal and re-enact the law relating to the preservation and protection of antiquities. The federal government may, by notification in the official Gazette, declare any antiquity to be a protected antiquity for the purposes of this Act. No person shall put any neon signs or other kinds of advertisement, including bill posting, commercial signs, poles or pylons, electricity or telephone cables and television aerials, on or near any protected immovable antiquity. No person shall, for any commercial purpose, make a cinematograph film of any protected antiquity or any part thereof except under, and in accordance with, a license granted by the Director. A contravention of any provision of this Act or the rules shall, where no punishment has been specification provided, be punishable with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to five thousand rupees, or with both.

2.5.8 Pakistan Penal Code 1860

72. The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared on the behalf of the Government of British India. After the partition of India in 1947, Pakistan inherited the same code and subsequently after several amendments by different governments, it is now a mixture of Islamic and English Law. Presently, the Pakistan Penal Code is still in effect and can be amended by the Senate of Pakistan.

2.5.9 The Baluchistan Wildlife Protection (Amendment) Ordinance, 2001

73. The Wildlife Protection Ordinance empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As no activities are planned in notified protected areas, no provision of this law is applicable to the proposed project.

2.5.10 Baluchistan Goats (Restriction) Ordinance 1959

74. This law may come into play, if any of the proposed intervention falls in any informal grazing pasture, as livestock rearing is an important occupation in the project area. The ordinance empowers the Government to restrict movement and / or grazing etc. of livestock in certain areas.

2.5.11 Baluchistan Ground Water Rights Administration Ordinance 1978

75. This law was promulgated to ensure efficient and site-specific management of scarce water resources in Baluchistan. The background to the law suggests admission that hydrological conditions in Baluchistan vary a great deal from place to place. Hence this Ordinance requires establishment of a provincial water Board and district level water Committees. The provincial water Board shall have representation from the Planning & Development department, Revenue department, and Irrigation department etc., thereby clearly identifying major stakeholders. The Ordinance also calls for registration of all water sources and establishes protocols for grant of permits by water committees for use of such sources. The statement of objectives for the Ordinance stipulates that the provincial water Board shall identify areas with ground water resources and declare them as designated ground water basins. It also calls for establishment of suitable laws for all designated ground water basins.

2.5.12 The Canal and Drainage Act, 1873

76. This is an act to regulate Irrigation, navigation and drainage. The provincial government is entitled to use and control for public purposes the water of all rivers and streams flowing in natural channels, and of all lakes, sub-soil water and other natural collections of still water.

2.6 INSTITUTIONAL SETUP FOR ENVIRONMENTAL MANAGEMENT

77. The structural setup of agencies/departments in the environmental sector is such that the provincial ministry of Environment governs and regulates environment-related work at the government level. The BEPA works directly under the control of ministry.

2.6.1 Provincial Environmental Protection Council (Provincial EPC) and the Baluchistan Environmental Protection Agency (BEPA)

78. After devolution of the subject environment to provincial level under 18th amendment, these two organizations are primarily responsible for administering the provisions of the Baluchistan Environmental Protection Act, 2012. The EPC oversees the functioning of the BEPA. Its members include the representatives of the government, industry, nongovernmental organizations and the private sector. The EPA is required to ensure compliance with the National Environmental Quality Standard (NEQS), establish monitoring and evaluation systems, and both identify the need to, as well as initiate legislation whenever necessary. It is thus the primary implementing agency in the hierarchy. Another function of the provincial EPA are the review and approval of environmental assessment reports.

2.7 ASIAN DEVELOPMENT BANK SAFEGUARD POLICIES

2.7.1 ADB Requirements for Preparation of Environmental Assessments of Projects

79. The ADB SPS, 2009 affirms that “environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific” (p 14). Furthermore, the document underlines the ADB’s Strategy 2030, promoting the “sustainability of project outcomes by protecting the environment and people from project’s potential adverse impacts”.

80. This IEE study is fully committed to the requirements determined in the “ADB Safeguard Policy Statement”. The environmental works carried out by RHC on behalf of project proponents have been essentially guided by these rules as enunciated in the “Outline of an Initial Environmental Examination Report”.

81. In the light of significance attached by ADB to various environmental impacts, Project is classified as Category B project, wherein an Initial Environmental Examination is required.

82. The main reason is that the interventions are basically the upgradation and rehabilitation of existing irrigation systems and no resettlement is envisaged. However, an environmental assessment using ADB’s Rapid Environmental Assessment (REA) checklist for urban development and water supply, was filled by PPTA consultants, and the results of the assessment show that the projects are unlikely to cause significant adverse impacts. This initial environmental examination (IEE) has been prepared in accordance with ADB SPS’s requirements for environment category B projects and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subprojects.

83. Thus, an Initial Environmental Examination (IEE) of the project has been conducted, through the following documents: -

- Review and data collection;
- Field visits and public consultation;
- Derive Baseline Condition for the area of influence of proposed work scheme;
- Alternative Analysis
- Impact identification and analysis, and planning and recommendation of mitigation measures;
- Preparation of an environmental management and monitoring plan.

2.7.2 ADB Safeguard Policy 2009

84. Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. ADB’s SPS, 2009 consists of three safeguard policies on environment, involuntary resettlement and indigenous peoples. These are accompanied by operations manual sections on environmental considerations in ADB operations; involuntary resettlement; and indigenous peoples. All three safeguard policies involve a structured process of impact assessment, planning and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that:

- Impacts are identified and assessed early in the project cycle;
- Plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and
- Affected Persons (AP) are informed and consulted during project preparation and implementation.

  The sub-projects will need to comply with all the safeguard policies in the subproject activities, irrespective of whether or not they are being funded in whole or in part by the ADB, the GoP or any other donor. A brief synopsis of these policies and their relevance for the proposed project is given in the **Table 2-1.**

Table 2-1: ADB Safeguard Policy 2009 Relevant to the Project

S. No.	Safeguard Policies	Key Requirements	Remarks
1.	Environment	Projects and subprojects need IEE to address important issues not covered by any applicable regional or sectoral EA.	Applicable to proposed project
2.	Involuntary Resettlement	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs. Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher	No involuntary resettlement is envisaged for the proposed project.
3.	Indigenous Peoples	Measures to avoid potentially adverse effects on the Indigenous Peoples' communities; and when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and intergenerationally inclusive.	There are no groups of people in the project area who could be categorized as indigenous people, therefore, this policy does not apply to the proposed project.

2.7.3 ADB's Accountability Mechanism Policy 2012

85. The objectives of the Accountability Mechanism are providing an independent and effective forum for people adversely affected by ADB-assisted projects to voice their concerns and seek solutions to their problems, and to request compliance review of the alleged noncompliance by ADB with its operational policies and procedures that may have caused, or is likely to cause, them direct and material harm. The Accountability Mechanism is a "last resort" mechanism.

86. In case PAPs' grievances/complaints are unaddressed by multi-tiered Grievance Redressal Committee, ADB provides an independent forum to all the affected personnel to register their complaints directly. However, ADB may refer back the case to multi-tiered GRC for consideration if any complainant approaches ADB without utilizing the project based GRM first.

2.7.4 ADB's Access to Information Policy 2018 (AIP)

87. The objective of the AIP is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported

development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations.

88. The policy applies to documents and information that ADB produces, requires to be produced by its borrowers or clients, or are produced and provided to ADB by other parties in the course of ADB operations. The policy will be implemented in accordance with detailed arrangements approved by ADB Management and made publicly available in accordance with ADB's normal procedures.

2.8 RELEVANT INTERNATIONAL TREATIES

- **Convention on Biological Diversity**

89. The Convention was opened for signature on 5th of June 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit"). It remained open for signature until 4th of June 1993, by which time it had received 168 signatures. The Convention entered into force on 29th of December 1993, which was 90 days after the 30th ratification. The first session of the Conference of the Parties was scheduled on 28thof November – 9th of December 1994 in the Bahamas.

90. The Convention on biological diversity was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. Pakistan became its member in 1994. The Inspector General of Forests Office in the Ministry of Climate Change act as its focal point.

- **Convention on the Conservation of Migratory Species of Wild Animals**

91. Also Known as CMS, it is an environmental treaty under the aegis of the United Nations Environment Program. CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. This was established at Bonn in 1979 and Pakistan has become its member in 1987. National Council for the Conservation of Wildlife in the Ministry of Climate Change is the focal desk for CMS.

2.9 COMPARISON OF INTERNATIONAL AND LOCAL ENVIRONMENTAL LEGISLATIONS

92. The ADB's SPS 2009 requires application of pollution prevention and control technologies and consistency with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

93. In order to select the most stringent standards applicable, a comparison of local (NEQS) and international i.e. International Financing Corporation (IFC)/ World Health Organization (WHO) and United States Environmental Protection Agency (USEPA) regulations have been made, as shown in Table 2-2 below. For air quality, comparison was only possible for pollutants having same averaging periods in NEQS, IFC and WHO. WHO standards for

ambient air quality are more stringent in comparison to USEPA and NEQS standards, in the case of most pollutants. So WHO standards will be used.

94. Similar to the standards for air quality, the comparison of noise standards provided in Table 2-3 clearly shows that NEQS for noise are more stringent in comparison to the WHO/IFC standards. The only exception is the daytime noise level standard for Industrial areas where the WHO/IFC standard is more stringent (70 dB (A)) in comparison to NEQS (75 dB (A)) and so for this particular parameter, the WHO/IFC standard will be used.

95. As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e. NEQS are more stringent and would be preferred over any other international regulations such as WHO/IFC.

96. Similar to the standards for air and Noise quality, the comparison of Water quality standards provided in Table 2-4 clearly shows that NEQS for biological and physical parameters of drinking water quality are same as for WHO standards except for Total hardness as CaCO3. NEQS for Chemical, Toxic inorganic and organic parameters are mostly similar/comparable zinc, residual chlorine, Phenolic compounds (as Phenols) mg/l, Poly-nuclear aromatic hydrocarbons (as PAHs) g/l. WHO for Lead and Zn are more stringent comparatively.

Table 2-2: Comparison of International and Local air Quality Standards

Pollutants	WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard
SO2	24 hr. 10 min	20 up/m^3 500 up/m^3	Annual Mean 24 hrs.	80 up/m^3 120 up/m^3
CO	-	-	8 hrs. 1 hr.	5 mg/m^3 10 mg/m^3
NO2	1 yr. 1 hr.	40 up/m^3 200 up/m^3	Annual Mean 24 hrs.	40 up/m^3 80 up/m^3
O3	8 hrs.	100 up/m^3	1 hr.	130 up/m^3
TSP	-	-	Annual Mean 24 hrs.	360 up/m^3 500 up/m^3
PM10	1 yr. 24 hr.	20 up/m^3 50 up/m^3	Annual Mean 24 hrs.	120 up/m^3 150 up/m^3

PM2.5	1 yr. 24 hr.	10 up/m^3 25 up/m^3	Annual Average 24 hrs. 1 hr.	15 up/m^3 35 up/m^3 15 up/m^3

Table 2-3 Comparison of International and Local Noise Standards

Category of Area/Zone	Limit in dB(A) Leq			
	NEQS		WHO	
	Day Time 06:00 – 22:00	Night Time 22:00-06:00	Day Time 07:00 – 22:00	Night Time 22:00-07:00
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

97. There are no national standards for surface water quality. Instead, drinking water quality and effluent discharge (to inland waters) are listed below. The latter standard assumes a dilution factor of 10 to 1 at discharge and at this dilution is taken as an indicator of acceptable surface water quality.

Table 2-4 Comparison of National and WHO Environmental Quality Standards for Drinking Water

Parameter	Unit	NEQS	WHO/IFC
Bacterial			
E-Coli	numbers/ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Total Coliform	numbers/ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Physical			
Color	TCU	≤ 15 TCU	≤ 15 TCU
Taste	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Odor	No objectionable/Acceptable	No objectionable/Acceptable	No objectionable/Acceptable
Turbidity	NTU	< 5 NTU	< 5 NTU

Total Hardness	mg/l	< 500 mg/l	--
TDS	mg/l	< 1000	< 1000
pH		6.5-8.5	6.5-8.5
Chemical			
Aluminum	mg/l	≤0.02	0.2
Antimony	mg/l	≤0.005 (P)	<0.02
Arsenic	mg/l	≤0.05 (P)	0.01
Barium	mg/l	0.7	0.7
Boron	mg/l	0.3	0.3
Cadmium	mg/l	0.01	0.003
Chloride	mg/l	<250	250
Chromium	mg/l	≤0.05	0.05
Copper	mg/l	2	2
Cyanide	mg/l	≤0.05	0.07
Fluoride	mg/l	<1.5	1.5
Lead	mg/l	≤0.05	0.01
Manganese	mg/l	≤0.5	0.5
Mercury	mg/l	≤0.001	0.001
Nickel	mg/l	≤0.02	0.02
Nitrate	mg/l	≤50	50
Nitrite	mg/l	≤3	3
Selenium	mg/l	0.01)P)	0.01
Residual Chlorine	mg/l	0.2-0.5 at consumer end	-
Zinc	mg/l	5.0	3

98. NEQS for vehicular emissions and wastewater are given in Table 2-5 and 2-6 respectively.

Table 2-5: National Environmental Quality Standards for Motor Vehicle Exhaust and Noise

Sr. No.	Parameter	Standards (maximum permissible limit)	Measuring method
1	Smoke	40% or 2 on the Ringelmann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more.
2	Carbon Monoxide	Emission Standards: New Used Vehicles 4.5% 6%	Under idling conditions: Non-depressive infrared detection through gas analyzer
3	Noise	85 db (A)	Sound-meter at 7.5 meters from the source

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Table 2-6: NEQS for Municipal and Liquid Industrial Effluents (Mg/L, Unless Otherwise Defined)

Sr. No.	Parameter Standards	Value
1.	Temperature	$40^{O}C$
2.	pH value (acidity/basicity)	6-10pH
3.	5-days Biochemical Oxygen Demand (BOD) at $20^{O}C$	80mg/L
4.	Chemical Oxygen Demand (COD)	150 mg/L
5.	Total Suspended Solids	150 mg/L
6.	Total Dissolved Solids	3500 mg/L
7.	Oil and Grease	10 mg/L
8.	Phenolic compounds (as phenol)	0.1 mg/L
9.	Chloride(asCl^{-})	1000mg/L
10.	Fluoride (as F^{-})	20mg/L
11.	Cyanide (as CN^{-})	2mg/L
12.	An-ionic detergents (2) (as MBAS) (5)	20mg/L
13.	Sulphate($SO4^{2-}$)	600mg/L
14.	Sulphide (S^{2-})	1.0mg/L

15.	Ammonia (NH_3)	40mg/L
16.	Pesticides, herbicides, fungicides and	0.15mg/L
17.	insecticides Cadmium (4)	0.1mg/L
18.	Chromium (4) (trivalent and hexavalent)	1.0 mg/L
19.	Copper (4)	1.0mg/L
20.	Lead (4)	0.5mg/L
21.	Mercury (4)	0.01mg/L
22.	Selenium (4)	0.5mg/L
23.	Nickel (4)	1.0mg/L
24.	Silver (4)	1.0mg/L
25.	Total toxic metals	2.0 mg/L
26.	Zinc	5.0mg/L
27.	Arsenic	1.0mg/L
28.	Barium	1.5mg/L
29.	Iron	2.0mg/L
30.	Manganese	1.5mg/L
31.	Boron	6.0mg/L
32.	Chlorine	1.0mg/L

Explanations:

1. Assuming minimum dilution 1: 10 on discharge. Lower ratios would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
2. Assuming surfactant as biodegradable.
3. MBAS means Methylene Blue Active Substances.
4. Subject to total toxic metals discharge as at S. No. 25.

3. PROJECT DESCRIPTION

3.1 BACKGROUND

99. Baluchistan is the largest province of Pakistan in terms of area and the smallest in terms of population. It is considered to be comparatively less developed and the sole reason is the scarcity and paucity of water. Pakistan received financing for the proposed project from ADB through NDRMF.

100. The flood problems in the project area are peculiar and common like in other areas but different when compared to other districts of Baluchistan due to its topographical, physiographical, and demographic conditions. Flashy hill torrents emanating from steep and denuded hills cause devastation in almost the project area because of high velocity and unpredictable magnitude. The population and cultivated land/orchards are mainly located at the edge of rivers and the base of hills which are under constant threat of flooding. During each flood season, a considerable chunk of land is eroded, resulting in significant financial losses for farmers.

101. To address this problem, the restoration of damaged storage/delay action/check dams has been conceived as an effective tool to enhance groundwater recharge. Flash floods have been experienced in all parts of the province, particularly in the project area, leading to loss of human lives, erosion of arable lands, damage to residential areas, loss of livestock, and damage to irrigation infrastructure, roads/bridges, etc. Therefore, it is necessary to manage hill torrents for irrigation and recharge purposes. Hence, the restoration and rehabilitation of these schemes are proposed.

3.2 LOCATION OF THE PROJECT

102. The location map of the project area has been provided in Figure 3.1 below.

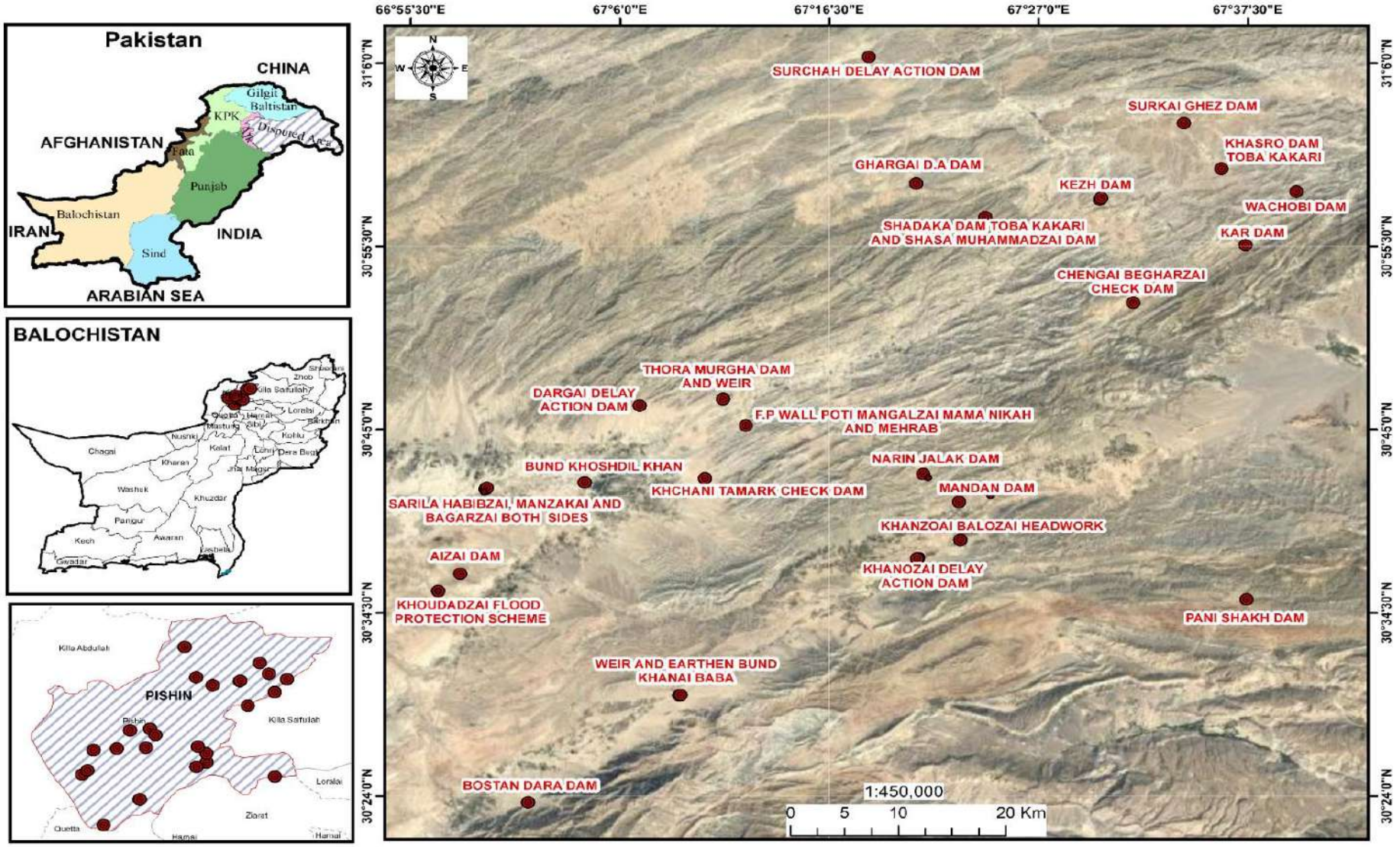


Figure 3-1: Location Map of the sub-projects

3.3 COMPONENTS OF THE PROJECTAND SCOPE OF WORK

103. Main components of the sub-projects include:

- Restoration of water conservation structures (small dams, check dams, delay action dams, spillways and outlet works)
- Restoration and strengthening of flood protection bunds

104. The salient features of the project and details of the scope of work are presented below.

3.3.1 BUND KHUSHDIL KHAN

History

105. Bund Khushdil Khan is a historic dam with reasonable storage capacity fulfilling the irrigation water requirements of the Malazai Yasinzai, Jungle Sarkar and Khudaidadzai areas. This dam was constructed during the British era in 1890 by utilizing the flow of the Surkhab and Tore Murgha rivers through gated off-takes. It has a distribution system to serve the downstream command area through three channels i.e. the channel with a 6800 FT withdrawal capacity of 46 Cusecs, the Sarla Channel with a 7000 FT withdrawal capacity of 25 cusecs and the main Channel with a 5000 FT withdrawal capacity of 21 Cusecs.

Description & Justification of the Project

106. After the restoration of this dam, farmers will be able to focus on developing their lands. The Agriculture Department at Bund Khushdil Khan Village will guide farmers and provide them with the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is anticipated, with expectations of an expansion exceeding 1000 acres. In addition to providing sustained water supply for the existing seasonal cultivation of vegetables and food grains will be ensured. Field surveys indicate that 230 tube wells and 45 open surface wells will be recharged, benefiting 2300 livestock and 6195 farming families. Furthermore, the protection of villages like Surai dam from flood devastation caused by local rivers and creeks will also lead to improvements in the socioeconomic conditions of the people in the project area.

Key Facts of Damages and Soil Classification of Catchment area

107. In the 2022 monsoon season, heavy floods caused damage to the earthen embankment, which is 700 feet in length and includes a gated spillway. As a result of this flooding, houses along the Barshore river sustained damage. The functionality of the Thora Murgha channel has been halted because the weir and gated system, which were installed to divert the flow were demolished and itcurrently, only the Surkahb channel remains functional.

Previous parameters and Existing Condition of Project

1.	Year of completion.	=	1890.
2.	Catchments area	=	694 Sq. miles
3.	Command area.	=	10,000 acres
4.	Length of embankment of bund Khushdill Khan.	=	3500 feet
5.	Max: depth of water.	=	38 ft.
6.	Length ofspillway.	=	140 feet.
7.	Spillway discharge ccapacity.	=	4000 cusecs

8. Feeding sstreams. = Tore Murgha, Barshore,
9. Tamarak & Surkhab
10. Pond area of reservoir = 5 Sq. miles
11. Design storagecapacity = 23840 acre- feet.
12. Present storage capacity = 6000 acre-feet

A. Distribution System

1. Main cchannel. = 6800 feet length.
2. Withdrawal ccapacity. = 46 cusecs.
3. Sheba channel. = 70000 feet length.
4. Withdrawal capacity. = 25 cusecs.
5. Sarala channel. = 50000 feet length.
6. Withdrawal capacity. = 21 cusecs.
7. Present area under Irrigation. = 2500 cusecs.

B. Feeding Channels Discharge

8. Tore Murgha ffeeding cchannel ddischarge. = 4000 cusecs.
9. Surkhab ffeeding ddischarge. = 2000 cusecs

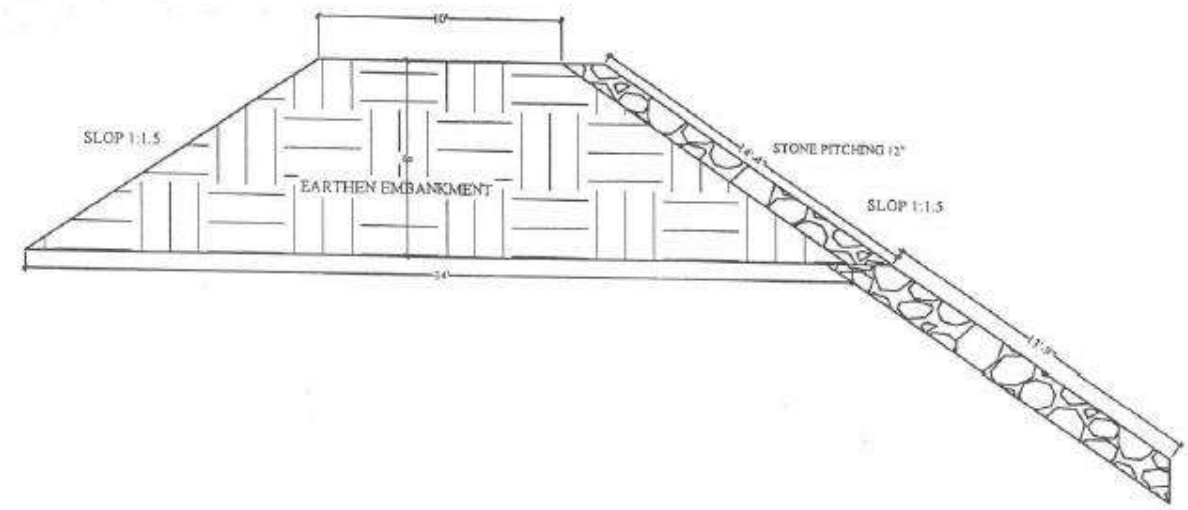
RESTORATION WORKS

1. Estimated Cost Rs. 80.00 Million

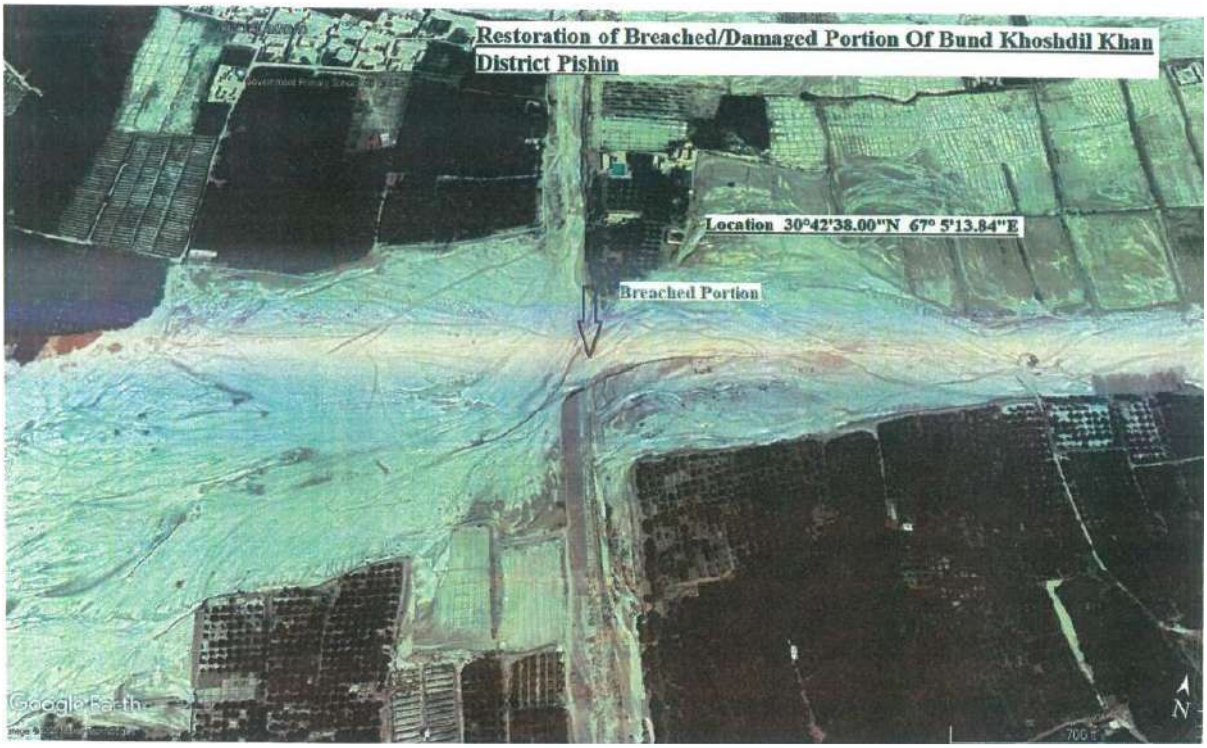
	Location	Bund Khushdil Khan is Located about 14 Km North-East of Pishin Town & 62 Km North of Quetta in District Pishin
		Location Point: Latitudes 30.42'38.00"N, Longitudes 67"5'13.84."E
Dam Structures		
1	**Restoration of breached portion of Khushdil Khan bund**	
	Type	Earthen embankment
	Maximum height above river bed level to dam top level	The breached portion has to be raised up to 13 ft.
	Catchment area	694 Sq. Mile
	Top width of embankment	20ft
	Length of embankment	700 ft. breached portion
	Dam top elevation	100ft
	Pond storage capacity	Existing poundage capacity is 6000 acre-ft.
2	**Restoration of breached portion of Malikyar bund along with Barshore river**	
	Type	Earthen embankment
	Maximum height above river bed level to top level	8ft
	Length	2500ft
	Apron	13.5 ft.

3	**Spillway widening and Restoration of Gates**	
	Spillway width	30 ft. to be wide
	Spillway length	45ft
4.	**Restoration of breached portion of Malikyar protection wall along orchards**	
	Type	Gabion wall
	Maximum height above river bed level to top level	8ft
	Length	783ft
	Apron	10.8 ft
5.	Proposed command area	(10000 Acres) For whole bund Khoshdil Khan project

X-Section of Bund Khushdil Khan



Location Map of Band Khushdil Khan



3.3.2 THORA MURGHA DAM AND WEIR

History

108. In 2005, an earthen embankment was constructed on Thora Murgha Manda to store runoff generated either by flash floods or through the melting of snow. This embankment serves to recharge downstream open surface wells, tube wells, and kareezs. The storage of floodwater will be utilized to raise the water table and promote agricultural development to a greater extent. The scheme is promising to meets the criteria for priority implementation.

Description & Justification of the Project

109. After the restoration of this dam, farmers will be able to focus on the development of their lands. The Agriculture department at Thora Murgha village will guide farmers and provide them with the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is assured and expected to be more than 900 acres, in addition to providing sustained water supply for the existing seasonal cultivation of vegetables and food grains. Field surveys reveal that 70 tube wells and 60 open surface wells, among others, will be recharged, benefiting 350 livestock and 300 farming families. Furthermore, the protection of villages like Surai dam from flood devastation caused by local rivers and creeks will also lead to improvements in the socio-economic conditions of the people in the project area.

Proposal

1. Dam

110. Dam is a vital component of infrastructure and continuously provides a wide range of economic, environmental and social benefits, including water supply, wildlife habitat, and flood risk reduction. To restore the scheme for the damages in the 2022-23 monsoon flood season, the BID in Pishin has prepared a proposal (PC-1) with the recommendation to restore the damaged portion of the weir and stone masonry wall for the outlet structure.

2. Restoration of Weir and dam

111. Cut-off walls have been provided for both the upstream (U/S) and downstream inner side (D/IS) with scanning on the stilling basin. An RCC wall has been constructed for the right-side embankment.

3. Stone Masonry wall

112. Stone masonry wall for outlet structure has been proposed along right site embankment of 480 ft length.

Key Facts of damages and soil classification of catchment area

113. In order to divert both the perennial and flood flows of the Thora Murgha river, a steel-crafted weir was constructed spanning a length of 740 ft across the river. This weir is designed to redirect the flow towards intake structure and regulator gates.

114. The upstream cutoff wall of the weir and stilling basin sustained damage during the 2022 monsoon season. The primary function of the weir, which is to divert floodwater has been compromised. The earthwork embankment remains intact, but the toe at RD 1600 adjacent to the river is damaged. The catchment area covers 95 square miles with the longest river spanning 23.5 miles. Soil classification in the catchment area includes 40% fractured sandstone and shale, 25% fractured limestone, 5% low-lying valley floor, and 30% non-fractured rock. Discharge calculations using the HALCROW-ULG method indicate a flow of 19947 cusecs for a 500-year return period.

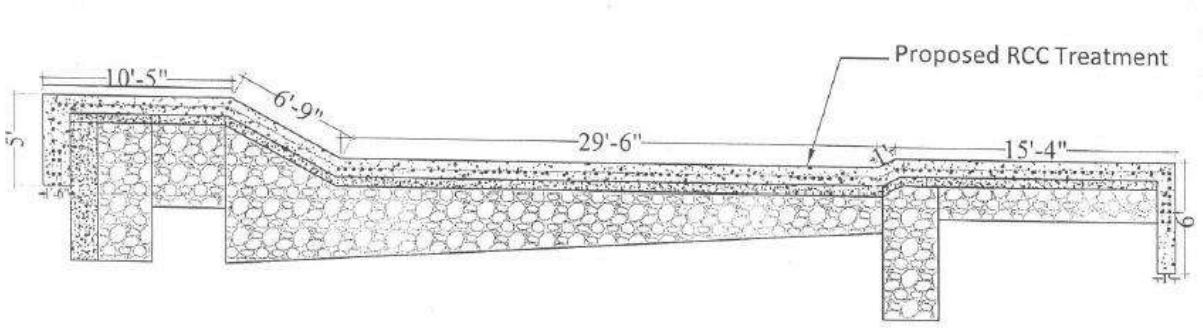
PREVIOUS PARAMETERS AND EXISTING CONDITION OF PROJECT

1. Estimated Cost Rs. 50.00 Million

Location	Proposed dam site is located at a distance of about 30 km north - east of Pishin town near Thora Murgha bridge on Pishin Barshore road, district Pishin.
	Location point: Latitude 30°46'56.18"N, Longitude 67°11'22.15"E
Dam Structures	
Restoration of dam body and weir	

Type of weir	Steel crated weir (existing). The upstream cutoff wall is proposed.
Length of cutoff wall (weir)	740ft
Length of damaged portion of stilling basin	Length= 740 ft., width= 60ft
Catchment area	95 Sq. miles
Dam top width	20feet
Dam length	4215 feet.
Pond / storage capacity	1610 acre-feet.
Spillway	
Type and location	PCC cutoff walls (UIS, DIS)
Design discharge	19947. (500 year)
Flood surcharge over spillway	2.65 feet, free board 5.35 feet.
Pond / storage capacity	1610 acre-feet.
Spillway width (clear)	Existing 70 feet
Spillway length	134 feet.
Crest elevation	90 feet
Stone masonry wall for out let structure	
Length	480 feet
Proposed command area	(900-1000 acres)

Cross Section of Weir of Murgha Dam



Location Map of Murgha Dam

3.3.3 BUND KHANAI BABA

History

115. The Khanai Baba dam was constructed in the year 2004-2005 on the Dargai river, which has a discharge of 7100 cusecs. The Khanai Baba dam is located in Killi Khanai Baba, Tehsil Karezat, and has a reasonable storage capacity of 1000 acre-feet. This dam serves as the sole source of water for the scheme area. The storage of floodwater is utilized to raise the water table and promote agricultural development to a greater extent. The scheme is promising and meets the criteria for priority implementation.

Key facts of damages and soil classification of catchment area:

116. The scheme was overtopped during the flood season of Monsoon 2022, resulting in damages to the upstream sloped portion of the dam body.

117. The flood discharge for a 30-year return period was previously designed at 8400 Cusecs. The weir has been designed to handle 14494 cusecs for a 100-year return period. The Gharki River's catchment area spans 60 square miles, with the longest river reaching 16.25 miles. Soil classification in the catchment area consists of 60% fractured sandstone and limestone shale, 20% alluvial fan/piedmont, and 20% non-fractured rock. Discharge calculations using the HALCROW-ULG method indicate a flow of 2800 cusecs for a 100-year return period.

Description & Justification of the Project

118. After the restoration of this project, farmers will be able to fully concentrate on the development of their lands. The agriculture department at Killi Khanai Baba will guide

farmers and provide them with the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is assured and expected to be more than 321 acres. This will also ensure sustained water supply to the present area being cultivated on a seasonal basis for growing vegetables and food grains. Field surveys reveal that 12 tube wells and 4 open surface wells, among others, will be recharged, benefiting 543 livestock and 450 farm families. Additionally, this project will have a positive impact on the agricultural land and orchards in the surrounding villages.

Proposal:

119. To restore the scheme, which was damaged in the 2022 monsoon flood season, the BID has prepared a proposal (PC-1).

1. Rehabilitation of Weir

120. An obstruction wall was constructed across the Gharki river to divert water to the pond of Khanai Baba dam, which was washed away due to a flood. Therefore, the BID proposed the construction of a weir across the Gharki river.

2. Rehabilitation Guide Bund:

121. A guide bund/protection bund was constructed to protect the downstream toe of the dam embankment and agricultural land, which was damaged in a previous flood. Therefore, the proposal includes the restoration of this bund.

3. Flood Protection Wall:

122. A flood protection wall with a length of 1897 feet is also included in the proposal along the Gharki river to protect the agricultural land.

4. Rehabilitation Flood Channel:

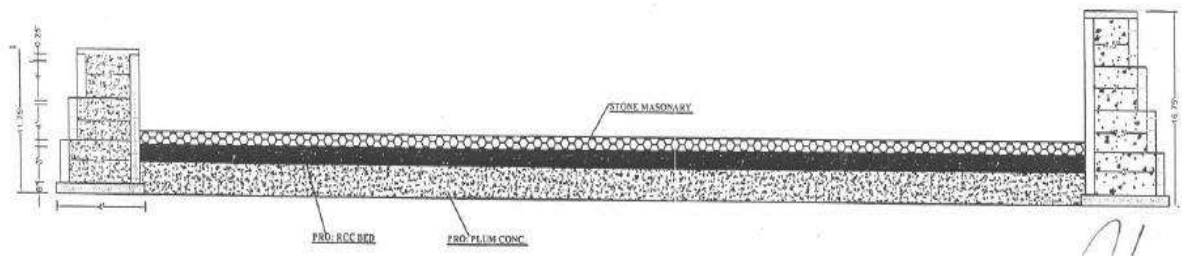
123. A flood channel with a length of 386 feet has been included in the project to carry the gated water of 200 Cusecs to the Khanai Baba dam.

Previous parameters and Existing Condition of Project:

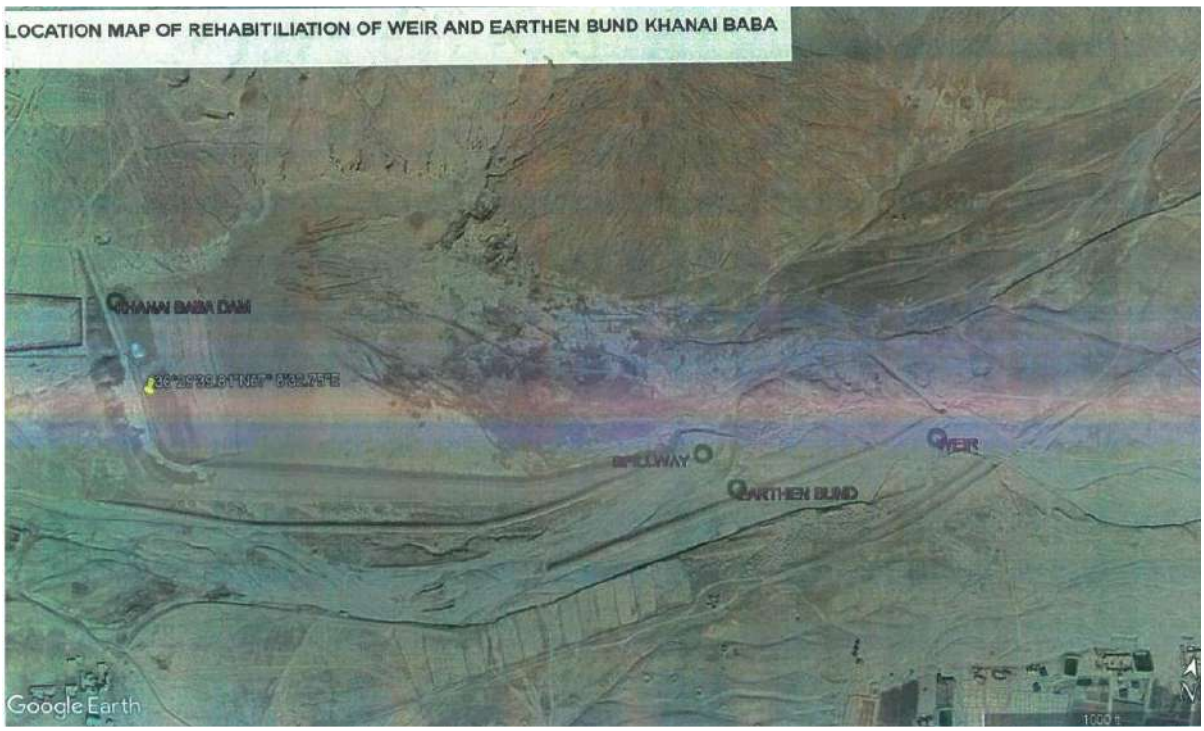
	Location	Proposed dam site is located at 48 km from Pishin towards its south, direction near Khanai aba on main Quetta Zhob.
		Location point
		Latitude 30° 29'39.81"N, Longitude 67"6'32.75"E
Dam Structures		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	38.0 feet
	Catchment area of dargai river	55.00 Sq. mile 60.00 Sq. mile

	Dam top width	20ft
	Dam length	3465 feet
	Pond / storage capacity	1000-acre feet
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	7100 cusecs. (100 year)
	Flood surcharge over spillway	5 feet
	Spillway width (clear)	225 feet.
	Spillway length	80 feet.
3	**Obstruction/Profile gabion wall**	
	type	Gabion
	length	200 ft. {across Gharki river)
	Capacity	200 cusecs
4	**Off take structure**	
	type	Un gated
	length	40 feet
	RCC pipe	2 nos :(3 feet dia)
	Abutment wall {R/L Side)	78 feet
5	**Guide Bund**	
	Location	RJS creek in hilly range
	Length'	1070 feet
6	Command area	(1886 acres)

X-Section of Weir of Bund Khanai Baba



Location Map of Bund Khanai Baba



3.3.4 KHANOZAI BALOZAI HEADWORKS

124. Estimated Cost: Rs.90.20 million

History:

125. Khanozai Balozai headwork constructed in Khanozai area in 2015-16. The headwork is constructed on Togi river having a catchment area of about 82.50 sq. miles with flood discharge of 13800 cusecs at point of interest. Khanozai Balozai head works is constructed at U/S side of existing Balozai delay action dam, through this project the existing Balozai & Khanozai delay action dam will get 400 cusecs of flood water exclusively out of total flood discharge of 13800 cusecs through their proposed feeding channels during rainy season. The project is thus expected to contribute substantially as mentioned below:

i. The primary objectives of this project are to minimize the flood losses currently affecting the people of the Khanozai and Balozai areas.

ii. The project aims to achieve an effective flood management target by providing a flood diversion weir on the Togi river and ensuring regulated supplies of floodwater for the existing Balozai and Khanozai delay action dams. This scheme is promising and meets the criteria for priority implementation. During the last year's monsoon flood season, the floodwater damaged the downstream cutoff wall and gabion apron. The right side of the feeding channel of Balozai sustained significant damage, and on the left side, the Khanozai feeding channel was also affected by the flood. The BID Pishin proposes to restore the damaged portions of both feeding channels and is considering the construction of a new cutoff wall based on design criteria.

Key Facts of damages and soil classification of catchment area:

126. This scheme was damaged during the monsoon 2022 flood season, resulting in damage to the last downstream cutoff wall and the washout of a gabion apron.

127. The catchment area covers 82.50 square miles, with the longest river spanning 23.38 miles. Soil classification in the catchment area consists of 50% fractured sandstone, 40% fractured limestone, and 10% alluvial fan/piedmont. Discharge calculations using the HALCROW-ULG method indicate a flow of 13,800 cusecs for a 100-year return period.

Description & justification of the Project:

128. After the restoration of the feeding channel and the downstream portion of the weir body, the flow of water through both feeding channels namely Khanozai and Balozai feeding channels will smoothly carry water to the Khanozai and Balozai dams. This will also provide protection to downstream agricultural land and orchards from flood devastation caused by local rivers and creeks, ultimately improving the socio-economic conditions of the people in the project area.

Proposal:

129. To restore this scheme, which was damaged in the 2022 monsoon flood season, the BID Pishin has prepared an estimated proposal (PC-1).

1. RCC CUTTOFF WALL

130. The last downstream cutoff wall was damaged and a gabion apron was also washed away in the flood. As a response, the BID conducted a survey of the scheme and proposed the construction of a new 260-foot cutoff wall along with a chute and gabion apron in the project.

2. RESTORATION OF KHANOZAI ANO BALOZAI FEEDING CHANNEL:

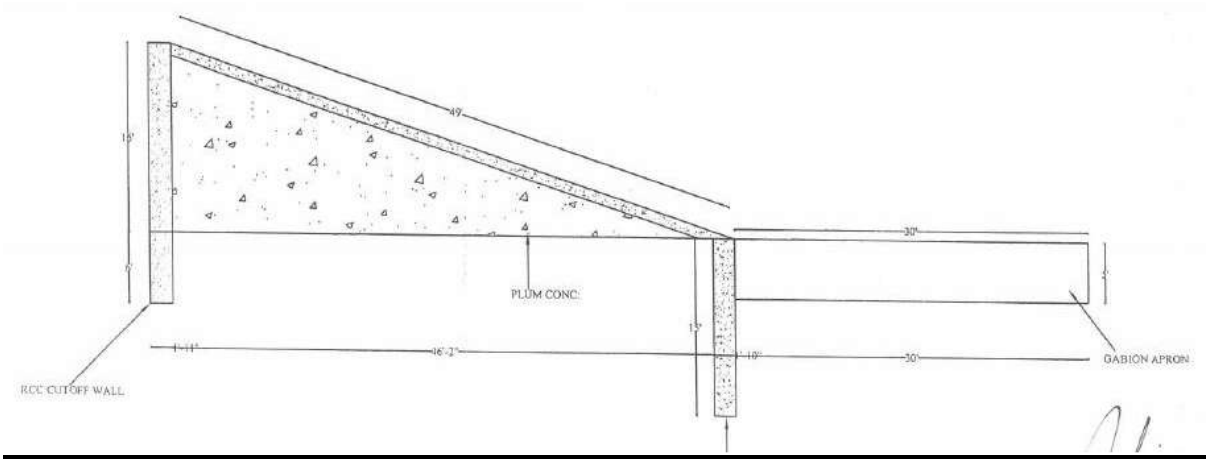
131. Both the feeding channels were demolished in the flood therefore, in the proposal an RCC wall along with cutoff walls and a channel bed is recommended.

Previous parameters and Existing Condition of Project

Location		The project site is located at a distance of about 7 km from Khanozai town near Quetta-Zhob national highway.
		Location point: Latitude 30° 38'40.47"N, Longitude 67°23'1.93"E
Dam Structures		
1. Main weir body		
	Maximum height above river bed level to top Level	5.0 feet
	Catchment area	82.50 Sq. miles
	Weir body length	260 feet
2	**OFF TAKE WALL, 2 NOS REGULATION GATED**	

	Flood Openings	2 Nos.
	Discharge Capacity.	400 cusec; each
3	***GUIDBUND.***	
	Guide bund.	2 Nos
	Length.	350 feet each
	Avg: height.	10 feet
	Crest elevation	90 feet
4	***FEEDING CHANNEL.***	
	Discharge capacity.	400 cusecs. (each)
	Length (Balozai)	800 feet.
	Length (Khanozai)	800 feet.

L-Section of Weir



Location Map of Khanozai Balozai Dam

3.3.5 KHANOZAI DELAY ACTION DAM

132. Estimated Cost: Rs.150.00 million

History:

133. Khanozai dam was originally constructed in 1940 through the motivation of the local community on a self-help basis. It was rehabilitated in the years 1983 and 2019-20 by the Irrigation Department. A flood feeding channel is situated to carry the water of the Mochi River, which has a capacity of 1800 cusecs. Additionally, a weir has been constructed on the upstream side of the Togi River in the Dilsora area, allowing 400-cusec gated floodwater to enter the Khanozai dam's pond. Khanozai dam has a reasonable storage capacity of 980 acre-feet, serving as the sole source of water for the scheme area. The storage of floodwater is effectively utilized to raise the water table and promote agricultural development to a greater extent. This scheme is promising and meets the criteria for priority implementation. Key Facts of Damages and Soil Classification of Catchment area:

134. The scheme was damaged during the Monsoon 2022 flood season. Due to this, the dam body received damages on both the upstream sloping portion and the downstream portion.

135. The catchment area covers 5.85 square miles, with the longest river spanning 4.58 miles. Soil classification in the catchment area consists of 60% fractured sandstone and shale, 25% alluvial fan/piedmont, and 15% non-fractured rock. Discharge calculations using the HALCROW-ULG Method indicate a flow of 2800 Cusecs for a 100-year return period. Description & Justification of the Project.

136. After the restoration of this dam, farmers will be able to fully concentrate on the development of their lands. The agriculture department at Khanozai village will guide farmers

and provide the latest information on agriculture, including the use of modern seeds and fertilizers. Field surveys reveal that 18 tube wells and 2 open surface wells will be recharged, benefiting 798 livestock and. Additionally, this project will protect villages near the Khanozai dam from flood devastation caused by local rivers and creeks, ultimately improving the socio-economic conditions of the people in the project area.

Proposal:

137. To restore the scheme, the irrigation division Pishin has prepared a Pc1 estimated with following proposal:

1. Raising of dam body

138. Some settlement is present close to the dam body, so the irrigation division Pishin has proposed to raise the dam body's height by up to 5 feet. The existing bund is in a very weak condition due to wave action, and at some points, rat holes have also formed. Therefore, it is proposed to remodel and strengthen the existing dam body, along with its raising. Additionally, a key trench is proposed for the upstream and downstream sides of the embankment to reinforce the dam embankment further. An earthen embankment, approximately 10 feet wide, is also included to further strengthen the dam body.

2. Raising of saddle bund:

139. A saddle bund is also a part of the main dam body, located at the end of the pondage area to protect the agricultural land from the pond water. Therefore, raising the saddle bund is also planned to be carried out at the same level as the main dam.

3. Stone masonry Wall:

140. A flood feeding channel is situated to carry 1800 cusecs of water from the Mochi River, while a weir has been constructed on the upstream side of the Togi River in the Dilsora area to manage 400 cusecs of gated floodwater, which serves as the primary water source for the dam. However, during the previous flood, the feeding channel breached at some points, causing water to disperse all around. To protect the feeding channel and safely guide floodwater to the dam, a stone masonry wall with a length of 3800 feet is proposed.

4. Restoration of Flood Channel:

141. The spill water from the spillway enters a flood channel that runs through the village of Khanozai. The flood channel is mostly in a weak position and damaged at some points. Therefore, the irrigation division Pishin has proposed the construction of a new flood channel with a length of 5584 feet to safely divert the spill water into the local river.

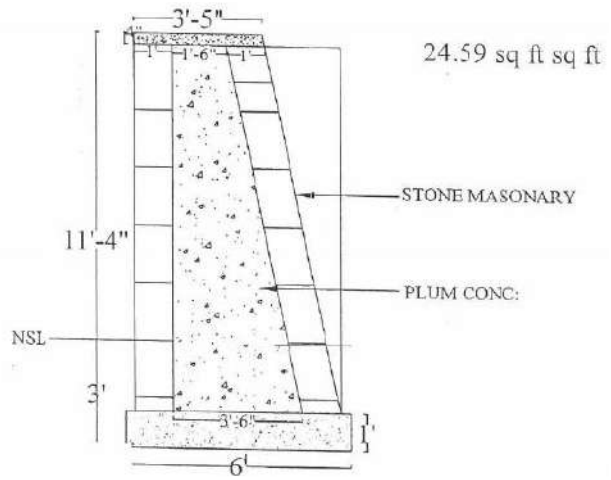
5. Box culvert:

142. During the rainy season, the floodwater passing into the feeding channel disrupts the transportation of the local community. To address this issue, the proposal includes the construction of two box culverts on the feeding channel, providing the community with improved transportation access.

Previous parameters and Existing Condition of Project:

Location		Proposed dam site is located at 50 Km from Pishin towards its south, direction near khanozai on main Quetta zhob.
		Location Point: Latitudes 30° 37'35.04"N, Longitudes 67°20'51.83"E
Dam Structures		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height	30.0 feet
	Catchment area	5.85 Sq. mile
	Dam top width	20ft.
	Dam length	3200 feet.
	Pond / storage capacity	980-acre feet
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	2800 cusecs. (100 year)
	Flood surcharge over spillway	5 feet
	Spillway width (clear)	40 feet.
	Spillway length	70 feet.
	Command Area	4062 acres

X-Section of Stone Masonary wall of Khanozai Delay Action Dam



Location Map of Khanozai Delay Action Dam

3.3.6 KEZH DAM

143. Estimated Cost: Rs. 46.13 Million

History:

144. Kezh dam was constructed in 2005 by the irrigation department. Kezh dam has a reasonable storage capacity of 150 acre-feet, serving as the sole source of water for the scheme area. The storage of floodwater is effectively utilized to raise the water table and promote agricultural development to a greater extent. This scheme is promising and meets the criteria for priority implementation.

Key facts of damages and soil classification of catchment area:

145. The scheme was overtopped during the monsoon flood season of 2022. Consequently, the dam body received damages on the downstream sloppy portion.

146. The catchment area covers 10.50 square miles, with the longest river spanning 6.92 miles. Soil classification in the catchment area consists of 60% fractured sandstone, shale, and 40% alluvial fan/piedmont. Discharge calculations using the HALCROW-ULG Method indicate a flow of 2800 Cusecs for a 100-year return period.

Description & justification of the project:

147. After the restoration of this dam, farmers will be able to fully concentrate on the development of their lands. The Agriculture Department at Kezh Village will guide farmers and provide the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is assured and expected to exceed 232 acres, in

addition to sustaining water supply for the present cultivated area used for seasonal vegetable and grain crops. Field surveys reveal that 18 tube wells and 5 open surface wells will be recharged, benefiting 1651 livestock and 100 farm families. Furthermore, this project will protect Kezh dam and the surrounding villages from flood devastation caused by local rivers and creeks, ultimately improving the socio-economic conditions of the people in the project area.

Proposal:

148. To restore the scheme that was damaged in the monsoon flood season of 2022-23, the irrigation division Pishin has prepared a proposal with the following works:

1. Restoration of dam body:

i. The breached portion will be restored from RD 100 to RD 350 with a width of 55 feet at the bottom and 25 feet at the top.
ii. Some settlement has occurred in the dam body, so it is proposed to raise the dam body by up to 4 feet in height.

2. Proposed new spillway:

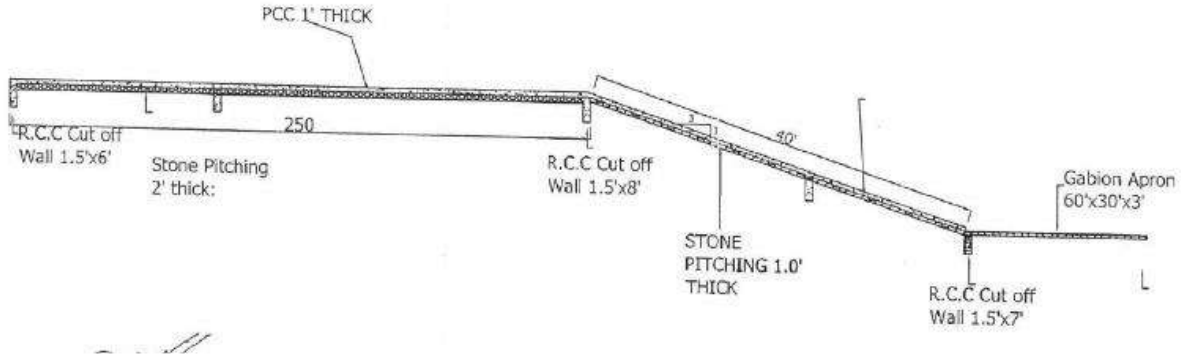
149. A new spillway has been proposed due to the vulnerable location of the old spillway. When the floodwater in the dam reaches the pond level, the surplus water did not spill out over the existing spillway. For this reason, the irrigation division Pishin has proposed a new spillway on the left side of the dam.

Previous parameters and Existing Condition of Project:

Location		Proposed dam site is located at distance of 95 Km north east of Pishin town in Toba Kakarai near Injinai area in district Pishin.
		Location Point: Latitudes 30° 58'12"N, Longitudes 67°30'3"E
Dam Structures		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	45.0 feet
	Catchment area	10.50 Sq. mile
	Dam top width	20 feet.
	Dam Length	1700 feet.
	Pond / Storage capacity	150 acre feet
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	2800 cusecs. (100 year)
	Flood surcharge over spillway	5 feet

	Spillway width (clear)	90 feet.
	Spillway length	640 feet.
	Command Area	(1308 acres)

L-Section of Spillway of Kezh Dam



3.3.7 KHASRO DAM

150. Estimated Cost: 47.93 million PKR

151. The dam was constructed in 1983 at an estimated cost of 0.90 Million PKR by the irrigation department for flood mitigation and to conserve floodwater for drinking and agriculture during scarce periods. Over the decades, the storage capacity of the dam has been reduced due to silt accumulation and the dam body has weakened as a result of rain floods. Moreover, the dam body sustained damages at RD 100 ft. during the recent unprecedented floods from July 4 to August 26, 2022. This dam has remained a sustainable source of water supply for the Khasro Area. The irrigation division Pishin has proposed to raise the dam.

Dam Body

- Length = 1700 feet
- Height = 42feet
- Designed storage capacity = 400 acre-feet.
- Current capacity = 200 acre-feet.
- Catchment area = 4Sq. miles

Spillway

- Length of spillway = 100 R. feet
- Width = 40 feet
- Design discharge = 2500 cusecs
- Flow depth = 4.0 feet.
- Free board = 2.0 feet.

Restoration

1. Dam body (Earthen)

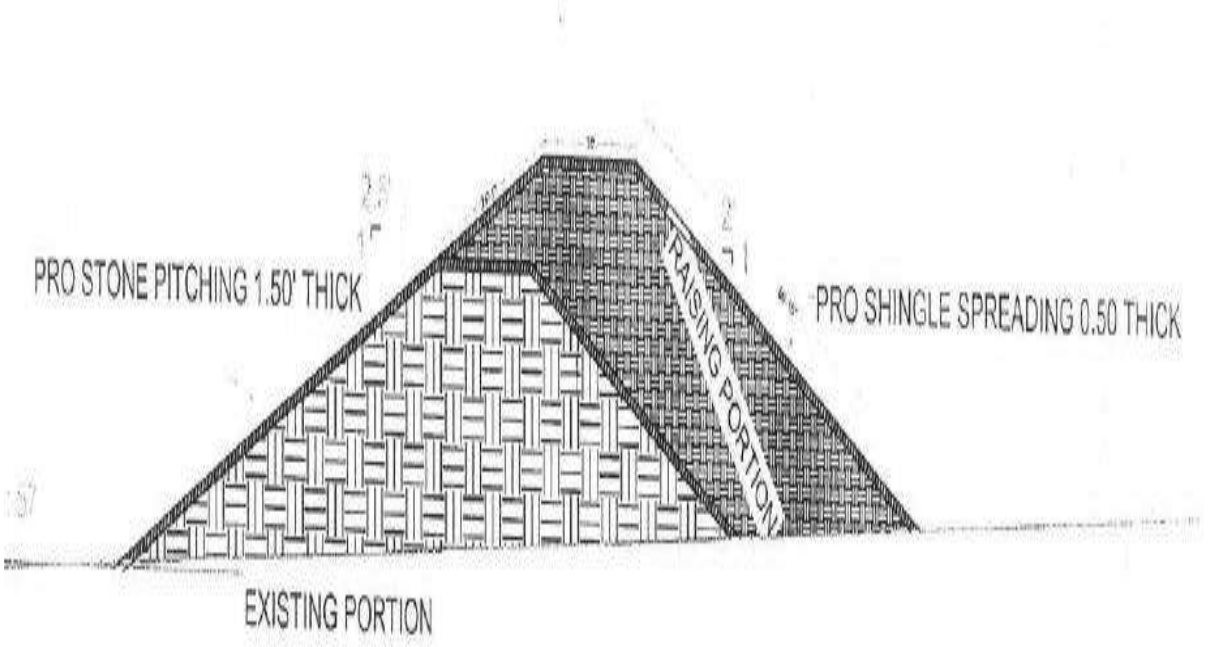
- Length = 1700 feet.
- Height = 45 feet
- U/S slope = 2.5:1
- DIS slope = 3:1
- Top width = 20 feet.
- U/S stone pitching = 1.5 feet.
- Shingle laying on top = 0.5 feet.
- Storage capacity = 7300 MG
- Catchment area = 4 Sq. miles

2. Spillway

152. Spillway received damages during monsoon flood. Irrigation division Pishin proposed to widen the spillway up to 20 ft:

- Length of spillway = 150 R. feet
- Width = 60 feet
- Design discharge = 3500 cusecs
- Flow depth = 6.0 feet
- Free doard = 5.0 feet.

Earthen Treatment from RD: 00+350 ft. Right Side



Location Map of Khasro Dam

3.3.8 FLOOD PROTECTION BUND OF SARILA HABIBZAI, MANZAKAI AND BAGARZAI BOTH SIDES

Location:

153. The site of the scheme is located at a distance of 12 Km towards North of Pishin town.

History:

154. The existing Manzaki flood protection bund was constructed by the irrigation department in 1989-90 with a length of 8100 feet on both sides of Manda. The people and beneficiaries of the area use the flood protection bund as a road during flood seasons to protect agricultural land and houses. The existing flood protection bund has a top width of 16 feet, making it easily usable as a road. The Bagerzai Manda is a stream in tehsil Huramzai with a design discharge of 18303 cusecs at the point of interest. The Manda often affects adjacent villages in tehsil Huramzai. The bed of Bagerzai Manda is composed of shingle and gravel with medium-sized boulders and has a sharp gradient with high velocity.

155. Therefore, the meandering action and flash flood behavior of the river are damaging Killi Bagerzai in tehsil Huramzai. It has been reported by field staff that thirty-five (35) acres of land have been washed away. These flood losses, in terms of property, are worth

hundreds of thousands of rupees. The floods not only damage the land and properties of the area's inhabitants but also further undermine the socioeconomic conditions. To safeguard and improve the socioeconomic development and protect against flood hazards, this project has been initiated by providing a flood protection bund with a length of 8100 feet.

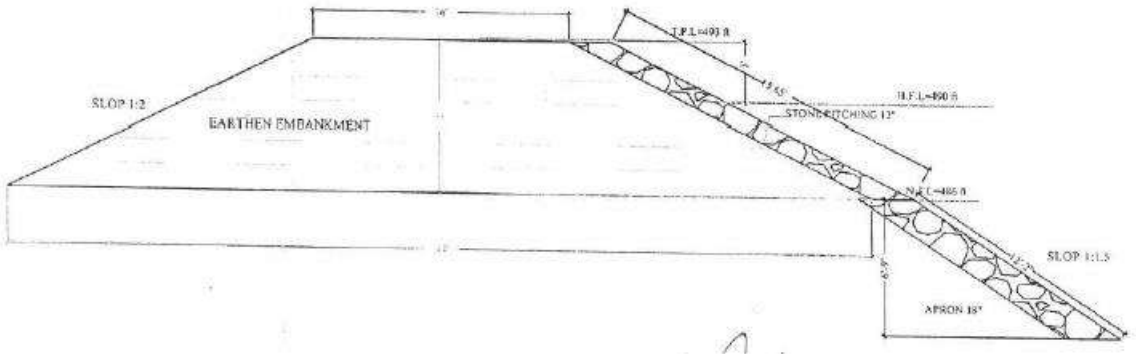
Proposal:

1. Restoration of Bundh.

156. To protect the valuable agricultural lands from the devastation of floodwater it is proposed to restore the flood protection bund on both sides of Bagharzai Manda in district Pishin on the following design standards:

i)	Length	=	6500 feet
ii)	Tope width	=	16 feet.
iii)	Bottom width	=	44 feet.
iv)	Stone pitching	=	12 inch
v)	Apron	=	18 inch

X-Section of Protection Bund of Sarila Habibzai, Manzakai and Bagarzai Both Sides



Location Map of Sarlazai Flood Protection Scheme

3.3.9 F.P WALL POTI MANGALZAI MAMA NIKAH AND MEHRAB KECH

Location:

157. The site of the scheme is located at a distance of 25 Km towards North East of Pishin town.

History:

158. The existing Poti Mangalzai, Mama Nikah, and Mehrab Kech flood protection wall were already constructed by the irrigation department in 2000-01 with a length of more than 12,000 feet on both sides of Manda. The flood protection wall received damages during the recent monsoon floods.

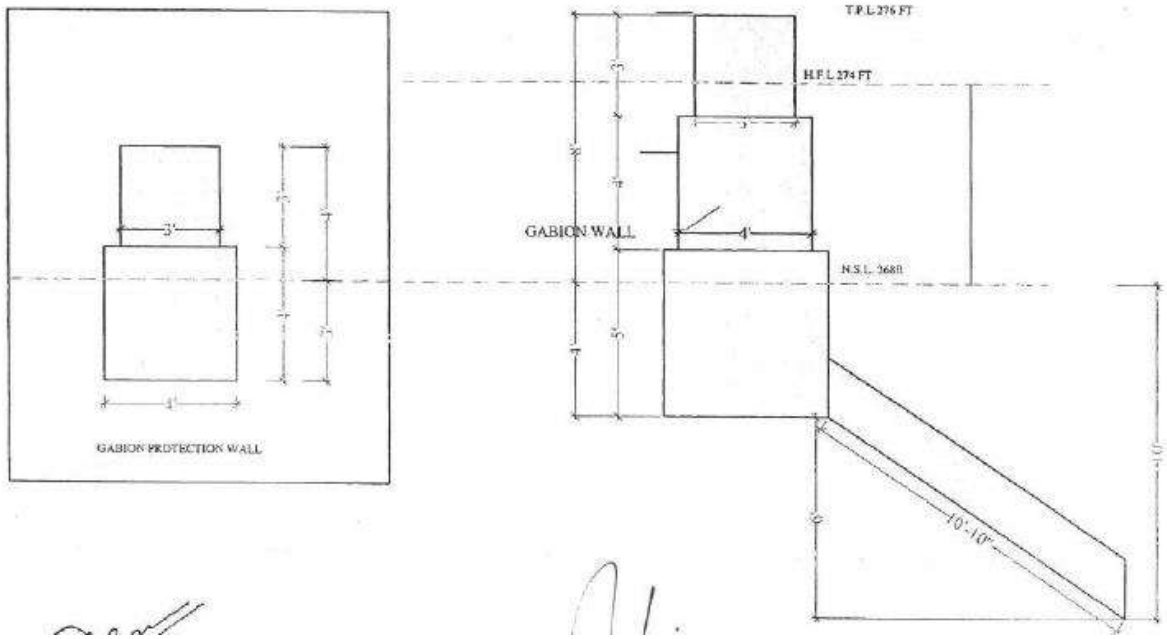
3. Restoration of Wall:

159. In order to protect the valuable agricultural lands from the devastation of floodwater it is proposed to restore the flood protection wall on both sides of villages Manda, Mama Nikah, and Mehrab Kech in district Pishin with the following standard design parameters:

- Restoration of flood protection wall for orchards and houses Poti Mangalzai = 3160 feet
- Restoration of flood protection wall for orchards and houses Mama Nikah = 3000 feet
- Restoration of flood protection wall for orchards = 2700 feet

i) Length = 8860 feet
ii) 1st step = 5x5,5x5
iii) 2nd step = 4x4 feet.
iv) 3rd step = 3x3 feet.
v) Apron = Thickness 18 inches L=11feet

Cross Section of F.P Wall Poti Mangalzai Mama Nikah and Mehrab Kech



3.3.10 KHUDAIDADZAI FLOOD IRRIGATION SCHEME

Location

160. The proposed scheme site is located at a distance of 5 Km from Pishin town towards its west direction on Pishin Saranan road.

History

161. Flood irrigation scheme, namely Khudaidadzai comprising a weir and its allied components across the Sukhab river for the diversion of floodwater through a canal towards its left side was constructed by the provincial irrigation and power department during the year 1984-85 under the financial assistance of UNHCR with the following approved parameters:

- Weir (P.C.C) 175ft: in length.
- Abutment walls (brick masonry).
- Controlled gate regulators 2 Nos for passage of 500 cusecs discharge
- Main canal 4900 ft long.
- 2 Nos branch canals 800 ft: & 400 ft. in length.

162. At present, the weir crest level is at RL 500, with U/S and D/S highest flood RL 508.75 and RL 502.25, respectively. D/S of the weir has a pucca floor, adhered with a further 20-ft flexible apron.

163. The sill of the canal regulator was kept at RL 497.75, which caused a lot of silt deposition in the canal. The canal regulator currently does not work modularly in normal supplies and is submerged. Presently, U/S of the weir is silted up to the crest level, i.e., RL 500.00. The mouth of the canal regulator at the head reach in different locations has achieved the same level, while the main canal has also silted up. Obviously, the designed canal crest is lower by 2.75 feet but due to the non-provision of under sluice arrangements canal has accumulated a lot of silt.

164. The flood protection scheme in Pishin initially approved in 2004 for Rs. 1.10 million and faced multiple tendering challenges due to the contractor disinterest. In 2005, the P&D Department revised cost ceilings, leading to a PDWP approval of Rs. 10.120 Million in October 2005. Subsequent tender attempts continued to see a lack of contractor participation. In March 2007, the Balochistan P&D Department revised premium rates by district, resulting in a second revision with a cost of Rs. 15.772 Million, which received PDWP approval in March 2008. Further premium enhancements for Pishin were authorized in June 2008. Hence, a third revision, considering only the new premium rates for Pishin, has been prepared for PDWP approval maintaining the data from the second revision.

Weir Data

Water way	=	175 feet
U/S bed level	=	500 feet
Crest level	=	500 feet
Foundation level	=	486 feet.
Stilling basin	=	33 feet.
Flood discharge.	=	14000 cusecs (based on catchment area method for 50 years return period).

165. The river approach is oblique, and there is a "Bela" formation upstream (U/S) of the weir. It is impossible to assess the condition of the downstream (D/S) pacca floor, D/S flexible apron, and the pacca floor of the head regulator because the area is completely silted up and not visible. However, it is believed that the D/S structures and head regulator structure are not sufficient to dissipate the total energy of the fall in the event of the designed high flood flow through the regulator.

166. Raising the weir by 4.0 ft (as suggested) will not alone solve the problem of inadequate supplies in the canal. The actual reason for the low intake is a 2-3 ft silt deposit in the head reach. The canal head regulator was already functioning non-modularly and now has a significant loss of head across it. If only the weir crest is raised, the entire hydraulic parameters will change, potentially causing damage to the D/S pacca floor if a high discharge persists for some duration. Meanwhile, the canal will draw in more silt, causing its bed in the head reach to rise further and reducing the head across to an equal extent.

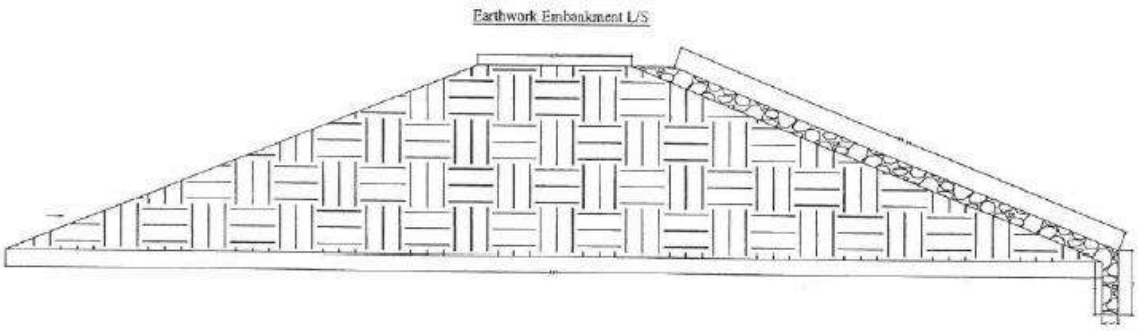
167. During the execution stage, beneficiaries of the area approached the department (application attached) with a request to rehabilitate the existing damaged distribution system to ensure the distribution of water as per the share. As a result, some project parameters have been revised as indicated in the attached revised proforma.

168. The revised parameters have been envisaging as under:

Proposal:

i) Restoration of damaged portion of abutment wall
ii) Restoration of bund
iii) Stilling basin is proposed at RL-492.0 ft., which is followed by end sill at RL 496.50 & D/S cut off Wall up to the lowest RL 485.50. Gabion apron 20ft in length has also been provided to counter the advent of erosion D/S of the weir.
iv) Raising and strengthening of earthen guide bunds U/S side of weir.

Earth Work Embankment of Khudaidadzai Flood Irrigation Scheme



3.3.11 KAR DAM

History:

169. Kar dam was constructed in 1936 by the irrigation department. Kar dam has a reasonable storage capacity of 125 acre-ft which is the primary source of water for the scheme area. The stored floodwater is utilized for raising the water table and promoting agricultural development to a greater extent. The scheme is considered promising and meets the criteria for implementation as a priority.

Key facts of damages and soil classification of catchment area:

170. The scheme was breached at RD 100ft during flood season of Monsoon 2022.

171. The catchment area covers 2.65 sq. miles, with the longest river extending 2.52 miles. The soil classification of the catchment area comprises 60% fractured sandstone and shale, along with 40% alluvial fan/piedmont. According to calculations using the HALCROW-ULG Method, the discharge for a 100-year return period is estimated at 2833 Cusecs.

Description & justification of the project:

172. After the restoration of this dam, farmers will be able to fully concentrate on the development of their lands. The agriculture department at Killi Kar will guide farmers and provide the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is anticipated, with expectations of it exceeding 153 acres. Additionally, a sustained water supply will support the cultivation of vegetables and food grains throughout the season. Field surveys indicate that 10 tube wells, 4 open surface wells, and others will be recharged, benefiting 83 livestock and 200 farm families. Moreover, the protection of agricultural land and villages around Kar dam from flood devastation will contribute to improving the socio-economic conditions of the project area's residents. Proposal;

173. Dam is a vital component of water conservation structures, continuously providing a wide range of economic, environmental and social benefits including water supply, support

for wildlife habitats, and flood risk reduction. To restore this scheme, which was damaged in the monsoon flood season of 2022, the irrigation division of Pishin has prepared a PC-1 with the following proposal:

1. Restoration of dam body

i) The Breached portion to be restored from RD 0-100 To width 117 feet.
ii) Some settlement is occurred in the dam body so proposed to raise the dam body up to 4 feet. in height.

2. Proposed new spillway:

174. The downstream gabion apron is mostly damaged, so the proposal includes the restoration of the gabion apron.

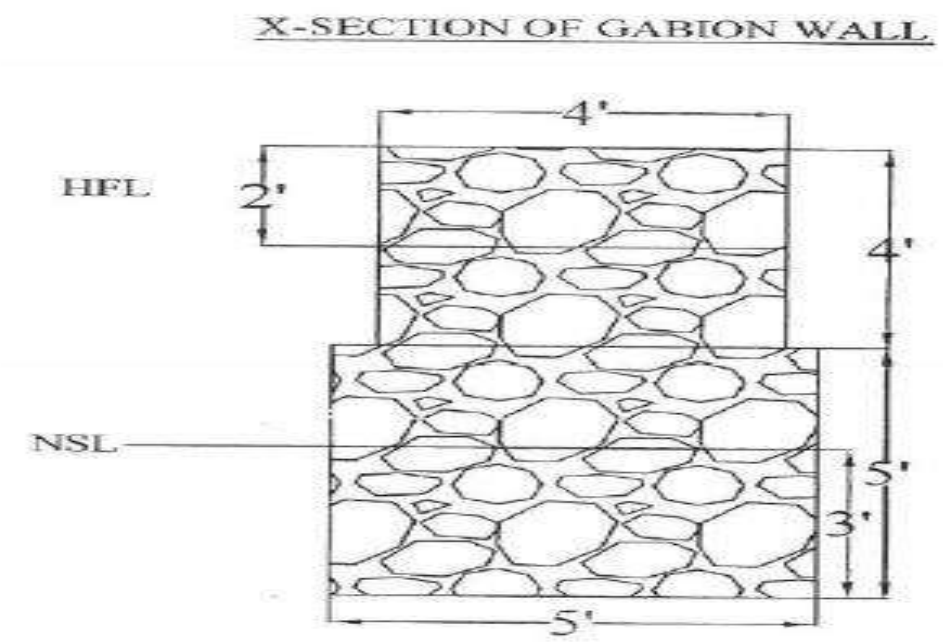
3. Flood protection wall:

175. A flood protection wall of 834 feet in length, is included in the proposal to protect the agricultural land downstream of the spillway.

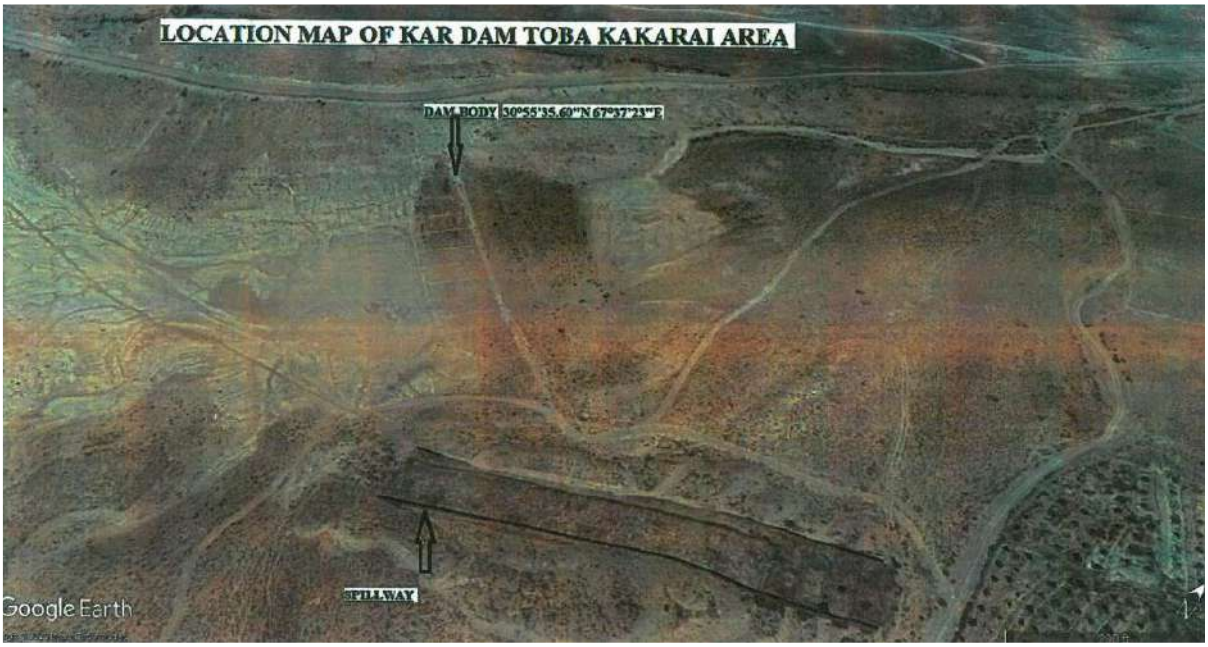
Previous parameters and Existing Condition of Project:

Location		Proposes dam site is located at distance of 110 km from Pishin town in Toba district
		Location Point Latitude 30°55'35.60", Longitude 67°37'23"
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	43.0 feet.
	Catchment area	2.65 sq. mile
	Dam top width	20 feet
	Dam length	500 feet
	Pond / storage capacity	125 acre feet
2	**Spillway**	
	Type and location	Ungated spillway
	Design discharge	2833 cusecs (100 years)
	Flood surcharge over spillway	5 feet
	Spill width (clear)	70 feet
	Spillway length	250 feet
	Command area	528 acres

X-Section of Gabion Wall of Kar Dam



Location Map of Kar Dam



3.3.12 SURCHAN DELAY ACTION DAM

Location:

176. The dam is located about 105 km from Pishin town towards North East direction in Toba Kakari area

History:

177. Surchan scheme was included in a groundwater recharge project in 2011 at Surchan river Toba Kakari area, with a reasonable water storage capacity. The storage of floodwater is utilized for raising the water table and promoting agricultural development to a greater extent. The scheme is promising and meets the criteria for implementation as a priority.

Key facts of damages and soil classification of catchment area:

178. The scheme was overtopped during the monsoon flood season of 2022, resulting in damages to the downstream sloped portion. The spillway discharge for a 50-year return period was previously designed at 3299 Cusecs. The design of the spillway has been revised. The catchment area covers 17.4 square miles, with the longest river spanning 6.99 miles. The soil classification of the catchment area comprises 40% fractured sandstone, shale, 30% fractured limestone, 10% alluvial fan/piedmont, and 20% non-fractured rock. The discharge calculation, using the HALCROW-ULG Method, indicates 4039 cusecs for a 100-year return period.

Description & justification of the project:

179. After the restoration of this dam, farmers will be able to focus on the development of their lands, and the agriculture department at Wochobai village will guide them while imparting the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is assured and expected to be more than 120 acres, in addition to sustained water supply for the existing cultivated area, supporting the seasonal cultivation of vegetables and food grains. Field surveys reveal that 4 tube wells, 8 open surface wells, including others, will be recharged benefiting 40 livestock and 25 farm families. Beyond agricultural land and orchards, the villages near Surai dam will be protected from flood devastation caused by local rivers and creeks, improving the socioeconomic conditions of the project area's residents.

Proposal:

180. Dams are vital components of infrastructure, continuously providing a wide range of economic, environmental, and social benefits, including water supply, wildlife habitat and flood risk reduction. To restore the scheme, which was damaged during the monsoon flood season of 2022-23, the irrigation division of Pishin has prepared a PC-1 with the following proposal:

4. Restoration of dam body:

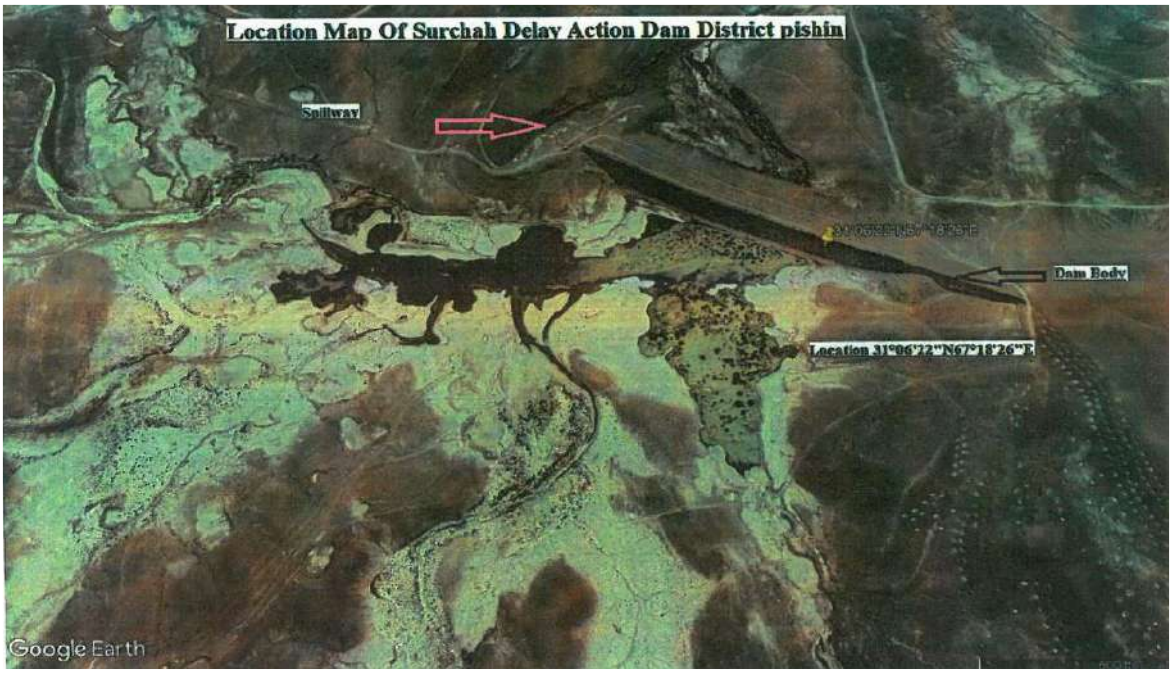
181. Restoration of the damaged sloped portion and raising of the dam body by up to 3.8 feet.

Previous parameters and existing condition of project:

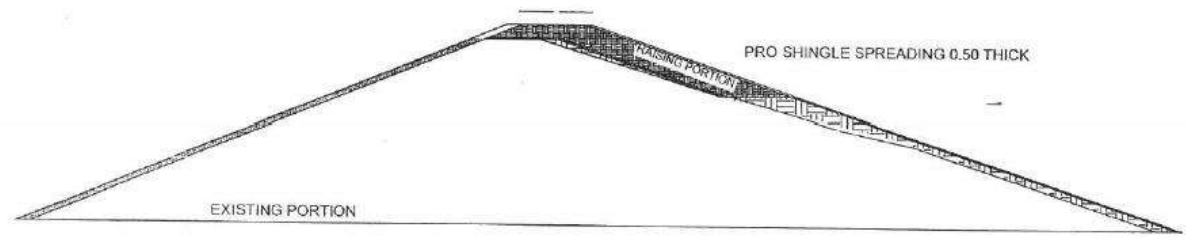
182. Estimated Cost 15.00 Million PKR

Location		Proposed dam site is located at Toba Kakari 105 Km from Pishin town towards North-East direction, in Toba Kakari area..
		Location Point Latitudes 31°06'22"N,Longitudes 67°18'26"E
Dam Structures		
1	**Main Dam**	
	Type	Earthen dam
	Maximum height above river bed level to dam top level	45 feet.
	Catchment area	17.4 sq. mile
	Dam top width	20 feet
	Dam length	1500 feet
	Dam top elevation	100 feet
	Pond / storage capacity	2600 acre feet
2	**Spillway**	
	Type and location	Ungated spillway
	Design discharge	4039 cusecs (100 years)
	Flood surcharge over spillway	3.5 feet, free board 4.5 feet
	Pond / storage capacity	73-acre feet after implementation of the project storage capacity will Increases to 100 acre ft.
	Spill width (clear)	Existing 50 feet new proposal1 100 feet
	Spillway length	150 feet
	Crest wlevation	90 feet
	Command area	100-120 acres

Location Map of Surchah Delay Action Dam



Layout of Surchah Delay Action Dam



3.3.13 CHENGAI BEGHARZAI CHECK DAM

History:

183. Chengai Begharzai scheme was included in a groundwater recharge project in 2011 at Chengai Begharzai river Toba Kakari area, with a reasonable water storage capacity. The storage of floodwater is utilized for raising the water table and promoting agricultural development to a greater extent. The scheme holds promise and meets the criteria for implementation on a priority basis.

Key facts of damages and soil classification of catchment area:

184. The scheme was overtopped during the monsoon flood season of 2022, resulting in damages to the dam body, particularly on the downstream sloped portion.

185. The spillway discharge was previously designed for a 30-year return period at 1900 Cusecs. The design of the spillway has been revised. The catchment area spans 16.5 sq. miles, with the longest river stretching 9.1 miles. Soil classification in the catchment area comprises 40% fractured sandstone and shale, 40% fractured limestone, 10% alluvial fan/piedmont, and 10% non-fractured rock. The discharge calculation using the HALCROW-ULG Method indicates a flow of 2431 cusecs for a 100-year return period.

Description & justification of the project:

186. After the restoration of this dam, farmers will be able to fully concentrate on the development of their lands. The agriculture department at Wochobai village will guide farmers and provide them with the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in the cropped area is anticipated, exceeding 120 acres, in addition to ensuring a sustained water supply for the current area under cultivation, where vegetables and food grains are grown seasonally. Field surveys indicate that 4 tube wells, 8 open surface wells, and others will be recharged, benefiting 40 livestock and 25 farm families. Furthermore, the protection of villages and agricultural lands around Chengai dam from flood devastation caused by local rivers and creeks will enhance the socio-economic conditions of the project area's inhabitants.

Proposal:

187. Dam is a vital component of infrastructure and continuously provides a wide range of economic, environmental and social benefits water supply, wild habituate and flood risk reduction. To restore the scheme which was damaged in 2022- monsoon flood season of 23 the irrigation division of Pishin has prepared a Pc-1 with following proposal:

1. Restoration of dam body

188. Restoration of the damaged sloped portion, including raising the dam body by up to 3.8 feet.

2. Widening of spillway

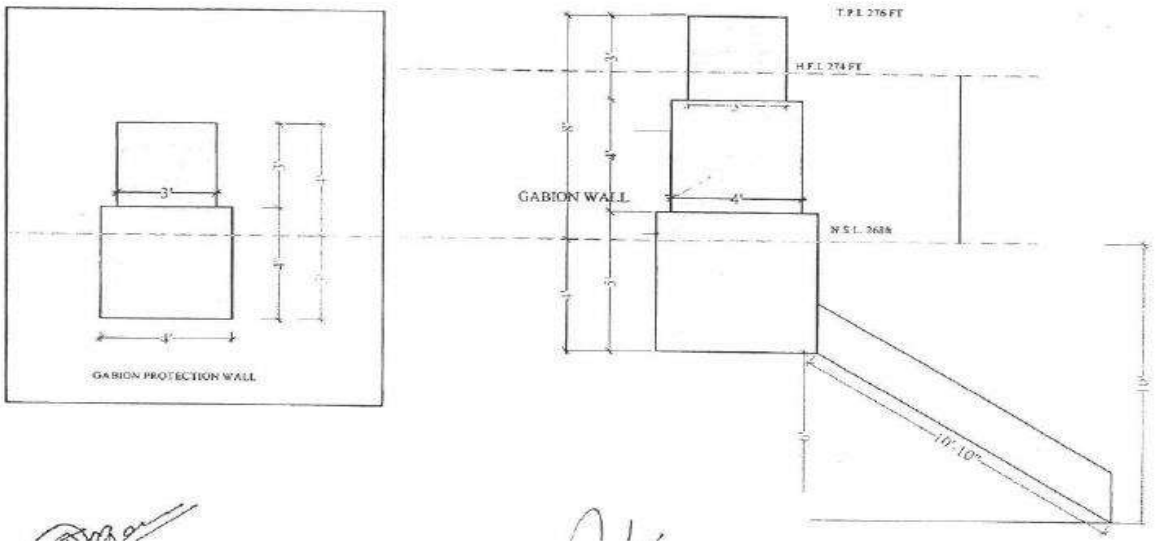
189. The spillway is designed for a discharge of 2431 cubic feet per second (Cusecs). Therefore, the irrigation division in Pishin has proposed widening the spillway from 50 to 100 feet, adding a 3.5-foot surcharge over the spillway, and providing a 4.5-foot freeboard

Previous parameters and existing condition of project:

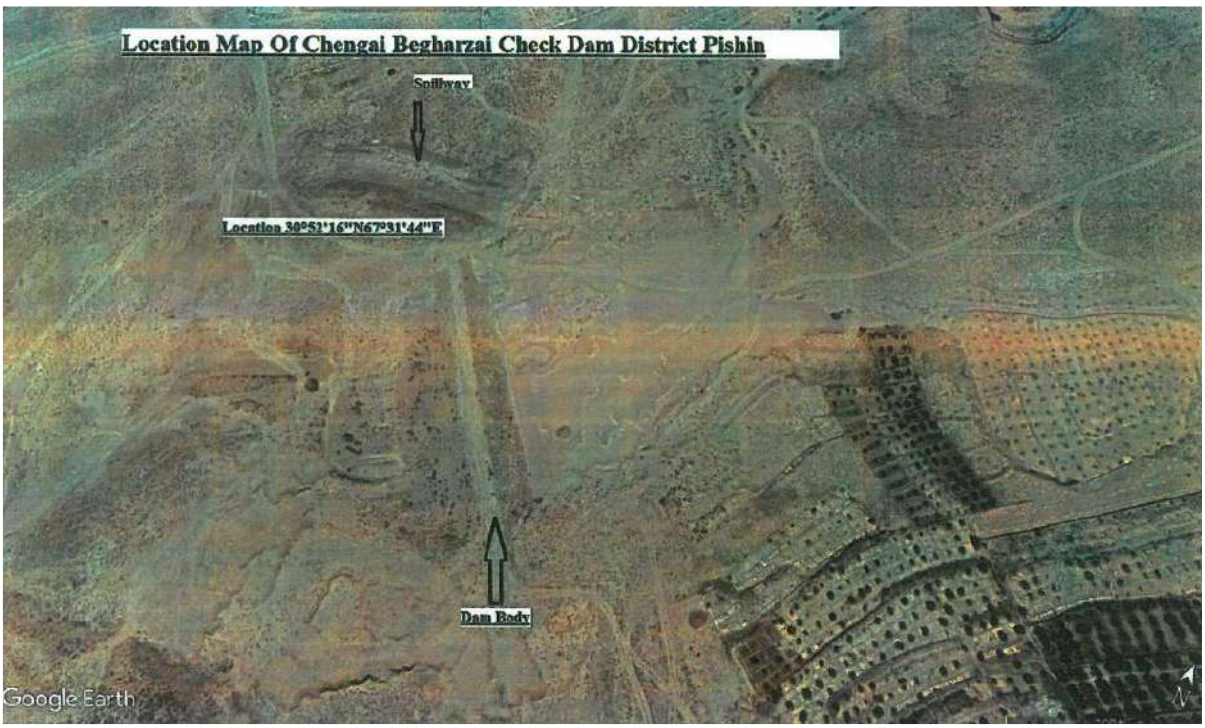
190. Estimated cost 20.00 million PKR

Location		Proposed dam site is located at Toba Kakari 160 km from Pishin town towards East direction, in Toba Kakari area.
		Location Point Latitudes 30°52'16"N, Longitudes 67°31'44"E
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam
	Maximum height above River Bed level to Dam Top Level	Existing 25 feet. proposed raising 3.8 feet total height 28.8ft feet
	Catchment area	3.8 Sq. mile
	Dam Top Width	20 feet
	Dam Length	420 feet
	Dam Top Elevation	100 feet
	Pond / Storage Capacity	70 acre-feet. after implementation of the project storage capacity will increases up to 100 acre feet
2.	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	2431. (100 year)
	Flood surcharge over spillway	3.5 feet, free board 4.5 feet
	Pond / storage capacity	73 acre feet. after implementation of the project storage capacity will increases to 100 acre feet
	Spillway width (clear)	Existing 50 feet new proposal 100 FT
	Spillway length	150 feet
	Crest elevation	90ft
	Proposed command area	(100-120 acres)

Gabion Wall of Chengai Begharzai Check Dam



Location Map of Chengai Begharzai Check Dam



3.3.14 WACHOBI DAM

History:

191. The Wachobai scheme was included in a groundwater recharge project in 2001 at Wochobi river Toba Kakari area, with a reasonable water storage capacity. The storage of floodwater is utilized for raising the water table and promoting agricultural development to a greater extent. The scheme holds promise and meets the criteria for implementation on a priority basis.

Key facts of damages and soil classification of catchment area:

192. The scheme was overtopped during the flood season of monsoon 2022, resulting in damage to the dam body's downstream slope.

193. The spillway discharge designed for a 50-year return period was 4122 cusecs in the original design. However, the spillway design has been revised. The catchment area covers 16.5 sq. miles, with the longest river being 9.1 miles. Soil classification in the catchment area consists of 40% fractured sandstone and shale, 30% fractured limestone, 20% alluvial fan/piedmont, and 10% non-fractured rock. Calculations using the HALCROW-ULG Method indicate a discharge of 6283 Cusecs for a 100-year return period.

Description & justification of the project:

194. After the restoration of this dam, farmers will be fully focused on developing their lands, and the agriculture department at Wochobai Village will guide them, providing the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in

cropped area is anticipated, expected to be more than 320 acres, in addition to sustaining water supply for the existing cultivated area, which grows seasonal crops like vegetables and food grains. Field surveys indicate that 12 tube wells and 8 open surface wells, among other sources, will be recharged, benefiting 300 livestock and 195 farm families. Furthermore, besides safeguarding agricultural land and orchards, the restoration of the dam will protect the villages downstream from flood devastation, thereby improving the socio-economic conditions of the project area's residents.

Proposal:

195. Dams play a vital role in infrastructure, continuously providing a wide range of economic, environmental, and social benefits, including water supply, wildlife habitat preservation and flood risk reduction. To restore the scheme, which was damaged during the 2022-23 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 for restoration of the damaged portion and the widening of the spillway to meet design criteria. This proposal also includes an increase in the storage capacity through the raising of the dam body and spillway. Such measures will not only restore the dam to its original condition but also increase the storage capacity from 320 acre-ft. to 430 acre-ft.

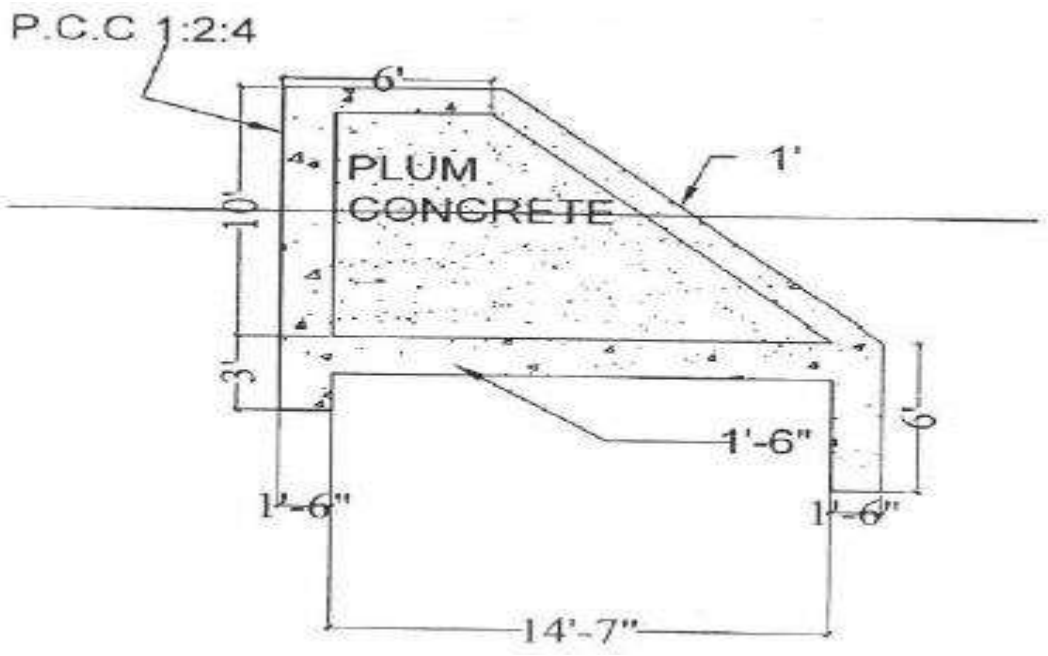
1. Restoration of dam body:

196. The proposed project involves the restoration of the damaged downstream slope of the dam and raising the dam body by up to 50 feet.

2. Widening of spillway:

197. To accommodate the designed discharge of 6283 cusecs, the irrigation division of Pishin has proposed widening the spillway from 100 to 130 feet, providing a 3.5-foot surcharge over the spillway, and incorporating a 4.5-foot freeboard.

Plum Concrete of Wachobi Dam



Location Map of Wachobi Dam

3.3.15 SURKAI GHEZ DAM

History:

198. Surkai Ghez Pewyera dam was constructed in Toba Kakari under PSDP#882 in 2014-15 and serves as the sole source of water for the scheme area. The storage of floodwater is harnessed to raise the water table and promote agricultural development significantly. This scheme is highly promising and fulfils the criteria for implementation as a priority project.

Key facts of damages and soil classification of catchment area:

199. In the last year's monsoon flood season, the dam overtopped due to heavy floods and subsequently breached away at RD 100ft. The irrigation division of Pishin has proposed the restoration of the damaged portion and the widening of the spillway in accordance with standard design criteria.

200. The spillway discharge for a 50-year return period was originally designed for 1430 cusecs and has been revised in the proposed project. The catchment area covers 3.48 sq. miles with the longest river extending 4.8 miles. Soil classification in the catchment area comprises 40% fract sandstone, shale, 30% fractured limestone, 20% alluvial fan/piedmont, and 10% non-fractured rock. The discharge calculation by HALCROW-ULG method now indicates 1776 cusecs for a 100-year return period.

Description & justification of the project:

201. After the restoration of this dam, farmers will be able to focus on the development of their lands, and the Agriculture Department at Surki Ghez Village will support them by

providing guidance and the latest information on agriculture, including the use of modern seeds and fertilizers. An increase in cropped area is expected to be over 400 acres, in addition to the sustained water supply for the present area, enabling seasonal cultivation of vegetables and food grains. Field surveys indicate that 15 tube wells and 10 open surface wells, among others, will be recharged, benefiting 500 livestock and 115 farm families. Furthermore, the protection of villages near Surkai dam from flood devastation caused by local rivers and creeks will lead to improved socio-economic conditions in the project area.

202. Dams are vital components of infrastructure and offer a wide range of economic, environmental, and social benefits, including water supply, support for wildlife habitats and flood risk reduction. To restore the scheme damaged during the 2022-23 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 with the following civil works:

1. Restoration of dam body:

203. The breached portion is planned to be restored from RD 100 to RD 250 with a bottom width of 20ft and a top width of 200ft.

2. Widening of spillway:

204. To accommodate a discharge of 1179 cusecs, the irrigation division of Pishin has proposed widening the spillway from its existing width of 50ft to 70ft. This adjustment includes incorporating a 3.5 ft. surcharge over the spillway and providing a 4.5 ft. freeboard for enhanced safety and efficiency.

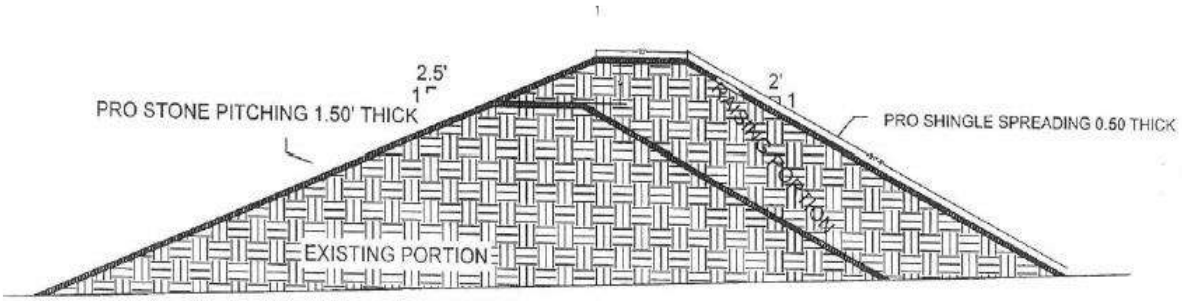
Previous parameters and existing condition of project:

205. Estimated cost Rs. 36.00 Million

Location		Proposed dam site is located at Toba Kakari 48 km from Barshore towards north, east, district of Pishin (Balochistan).
		Location point Latitudes 31°4'13.77"N, Longitudes 67°33'0.37"E
Dam Structure		
1.	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	35.0 feet
	Catchment area	3.48 Sq. mile
	Dam top width	20 feet.
	Dam length	520 feet.
	Dam top elevation	100 feet.
	Pond I storage capacity	350 acre-feet.
2.	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	1776. (100 year)
	Flood surcharge over spillway	3.5 feet
	Pond I storage capacity	350 acre feet

	Spillway width (clear)	Existing 50 feet new proposal 70 feet
	Spillway length	450 feet.
	Crest elevation	90 feet
	Proposed command area	(300-400 acres)

Raising and Existing Section of Surkkai Ghez Dam



Location Map of Surkkai Ghez Dam

3.3.16 PANI SHAKH DAM

History:

206. Pani Shakh dam was constructed in 2017 by the irrigation department, providing a storage capacity of 270 Acre-ft., which serves as the primary water source for the scheme area.

207. The storage of floodwater is effectively utilized to raise the water table and foster agricultural development to a significant extent. This scheme exhibits promising potential and fulfils the criteria for being implemented as a priority project.

Key facts of damages and soil classification of catchment area:

208. During the monsoon flood season of 2022, the scheme experienced overtopping, resulting in damage to the downstream sloppy portion of the dam body.

209. The catchment area spans 9.60 sq. miles, with the longest river extending over 7.30 miles. Soil within the catchment area is characterized by 45% fractured sandstone and shale, 20% fractured limestone, 10% non-fractured rock, and 25% alluvial fan/piedmont. The discharge calculation, conducted using the HALCROW-ULG method, yields a figure of 4048 cusecs for the 100-year return period.

Description & justification of the project:

210. Following the restoration of Pani Shakh dam, farmers in the region will be able to focus on developing their lands. The agriculture department at Pani Shakh village will play a pivotal role in guiding farmers and providing them with the latest agricultural information, including the use of cutting-edge seeds and fertilizers. An increase in cultivated area is anticipated, with expectations of exceeding 156 acres. Furthermore, there will be a continuous and reliable water supply for the existing agricultural areas, enabling the cultivation of seasonal crops such as vegetables and grains. A field survey indicates that the project will benefit 150 farm families, 118 livestock, and will include the recharging of 20 tube wells and 2 open surface wells. Additionally, the protection provided by Pani Shakh dam against flood devastation from local rivers and creeks will contribute to enhancing the socio-economic conditions of the project area's residents.

Proposal:

211. In response to the damage sustained during the 2022 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 for the restoration of the scheme. The proposal outlines the necessary measures and interventions required to rehabilitate and enhance the functionality of Pani Shakh dam.

1. **Raising of dam body**

212. The Pani Shakh dam experienced overtopping during previous floods, leading to damage to the downstream embankment of the dam body. Settlement has also occurred within the dam body, necessitating the proposal to raise the dam body to various heights.

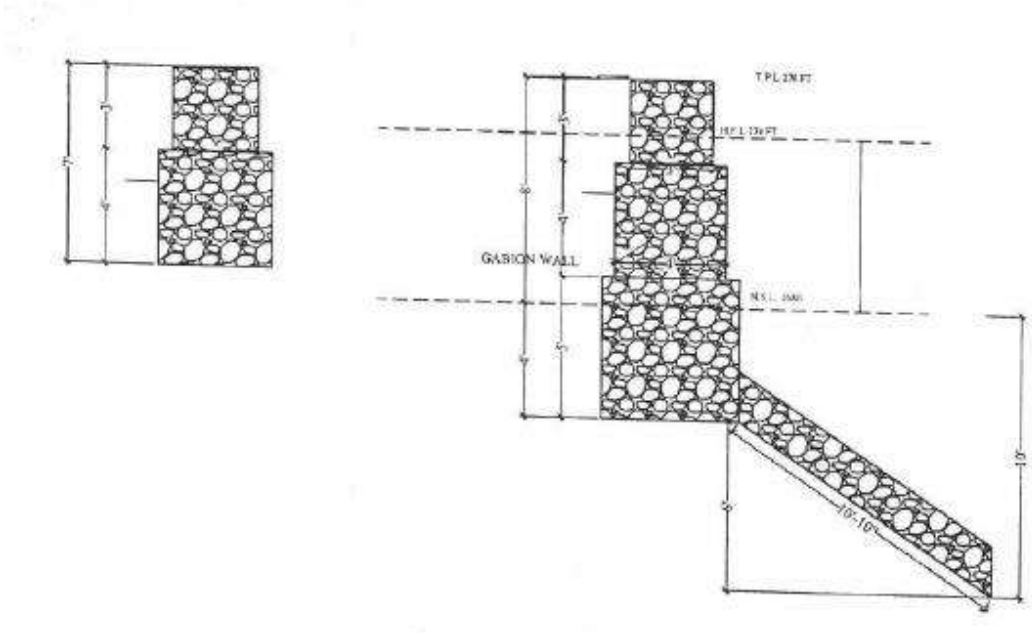
2. **Widening of spillway:**

213. The existing spillway has certain narrow points, which is why a widening of the spillway, approximately 20 ft. in width and 12 ft. in depth, is proposed. The previous flood discharge was at 2865 cusecs, but the current flood discharge, calculated to be around 4048 cusecs, has led to the redesign of the spillway to accommodate the increased flow.

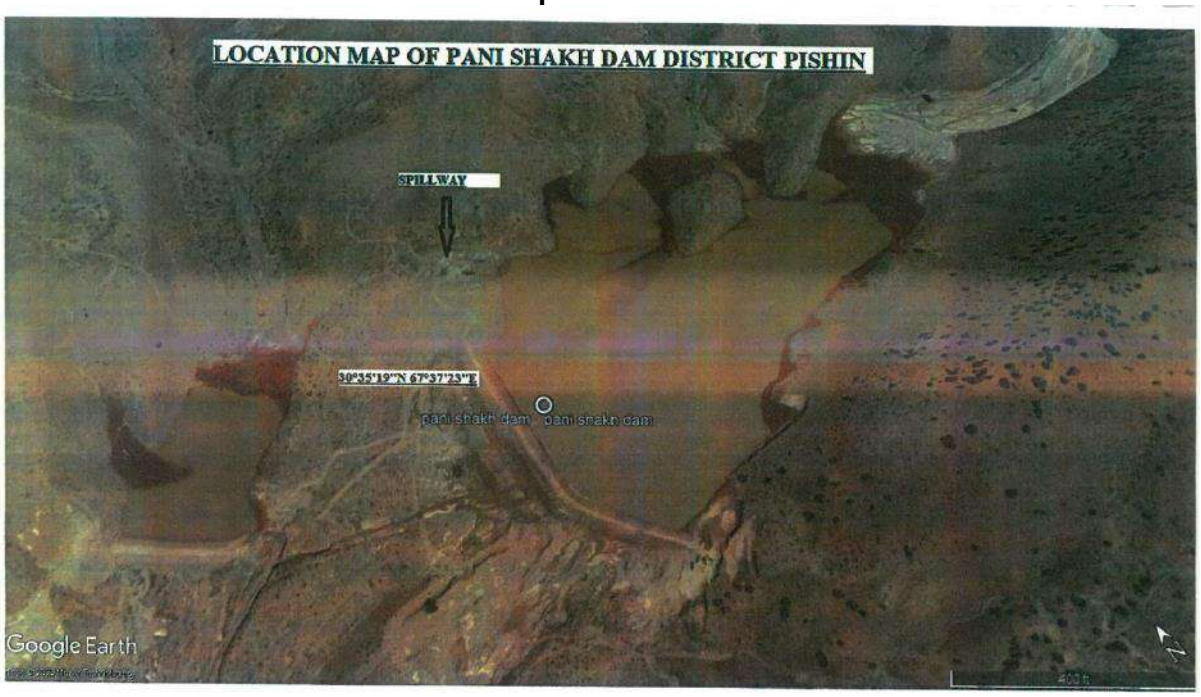
Previous parameters and existing condition of project:

Location		Proposed dam site is located at distance of 85 km east of Pishin town in Rudmullazai area .
		Location point Latitudes 30° 35'19"N, Longitudes 67°37'23"E
Dam Structure		
1.	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	35.0 feet.
	Catchment area	9.60 Sq. mile
	Dam top width	20 feet.
	Dam length	840 feet.
	Dam top elevation	100 feet.
	Pond / storage capacity	270 acre-feet.
2.	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	4048. (100 year)
	Flood surcharge over spillway	5 feet
	Spillway width (clear)	110 feet.
	Spillway length	213 feet.
	Proposed command area	(548 acres)

X-Section of Gabion Wall



Location Map of Pani Shakh Dam



3.3.17 ALIZAI DAM

History:

214. Alizai dam was constructed in the year 2017 by the irrigation department. Alizai dam has a reasonable storage capacity of 498 acre-feet., serving as the sole water source for the scheme area. The storage of floodwaters is utilized to elevate the water table and promote agricultural development. This scheme holds great promise and meets the criteria for implementation as a priority. In the previous year's Monsoon Flood Season, the bed portion of the spillway sustained damage.

Key facts of damages and soil classification of catchment area:

215. The spillway of the scheme suffered damage during the flood season of Monsoon 2022, leading to downstream damage below the spillway.

216. The catchment area spans 27.85 sq. miles, with the longest river extending 16.85 miles. The soil classification within the catchment area comprises 45% fractured sandstone and shale, 20% fractured limestone, 10% non-fractured rock, and 25% alluvial fan/piedmont. The discharge calculation using the HALCROW-ULG method suggests a flow of 811 cusecs for a 100-year return period.

Proposal:

217. To restore the scheme, which was damaged in the 2022 monsoon flood season, the irrigation division of Pishin has prepared a PC1 with the following proposal:

1. Restoration spillway:

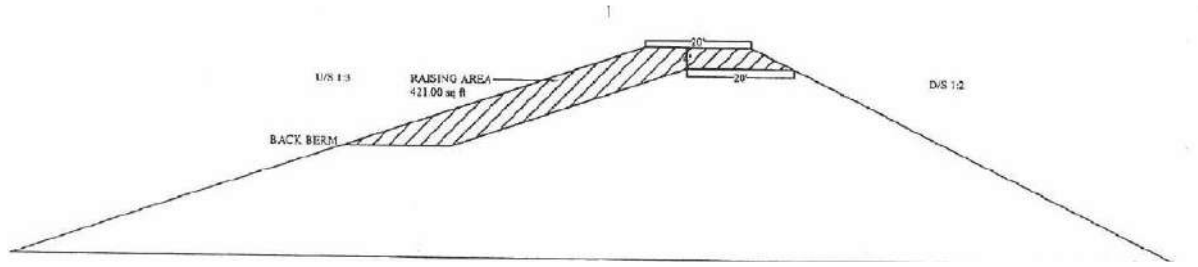
218. During the previous year's monsoon flood season, the bed of the spillway was damaged in some portions, leading to erosion. To address this issue, the irrigation division of Pishin has conducted a survey of the scheme and proposed the construction of two cut-off walls, bed concreting, and stone pitching on the spillway.

Previous parameters and existing condition of project:

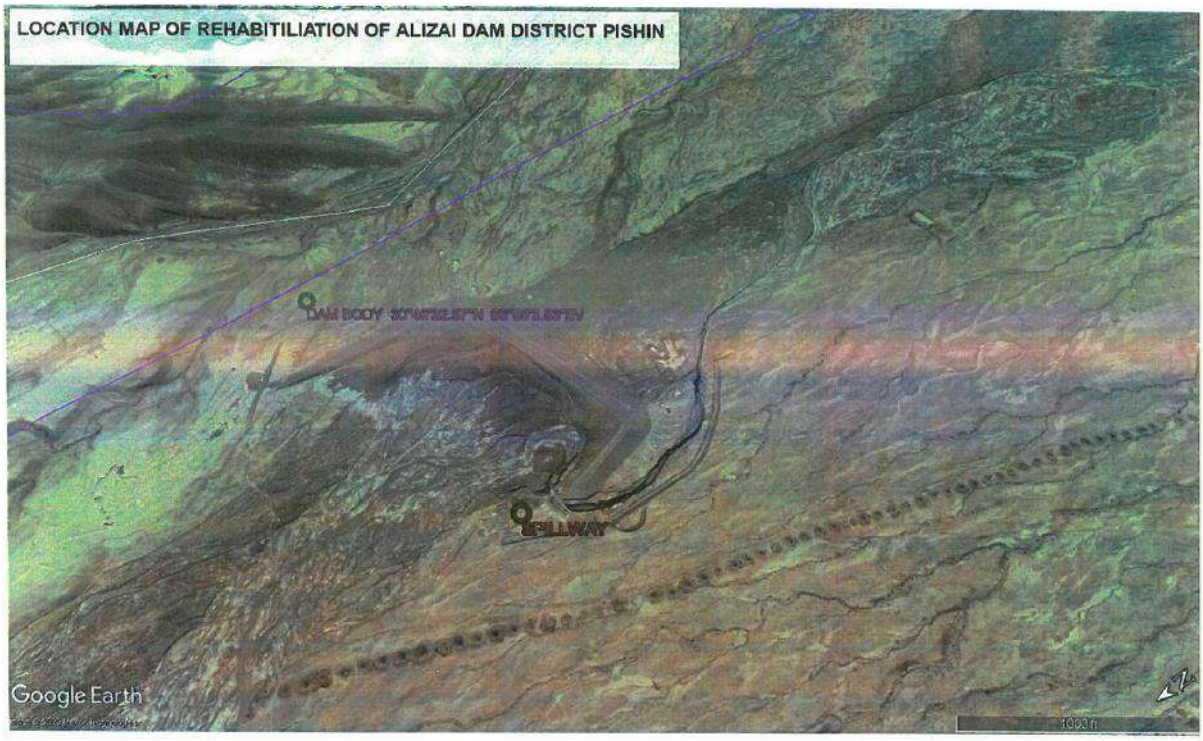
Location		Proposed dam site is located at distance of 25 km from Pishin town towards north east direction on Alizai Togi Manda in Huramzai district Pishin.
		Location point Latitudes 30°46'25.42"N, Longitudes 66°57'54.94"E
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	36.0 feet.
	Catchment area	27.85 Sq. Mile
	Dam top width	20 feet.
	Dam length	3100 feet.

	Dam top elevation	100 feet.
	Pond / storage capacity	498 acre-feet.
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	6811. (100 year)
	Flood surcharge over spillway	5.50 feet
	Free board	5 feet.
	Spillway width (clear)	200 feet.
	Spillway length	160 feet.
	Crest elevation	90ft
	Proposed command area	(447 acres)

Typical Section (Earthwork Embankment)



Location Map of Alizai Dam



3.3.18 KHCHANI TAMARK CHECK DAM

History:

219. Khchani Tamark dam was constructed in the Tamrak area by UNDP in 2012. It has a reasonable storage capacity and serves as the sole water source for the scheme area. The storage of floodwaters is utilized to raise the water table and promote agricultural development to a greater extent. This scheme holds great promise and meets the criteria for implementation as a priority.

220. In the last year's monsoon flood season, the spillway of the dam suffered damages and was completely demolished. The irrigation division of Pishin has proposed to restore the damaged portion and widen the spillway in accordance with design criteria.

Description & justification of the project:

221. Tamrak delay action dam was constructed by the irrigation & power department under the income generating programme in 1986, costing Rs. 7.6 million. The purpose of the dam was to store the runoff of the Tamrak river, which has a maximum flood discharge of about 3000 cusecs at the dam site based on a 30-year return period. The storage capacity of this dam is 80 acre-feet, and it has a catchment area of 3.0 sq. miles. The government of Baluchistan has given top priority to the development of water resources to combat and mitigate the severe drought situation.

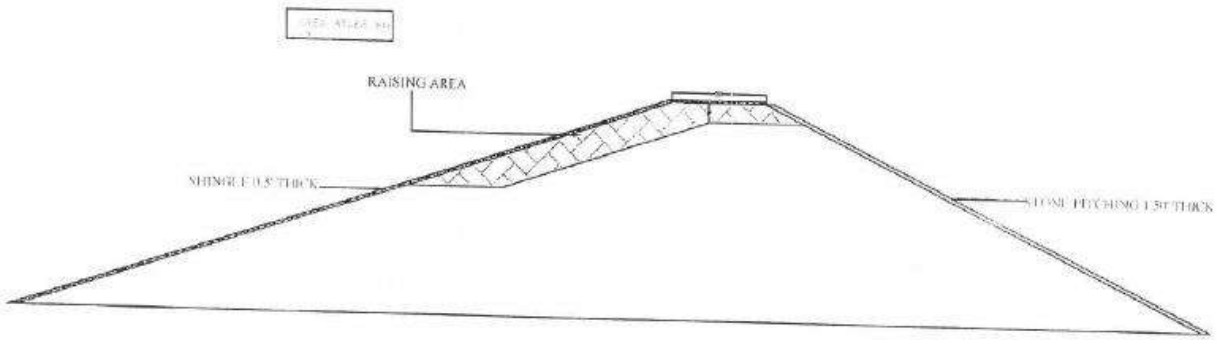
1. **Widening of spillway**

222. The spillway is to be designed for 1179 cusecs; therefore, the irrigation division of Pishin has proposed to widen the spillway from 50 to 70 ft. with a 3.5 ft. surcharge over the spillway and a 4.5 ft. freeboard.

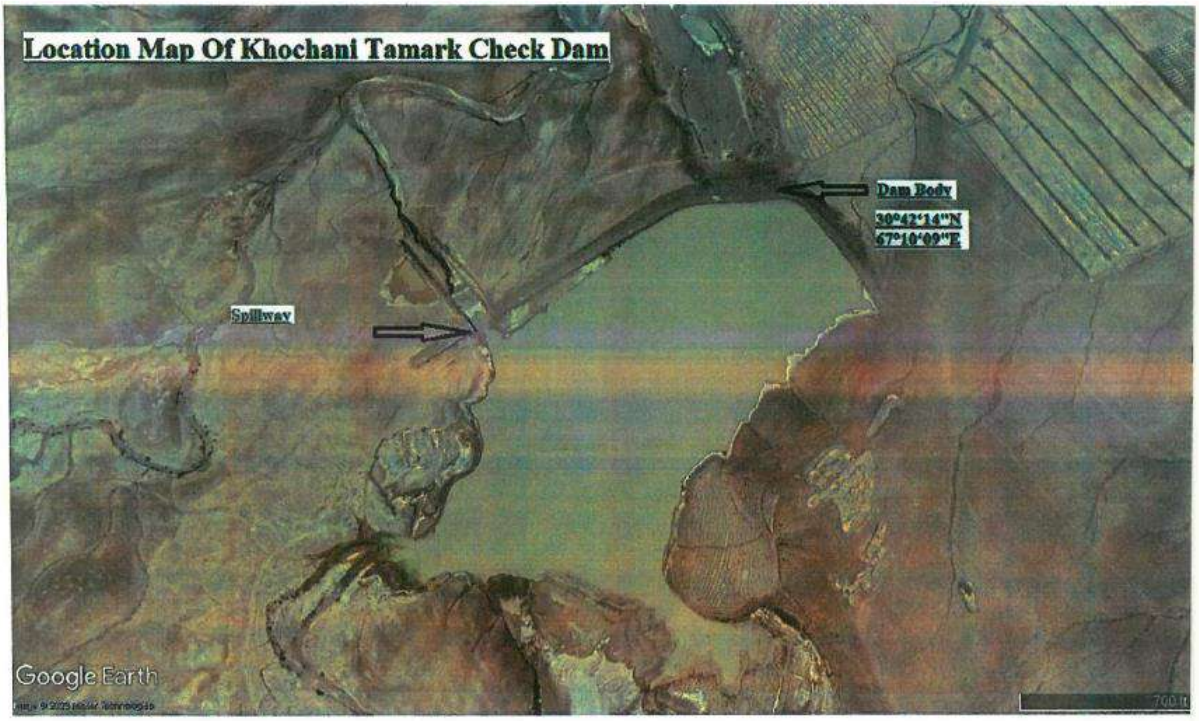
Previous parameters and existing condition of project:

223. During the monsoon in July 2022, heavy floodwaters passed through the spillway and severely damaged it. The gabion step of boulders in G.I wire could not withstand the forces applied by the floodwaters and dislocated in many portions. This situation indicates that the spillway bed would not have sustained even medium to low-intensity floods.

Typical Section (Earthwork Embankment)



Location Map of Khochnai Tamark Check Dam



3.3.19 MANDAN DAM

History:

224. Mandan dam was constructed in 2014 by the irrigation department. It has a reasonable storage capacity of 580 acre-ft., making it the sole source of water for the scheme area. The storage of floodwaters is utilized to raise the water table and support agricultural development to a greater extent. This scheme is considered promising and meets the criteria for implementation as a priority. However, in the last year's monsoon flood season, the shout portion of the spillway was mostly damaged, resulting in a significant pit at the end of the spillway, which caused erosion.

Key facts of damages and soil classification of catchment area:

225. The spillway of the scheme was damaged at the shout portion during the Flood Season of Monsoon 2022. As a result, the downstream of the spillway also received damages.

226. The catchment area covers 23.50 sq. miles, with the longest river being 15.50 miles. The soil classification of the catchment area comprises 55% fractured sandstone, shale, 20% non-fractured rock, 15% alluvial fan/piedmont, and 10% lowland/valley floor. The discharge calculation using the HALCROW-ULG method estimates a flow rate of 600 Cusecs for a 100-year return period.

Proposal:

227. To restore the scheme, which was damaged in the 2022 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 estimate with the following proposal.

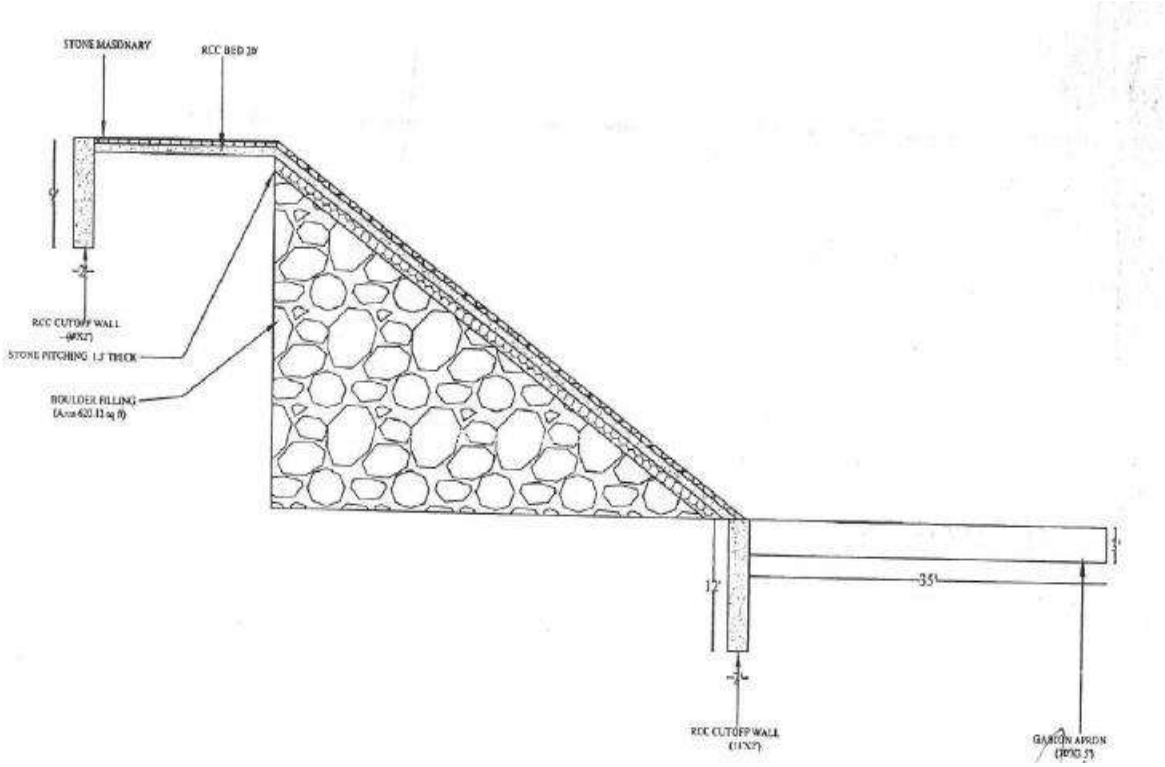
1. Restoration spillway:

228. In the last year's monsoon flood season, the shout portion of the spillway was significantly damaged, resulting in a large pit at the end of the spillway that caused erosion. To address this issue, the irrigation division of Pishin has surveyed the scheme and proposed a plan to restore the shout portion of the spillway.

Previous parameters and Existing Condition of Project:

Location		Proposed dam site is located to distance of 85 km from Pishin town towards east direction in Murgha Zakaryazai area district Pishin
		Location Point Latitudes30°41'12"N, Longitudes 67.24'38"E
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	36.0 feet.
	Catchment area	23.50 Sq. mile
	Dam top width	20 feet.
	Dam length	2150 feet.
	Pond / storage capacity	580 acre-feet.
2.	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	6200. (100 year)
	Flood surcharge over spillway	6 feet
	Free board	6 feet.
	Spillway width (clear)	910 feet.
	Spillway length	118 feet.
	Crest elevation	90 feet
	Proposed command area	(713 acres)

Loayout of Spillway



Location Map

3.3.20 GHARGAI delay action dam

229. The dam was originally constructed in 1986 at an estimated cost of 1.00 million by the irrigation department. Its purpose was flood mitigation and conserving floodwater for drinking and agriculture during periods of water scarcity. Over the decades, the storage capacity of the dam has reduced due to silt accumulation, and the dam body has weakened due to rain floods. Moreover, during the recent unprecedented floods from July 4th to August 26th, 2022, the dam body received damages on the downstream sloppy portion. This dam has historically provided a sustainable source of water supply to the Gharghai Area. To address these issues, the irrigation division of Pishin has proposed raising the dam, restoring the spillway, and constructing a flood protection wall for the Ghargai area.

DAM BODY:

Length	=	280 feet.
Height	=	35 feet.
Design storage capacity	=	500 acre-feet.
Current capacity	=	400 acre-feet.
Catchment area	=	5 Sq. miles

SPILLWAY:

Length of spillway	=	150 R. feet
width	=	70 feet.
Design discharge	=	4500 cusecs
Flow depth	=	4 feet
Free board	=	4 feet.

1. Restoration:

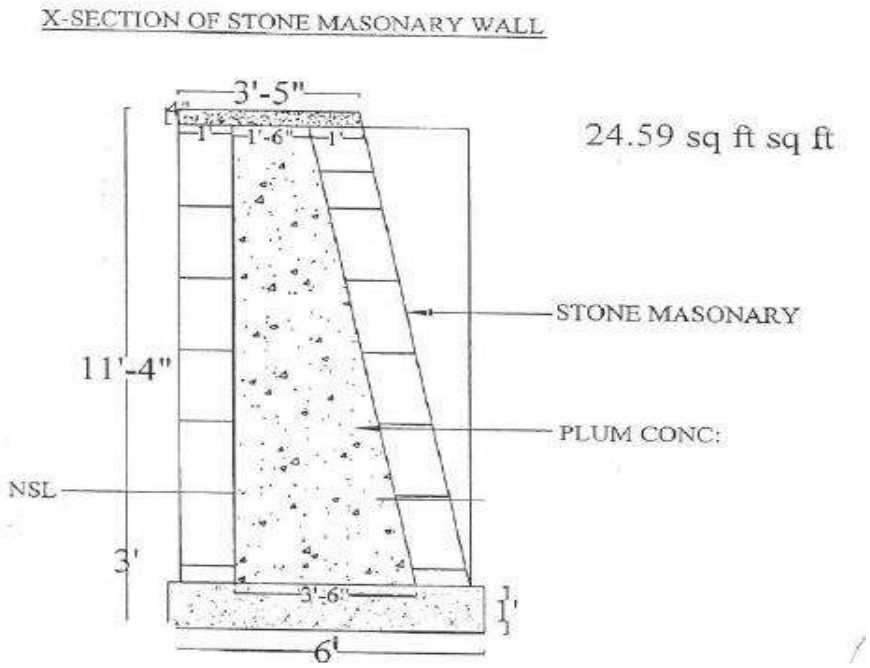
2. Dam Body (Earthen):

Length	=	2800 feet.
Height	=	40 feet.
U/S slope	=	2.5:1
DIS slope	=	3:1
Top width	=	20 feet
U/S stone pitching	=	1.5 feet.
Shingle laying on top	=	0.5 feet.
Storage capacity	=	450 acre-feet
Catchment area	=	4.0 Sq. miles

3. SPILLWAY:

230. The spillway sustained damages during the monsoon flood. The irrigation division of Pishin has proposed widening the spillway to a width of up to 30 ft. to address this issue.

Length of spillway	=	150 R. feet
width	=	100 feet. 30 feet. widening
Design discharge	=	3500 cusecs
Flow depth	=	6.0 feet.
Free board	=	4.0 feet.



Location Map

3.3.21 BOSTAN DARA DAM

History:

231. Bostan Dara check dam was constructed in the year 1993 by the irrigation department. Sagai Dara dam has a reasonable storage capacity of 148 Acre-feet, which is the sole source of water for the scheme area. The storage of floodwater is utilized for raising the water table and agricultural development to a greater extent. The scheme is promising and meets the criteria for implementation on a priority basis. In the last year's monsoon flood season, the bed of the spillway was damaged.

Key facts of damages and soil classification of catchment area:

232. The spillway of the scheme was damaged at some distance on the bed portion during the flood season of monsoon 2022. The catchment area is 2.64 sq. miles, the longest river is 3.18 miles, and the soil classification of the catchment area is as follows: 45% fractured sandstone, 20% fractured limestone, 10% non-fractured rock, and 25% alluvial fan/piedmont.

233. The discharge calculation by HALCROW-ULG method indicates a flow of 2845 cusecs for a 100-year return period.

Description & justification of the project:

234. After the restoration of this scheme, farmers will fully concentrate on the development of their lands. The agriculture department at Bostan Killi Qasim village will guide farmers and provide the latest information on agriculture, including the use of the latest seeds and fertilizers. An increase in cropped area is assured and expected to be more than 67 acres, in addition to sustained water supply for the present area, allowing for the cultivation of seasonal vegetables and food grains.

235. A field survey reveals that 10 tube wells will be recharged, benefiting 132 livestock and 125 farm families. Besides the agricultural land and orchards, the villages around Bostan Dara dam will be protected from flood devastation, which will also improve the socio-economic conditions of the people in the project area.

Proposal:

236. To restore the scheme damaged in the 2022 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 with the following proposal:

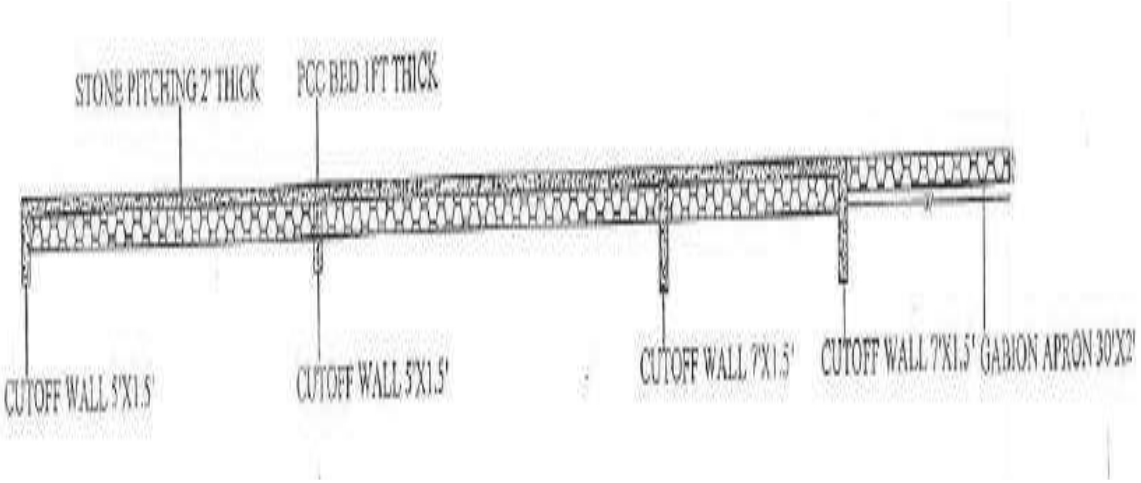
5. Restoration spillway:

237. In the last year's monsoon flood season, the bed portion of the spillway was damaged. The irrigation division of Pishin surveyed the scheme and proposed a plan to restore the bed portion of the spillway.

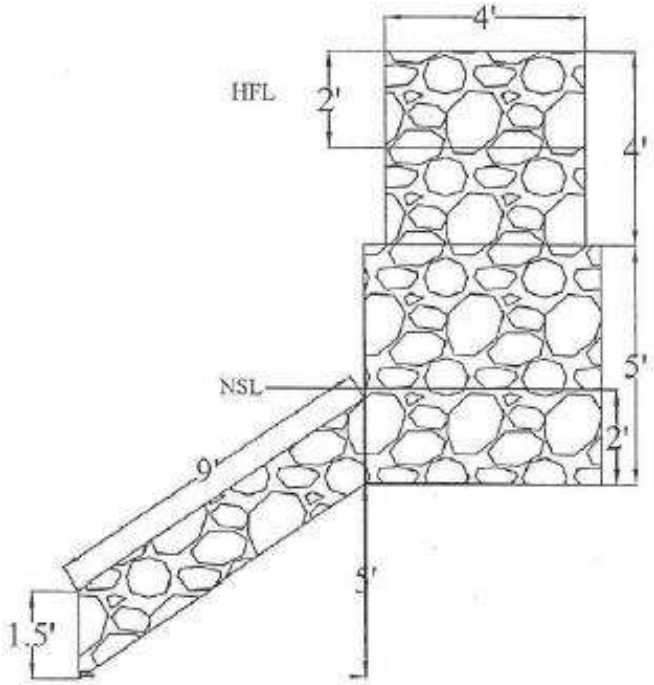
Previous parameter s and Existing Condition of Project:

Location		Proposed dam site is located at distance of 32 km from Pishin town in Bostan area in district Pishin.
		Location point 30°23'45.66"N67 °1'25.54"E
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	25.0 feet.
	Catchment area	2.64 sq. mile
	Dam top width	20 feet.
	Dam length	575 feet.
	Pond / storage capacity	148 acre-feet.
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	2845 (100 year)
	Flood surcharge over spillway	5 feet
	Free board	5 feet.
	Spillway width (clear)	80 feet.
	Spillway length	150 feet.
	Proposed command area	(764 acres)

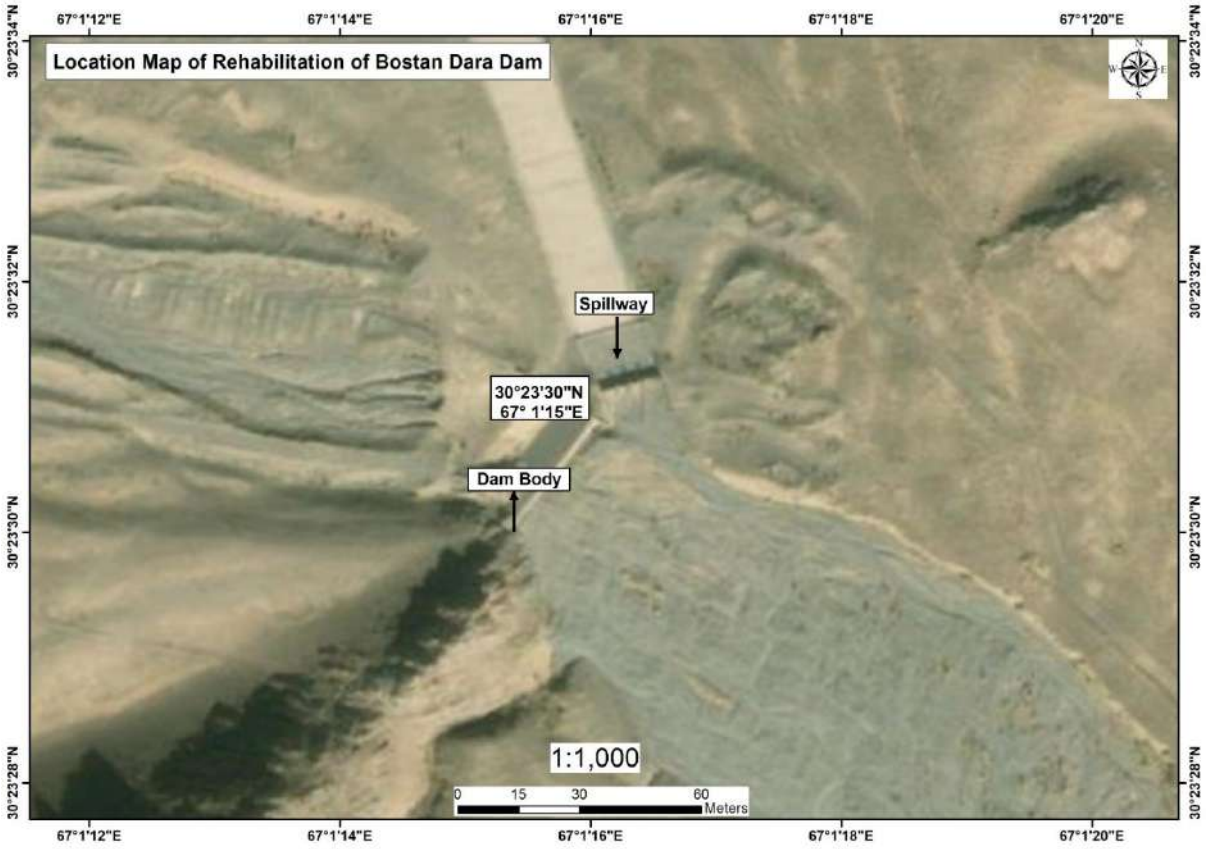
L-Section of Spillway



X-Section of Gabion Wall



Location Map of Bostan Dara Dam



3.3.22 DARGAI DELAY ACTION DAM

History:

238. Dargai Dam was constructed in the year 2012 by the irrigation department. Dargai dam has a reasonable storage capacity of 465 acre-ft, which is the sole source of water for the scheme area. The storage of floodwater is utilized for raising the water table and agricultural development to a greater extent. The scheme is promising and meets the criteria for implementation on a priority basis.

Key facts of damages and soil classification of catchment area:

239. The spillway of the scheme was damaged at the shout portion during the flood season of monsoon 2022. Due to this, the downstream of the spillway received damages.

240. The catchment area is 2.95 sq. miles, the longest river is 3.35 miles, and the soil classification of the catchment area is 75% hill fractured and 25% alluvial fan/piedmont. The discharge calculation by HALCROW-ULG method indicates a flow of 2535 cusecs for a 100-year return period.

Proposal:

241. To restore the scheme, the irrigation division of Pishin has prepared a PC-1 with the following proposal:

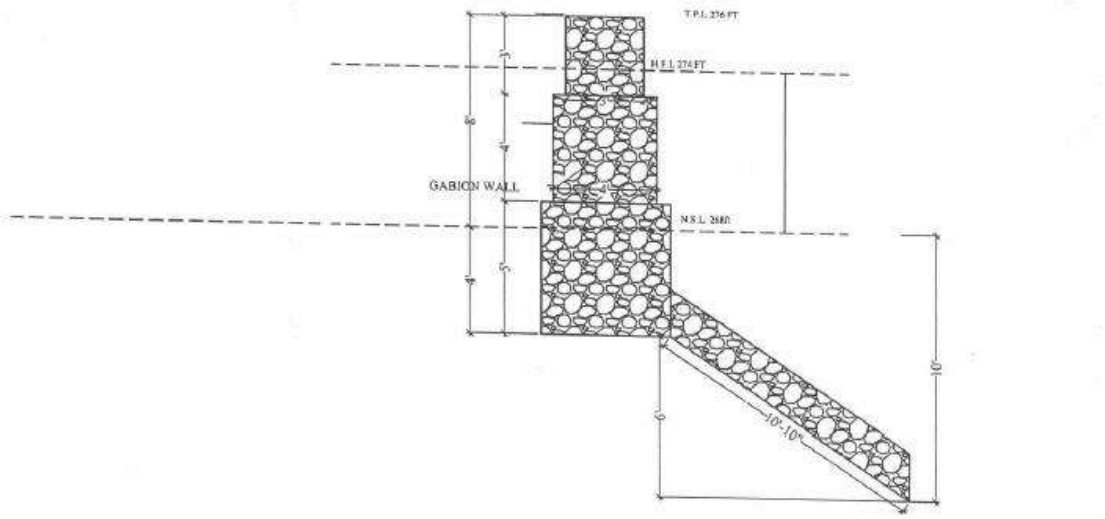
6. Raising of dam body:

242. Settlement has occurred in the dam body, so it is proposed to raise the dam body at different heights to address this issue.

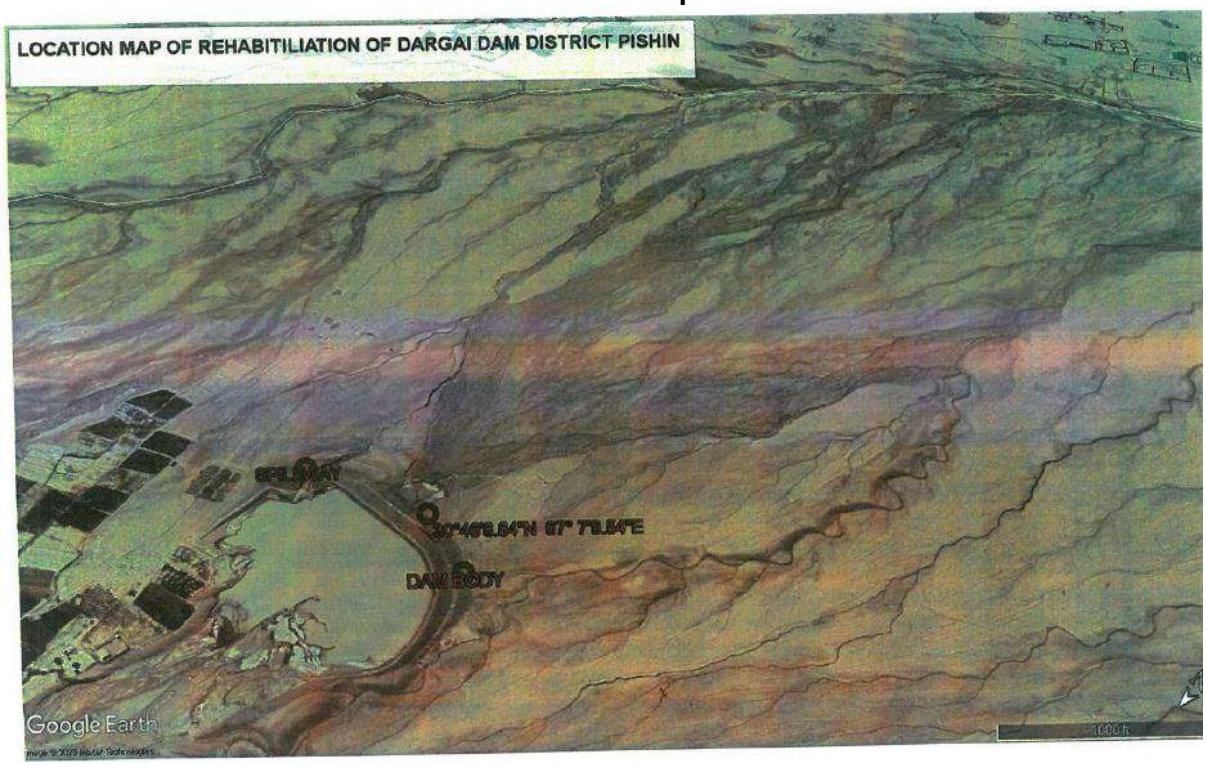
Previous parameters and Existing Condition of Project:

Location		The site of proposed dam is located about 30 km north-east of Pishin town in Sar Khanzai area
		Location point Latitudes 30°46'8.84"N, Longitudes 67°9.54"E
Dam Structure		
1	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	35.0 feet.
	Catchment area	2.95 Sq. Mile
	Dam top width	20 feet.
	Dam length	1670 feet.
	Pond / storage capacity	465 acre-feet.
2.	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	2535 (100 year)
	Flood surcharge over spillway	4.5 feet
	Free board	4.5 feet.
	Spillway width (clear)	80 feet.
	Spillway length	145 feet.
	Proposed command area	(350 acres)

X-Section of Gabbion Wall



Location Map



3.3.23 SHADAKA DAM AND SHASA MUAHAMMADZAI DAM

243. Shadaka dam was constructed in 1983 with an estimated cost of 0.70 million PKR by the irrigation department. Its purpose was flood mitigation and conserving floodwater for drinking and agriculture during periods of scarcity. Over the years, the storage capacity of the dam has been reduced due to silt accumulation, and the dam body has weakened due to rain floods. Additionally, during the recent unprecedented floods from July 4 to August 26, 2022, the dam body received damages, although it has remained a sustainable source of

water supply for the Gharghai Area. In light of these issues, the Irrigation Division Pishin has proposed raising the dam, restoring the spillway, and constructing a flood protection wall for the Ghargai Area.

DAM BODY:

Length	=	140 feet.
Height	=	35 feet.
Design storage capacity	=	150 acre-feet.
Current capacity	=	120 acre-feet.
Catchment area	=	2 Sq. miles

SPILLWAY:

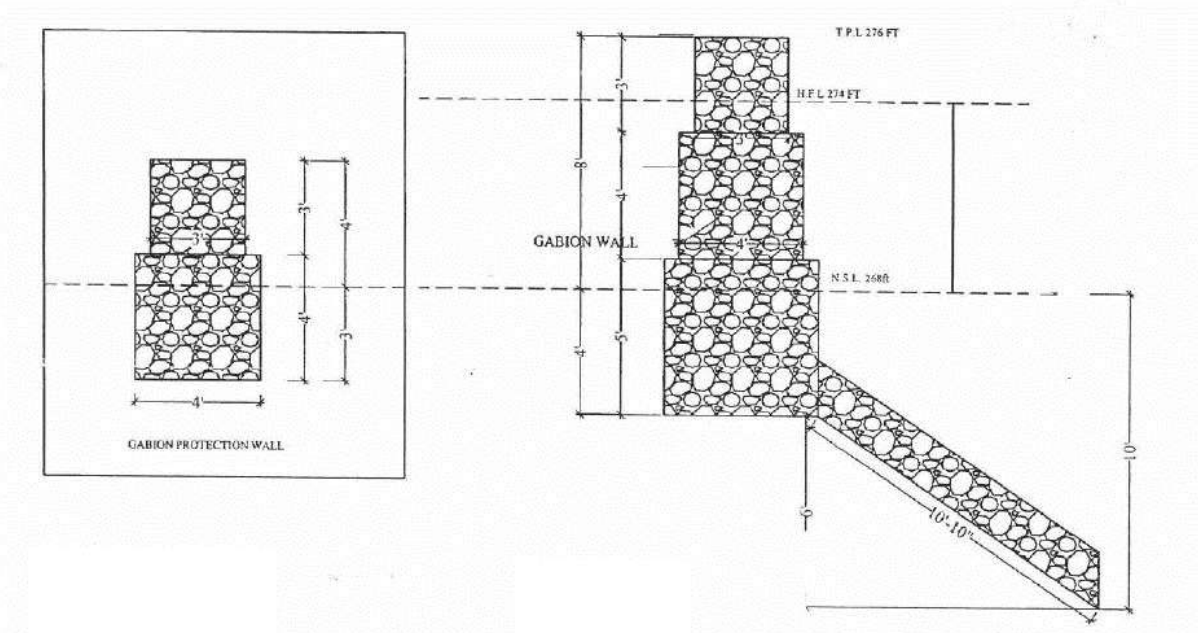
Length of spillway	=	50 R. feet
width	=	70 feet.
Design discharge	=	1500 cusecs
Flow depth	=	4 feet.
Free board	=	4 feet.

7. Restoration:

Dam Body (Earthen):

Length	=	140 feet.
Height	=	43 feet. (8 feet. raising)
U/S slope	=	2.5:1
DIS slope	=	3:1
Top width	=	20 feet
U/S stone pitching	=	1.5 feet.
Shingle laying on top	=	0.5 feet.
Storage capacity	=	180 acre-feet
Catchment area	=	4.0 Sq. miles

X-Section of Gabbion Wall



Location maps

3.3.24 NARIN JALAK DAM

History:

244. Narin Jalak dam was constructed in 1993 by the irrigation department. It has a reasonable capacity of 146 Acre-ft, serving as the sole water source for the scheme area. The storage of floodwater is crucial for raising the water table and supporting agricultural development. The scheme is considered promising and meets the criteria for implementation on a priority basis. During the last year's monsoon flood season, the spillway's chute portion sustained significant damage.

Key facts of damages and soil classification of catchment area:

245. The spillway of the scheme was severely damaged in the chute portion during the monsoon 2022 flood season. This damage subsequently led to downstream damages.

246. The catchment area covers 3.25 square miles, with the longest river spanning 4.35 miles. The soil classification in the catchment area comprises 75% hill fracturing and 25% alluvial fan/piedmont. The discharge calculation using the HALCROW-ULG method indicates a flow of 1846 Cusecs for a 100-year return period.

Description & justification of the project:

247. Upon the restoration of this scheme, farmers in the area will be able to focus on developing their lands. The agriculture department at Narin Jalak village will support farmers by providing guidance and the latest agricultural information, including seeds and fertilizers. The expected outcome includes an increase in cropped area, projected to be more than 350 acres, in addition to ensuring sustained water supply for the existing cultivation of seasonal crops such as vegetables and grains.

248. A field survey suggests that 10 tube wells will be recharged, benefiting 400 livestock and 125 farm families. Furthermore, aside from agricultural land and orchards, the villages near Narin Jalak dam will be protected from flood devastation caused by local rivers and creeks. This is expected to significantly improve the socio-economic conditions of the people in the project area.

Proposal:

249. To address the damage sustained during the 2022 monsoon flood season, the irrigation division of Pishin has prepared a PC-1 with the following proposal:

8. Restoration spillway:

250. During the previous monsoon flood season, the chute portion of the spillway suffered severe damage, resulting in a large pit at the end of the spillway and subsequent erosion. The irrigation division of Pishin has surveyed the scheme and proposed two restoration plans to address the damaged chute portion of the spillway.

Previous parameters and Existing Condition of Project:

Location		Proposed dam site is located at distance of 85 km from Pishin town towards east direction in Murgha Zakaryazai area district Pishin.
		Location point
		Latitudes 30°41'12"N, Longitudes 67°24'38"E
Dam Structure		
1.	**Main Dam**	
	Type	Earthen dam reservoir
	Maximum height above river bed level to dam top level	36.0 ft.
	Catchment area	3.25 Sq. mile
	Dam top width	20 feet.
	Dam length	247 feet.
	Pond / storage capacity	146 acre-feet.
2	**Spillway**	
	Type and location	Un-gated spillway
	Design discharge	1846 (100 year)
	Flood surcharge over spillway	6 feet
	Free board	6 feet.
	Spillway width (clear)	40 feet.
	Spillway Length	150 feet.
	Proposed command area	(400-500 acres)

Location Map of Narin Jalak Dam

3.8 Project Cost:

251. The estimated total cost for construction of proposed project is 990.727 million PKR. This cost is tentative and will be finalized with the detailed technical design of the proposed project.

3.9 Project Administrative Jurisdiction

252. The proposed project falls under the jurisdiction of deputy commissioner of Pishin, Balochistan province.

3.10 Project Implementation Schedule

253. It is estimated that with efficient management the work will be completed within 7 months after the commencement subject to availability of funds.

3.11 Construction Activities and Civil Works

254. Construction activities will involve the following activities:

Spillway- Civil Works:

- ***Excavation:*** Earthwork excavation to designed section, grades, and profiles. Excavated material to be disposed of and dressed, using shingle or gravel.

- ***Retaining Walls:*** Filling and compacting soil, earth, and boulders behind retaining walls, including excavation of soil.
- ***Concrete Work:*** Providing and laying cement concrete using crushed stone and down gauge in the foundation, including leveling, compacting, and curing.
- ***Wall and Piers:*** In situ laying of cement concrete in wall and piers using approved coarse sand and crushed aggregate, including compacting, curing, formwork cost, and its removal.
- ***Reinforcement:*** Providing, fabricating, and laying deformed steel reinforcement (deformed bar) for R.C.C work, including the cost of preparation and positioning.
- ***Water stop and Joints:*** Installing P.V.C. ribbed water stop, forming expansion joints with cork bitumen, and providing joint sealing compound.
- ***Drainage:*** Filter granular backfill behind retaining wall to prevent weep hole choking. Laying and testing PVC pipes.

Dam Parapet Wall-Civil Works:

- ***Foundation:*** Excavation, layout, dressing, refilling around structures with excavated earth, watering, and ramming, with a lead of any lift and lead.
- ***Concrete Work:*** Providing and laying cement concrete using crushed stone and down gauge in the foundation, including leveling, compacting, and curing.
- ***Masonry:*** Providing, dressing, and laying random rubble stone masonry in foundation, plinth, and basement, with cement sand mixture.

Flood Protection Bunds-Civil Works:

- ***Excavation:*** Earthwork excavation to designed section, grades, and profiles. Excavated material to be disposed of and dressed, using shingle or gravel.
- ***Embankment Earthwork and Compaction*****:** Mechanical compaction of earth embankment using optimal moisture content. Dressing as per designed section, including laying, leveling, and watering.
- ***Crush Aggregate Application***: Laying crushed aggregate on top of the bund, including handling for any lift and lead.
- ***Wire Crate Installation***: Providing and filling wire crates, including sewing. Separate payment for crates, including lead and lift costs.
- ***Galvanized Wire(GI) Netting for Crates***: Installation of mesh GI wire netting on crates, including siding and partition.
- **Hard Soil Compaction for Embankment:** Mechanically compacting the hard soil embankment, along with dressing to the specified section, including laying, leveling, and watering.

3.12 Construction camps

255. Camp sites will be selected based on following considerations:

- Number of workforces deployed;
- Type and quantity of machinery mobilized;
- Availability of adequate area for establishing camp sites including parking areas for machinery, stores and workshops;
- Access to communication and local markets;

- Appropriate distance from sensitive areas including settlements and religious and/or cultural facilities.

256. Final locations will be selected by the contractor with the assistance of Supervision Consultant. Care will be taken to safeguard the existing environment of the area and location shall be selected away from settlements.

3.13 Water required for construction and source of construction material

257. It is estimated that about 144,000 gallons of construction water will be required for the project. In addition to this water will be required for meeting the consumptive and non-consumptive needs of the campsites, workshop, washing yard etc. This estimate is based on the information received from the project design which has provided an estimated water requirement of 6000 gallons per site.

258. However, keeping in view the limited nature of the proposed works and the setting of the project area with limited scattered settlements, no burden is expected to be placed on the existing water resources in the area, particularly since the construction works will be short term in nature. Contractor will install hand pumps/tube wells accordingly as per his requirement after seeking seek approval from the Local Government for exploitation of the water resources.

259. Cement and steel will be procured from Quetta, sand from Yaro near Pishin and aggregate crush from Pishin and Quetta. No material will be sourced from river/stream bed.

3.14 Workforce Requirement

260. Manpower demand estimation is an essential component to facilitate deployment of manpower.

Workforce during construction phase

475. Total manpower required on site for proposed project will be approximately 282 workers per day, depending on the type of construction. They will be inside of the area of possession, under the supervision of a Contractor who will be awarded the contract.

Workforce during operation phase

476. Total manpower required during operation phase for proposed project will be approximately 66 workers comprising skilled and unskilled staff.

3.15 Solid Waste Generation

477. Due to construction activities, waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery, domestic waste and waste construction materials (construction waste will be reused or recycled through vendors).

478. Considering the labourers (about 282 in numbers) residing in the construction camp and the locally available labour, an average solid waste generation rate of 0.5 kg/capita/day

is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 141 kg of solid waste will be generated from construction camps on daily basis. Solid waste generated during construction and camp sites shall be safely disposed in designated waste disposal sites after consultation with the concerned authorities of Pishin district.

3.16 Water requirement

Construction Phase

479. The water consumption is estimated to be 11,280 litres/day[1] for 282 construction workers during construction phase of the proposed project.

Operation phase

480. The water consumption is estimated to be 2640 litres/day for 66 workers during operation phase of the proposed project.

3.17 Wastewater Generation

481. The wastewater generation is estimated to be 9.024 litres/day. Constructed wetland will be best option for wastewater treatment. Considering remote location of the project area, best disposal option will be constructed wetland for wastewater treatment. Its operation will result in treated water within the NEQS standards being discharged into the environment and thus is expected to reduce the load on the aquatic and terrestrial habitats present in proximity to the receiving water bodies in the project areas.

3.18 Power Requirement

Construction Phase

482. The main source of electricity/electric power during construction phase will be diesel generators for construction camps and construction machinery.

3.19 CONSTRUCTION EQUIPMENT

483. The Table 3-1 shows a tentative list of construction equipment required by the contractor to enable him to undertake this work and meet the prescribed schedule.

Table 3-1: List of Construction Equipment Required by the Contractor

Sr. No.	Description	Estimated Quantity
1	Bulldozer D8 with ripper (Blade capacity = 12.9 m^3)	5
2	Motor Grader cat 14G or Equivalent	4
3	Front End Loader Bucket capacity = 6 m^3	5
4	Sheep foot roller for core compaction (10-ton capacity)	3
5	Dump Trucks (capacity = 14 m^3)	5
6	Mobile water tanker 500 gallons	3

[1] National Highway Authority (July 2022) EIA Report Peshawar Chamkani. https://nha.gov.pk/uploads/topics/16758532038662.pdf Tentative Work Force Requirements Contractor Staff = Water consumption per (1) worker = 40 liters/day
(282 workers) x (40); = 11,280 liters/day
Wastewater generation=(282 workers) x (80% of water consumption)=9,024 liters/day

Sr. No.	Description	Estimated Quantity
7	Hydraulic Excavator with 14” wide bucket	5
8	Concrete Batching Mixer	3
9	Concrete Vibrators	5
10	Centrifugal pumps ½ cfs	4
11	Hand compactors	5
12	Diesel generator	3
13	Jeeps	5

4. ENVIRONMENTAL AND SOCIAL BASELINE

4.1 GENERAL

484. The purpose of this chapter is to establish the baseline conditions for the physical, biological and the social aspects of environment of the project area. The data were collected regarding the physical environment, biological environment and social aspects of the study area during stake holder consultation and technical visits conducted by the environment team.

4.2 AREA OF INFLUENCE (AOI)

485. This chapter describes the environmental, social and biological baseline conditions of the project area. The baseline conditions have been established on the basis of the data collected from the field, and through unstructured interaction with the local communities as well as the officials from various departments. In addition, the published data (secondary data) was also used to provide background information about the project area.

486. Spatial project boundary is defined as the specific site area that includes the areas of construction and operation and the zones of influence around the project site i.e. physical, biological and socioeconomic. It specifically includes the construction area and the land adjacent to it. The adjacent land includes any area that is directly disturbed by the construction and operational activities of the project. The project boundary may vary for different major areas covered under physical, biological and socioeconomic environment depending upon the areas of influence. In this report, the Area of Influence (AoI) is referred where the potential impacts of the proposed project are anticipated. The AoI includes all those areas in the region within 0.5 km from the project site and which may be affected directly or indirectly by the project activities.

487. This chapter describes the environmental setting of the proposed interventions.

4.3 PHYSICAL ENVIRONMENT

4.3.1 Topography

488. Pishin district lies between 30°04' to 31°17' north latitudes and 66°13' to 67°50' east longitudes. The district is bounded by Qila Abdullah in the north, Qila Saifullah in the east, Quetta and Ziarat in the south and Afghanistan in the west. Its length form north to south is about 68 km and its width from east to west ranges from 8 to 38 km. The area of the Pishin district is 5,850 sq. km. The general character of the district is mountainous. Its northern half is covered by Toba Plateau. The mountains are fairly uniform, with long central ridges from which frequent spurs descend. These spurs vary in elevation from about 1,500 to 3,300 meters. **Figure 4.1** shows the topography of the project area.

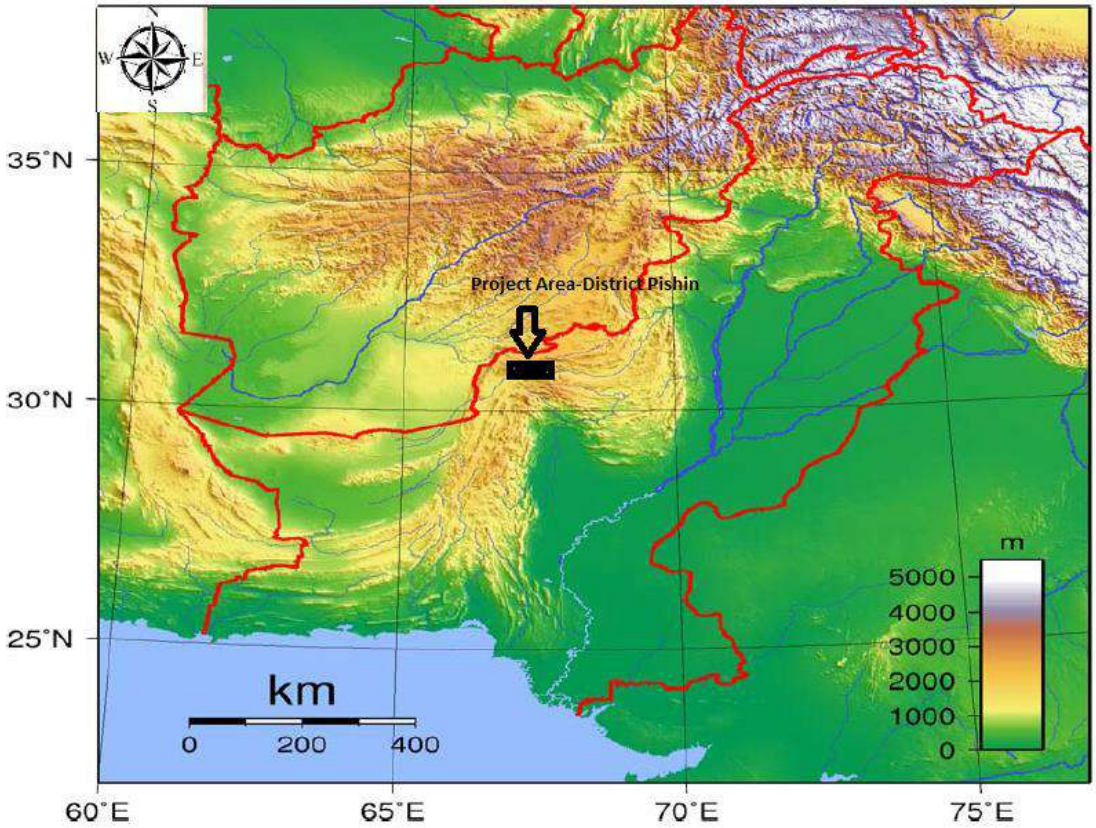


Figure 4-1: Topography of the sub-project areas

4.3.2 Soil

489. The soil composition of the district Pishin consist of deep, well drained, strongly calcareous, moderately alkaline, medium textured soil developed in the parent material derived from shale, sandstone and a little limestone. It occupies nearly level areas in the piedmont plain.

4.3.3 Hydrology

490. Baluchistan is a water starved region. Surface water mainly comes from precipitation in the form of surface runoff and its share of water from the Indus River via link canals. Surface water resources are very limited, and a major part of the province depends on rainfall, tube-wells, Karez flows, flood flows, hill torrents and diversions from non-perennial streams, which bring substantial runoff during the rainy seasons.

491. Pishin district has a network of irrigation canals and watercourses that are primarily supplied by the Pishin Lora river. The river plays a vital role in supporting agricultural activities in the area. Flood streams /rivers overflow due to torrents/sheath run-off from mountains are another seasonal source of surface water during monsoon.

4.3.4 Groundwater

492. Groundwater is the key source of water for survival in the Pishin area, which is decreasing with rapid urbanization. Karez, however, are considered as the major sources of irrigation and drinking water from many decades, but rapidly growing installation of tube wells in Baluchistan is adversely affecting functioning of the Karez.

493. Groundwater shows a decline in all four tehsils of Pishin district over the period from 2005 to 2016 and the condition is worst at Huramzai tehsil as groundwater is depleting rapidly. The main reason for this decline in the groundwater table is tube well pumping from groundwater resources which got exceeded than the natural recharge. Moreover, the rapid increase in urbanization decreased the infiltration rate in the recent years. According to 2017 census, total population of district Pishin was 736,481 with 51.48% male and 48.52% female in comparison to 376,728 in 1998 (MIC 2017). Water table got fluctuated approx. 25 to 30 ft. in past decades. Minimum and maximum water depth for 2007 were recorded 67.00 ft. and 214.98 ft. respectively. In 2013 Minimum and maximum water level were recorded 80.00 ft. and 266.98 ft. respectively and water level further declined 2014. The decline continued up to 300 ft. in 2015. The most affected areas in Pishin district are Pishin city tehsil and Huramzai tehsil.

4.3.5 Climate and Meteorology

a) Average Temperatures

494. Figure 4-2 represents modelled data where mean monthly maximum and minimum temperatures for different months of the last 30 years. The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Pishin. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.[2]

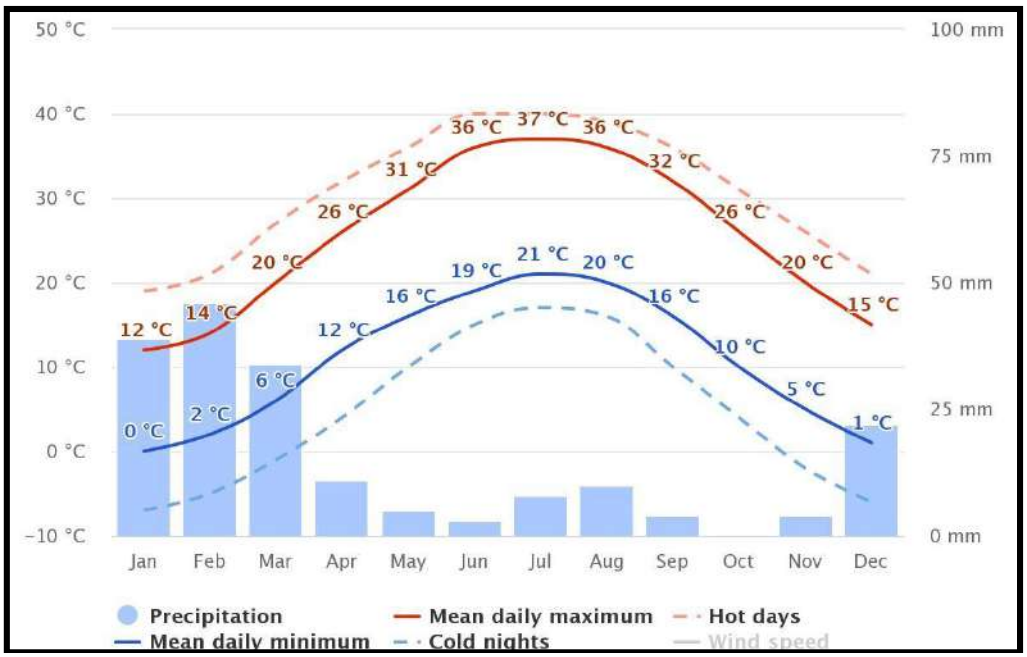


Figure 4-2: Average Temperatures

495. As it can be seen from Figure 4-3 the project area has extreme climate. It has hot summer and cold winters. The summer starts from May and lasts till September. July is the hottest month. The mean maximum and minimum temperature are 37 ºC and 21 ºC

[2] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/pishin_pakistan_1167821

respectively for month of July. The winter seasons lasts from November to February. January is the coldest month. The mean maximum and mean minimum temperature are 12 ºC and 0 ºC in January. The maximum temperatures are presented in Figure 4-3.

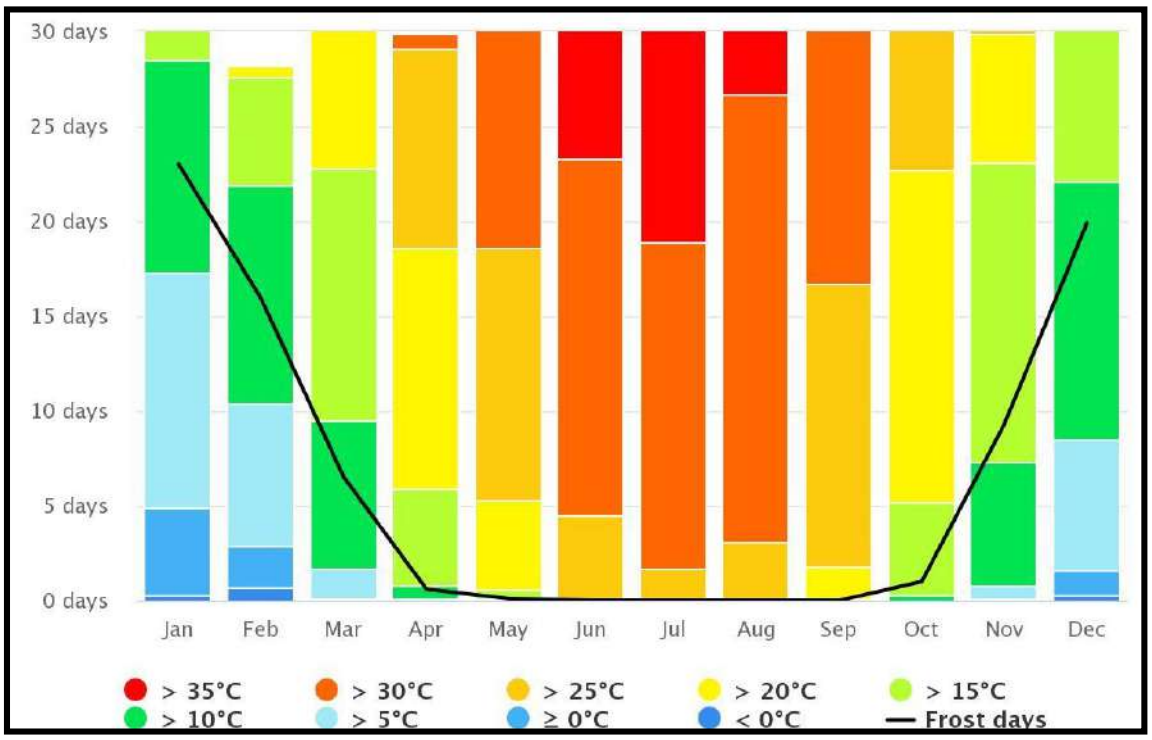


Figure 4-3: Maximum Temperatures[3]

b) Rainfall

496. Table 4-1 shows mean monthly rainfall. The climate of Pishin can be categorized as delightful summers, dry and bitterly cold winters. Pishin lies outside the sphere of monsoon currents. The district experience storms in winter season. Rainy season is mostly in the months of December, January, February, March and April.

Table 4-1: Mean monthly and annual Rainfall in Pishin

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	Total
Maximum Temp.	11	13	18	24	31	35	36	34	32	25	21	14	25	-
Minimum Temp.	2-	0.1	4	9	14	18	21	19	13	5	2	-1	8	-
Rainfall	58.8	46.3	68.5	38.8	5.4	0.3	19.4	23.9	6.8	2.7	3.5	33.8	25.7	308

Source (Pakistan Meteorological Department- Data)

[3] Ibid, p. 4-3.

c) **Wind:**

497. Figure 4-4 shows the days per month, during which the wind reaches a certain speed. Maximum wind speeds can be observed in the month of May which is >28 km/h. Wind speed >19 km/h dominates throughout the year.

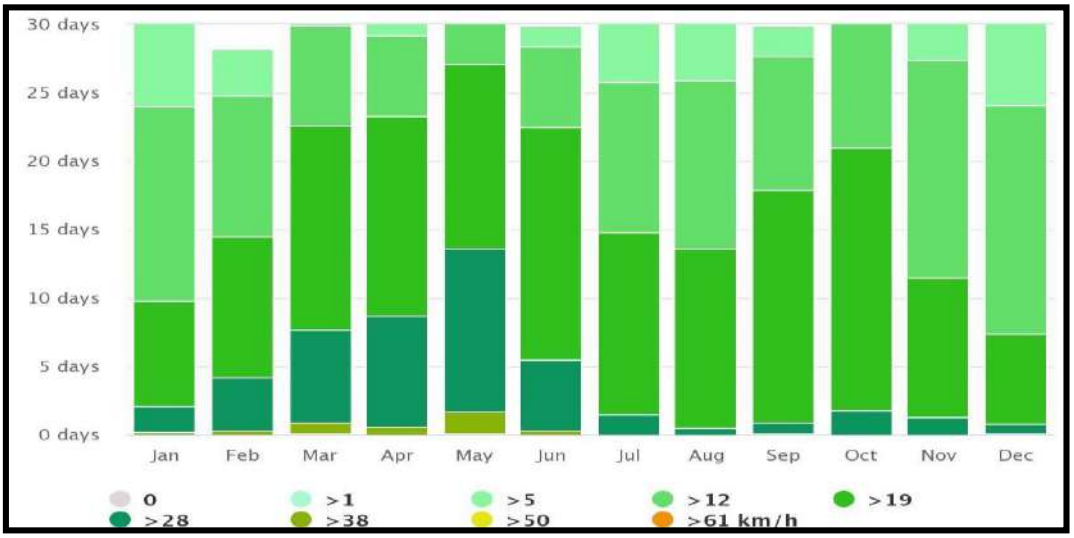
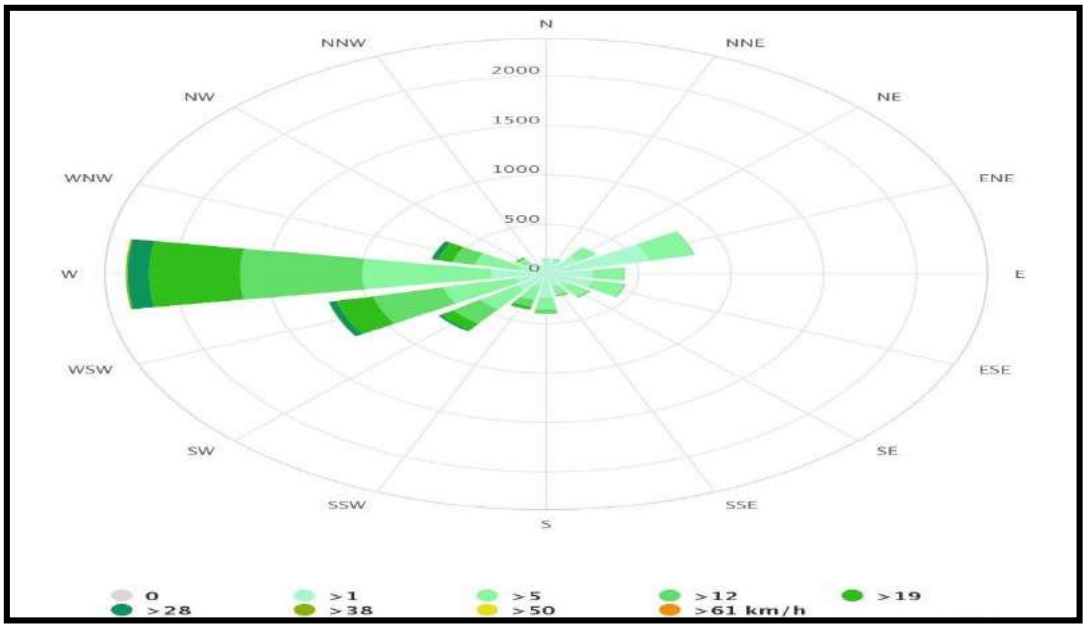


Figure 4-4: Wind Speed[4]

498. The wind rose for Pishin shows how many hours per year the wind blows from the indicated direction. Wind rose is shown in Figure 4-6. It can be seen from the wind rose that dominant wind direction is towards West (W), WSW (West South-West), WNW (West North-west), and SSW (South South West).

Figure 4-5: Wind Rose[5]



[4] Ibid, p. 4-3.

[5] Ibid, p. 4-3.

4.3.6 Climate Change

499. According to the Global Climate Risk Index 2020, Pakistan was ranked as the fifth most affected nation by extreme weather events (1999-2018). Natural disasters, which already disrupt livelihoods and the economy, are expected to increase in frequency and intensity with climate change. Projected temperature increases are expected to be above global averages, negatively impacting agricultural production, water availability, and human health. This will be particularly true for large parts of Punjab, Sindh and Baluchistan provinces, already considered intense heat zones.

500. Climate change will impact water conservation structures in myriad ways, depending on the mode and location specific characteristics. All water conservation structures are constructed under design standards that consider very specific temperature and precipitation ranges and return intervals for extreme events, such as floods and extreme heat. Water conservation structures malfunctions if weather conditions diverge from the design range (as was experienced in 2022 flood in Pishin in this project area), which could occur more frequently as the climate continues to change. Heat waves are likely to occur with a higher frequency and longer duration in the future. Water conservation structures are particularly vulnerable to precipitation extremes.

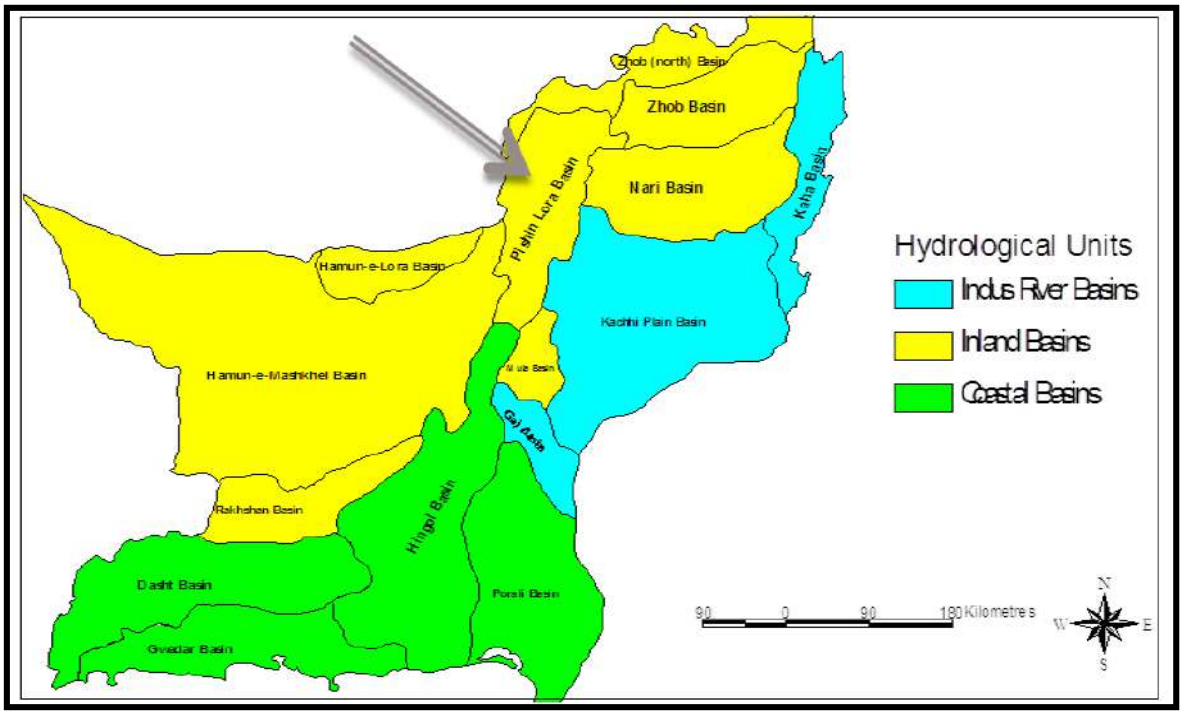


Figure 4-6: Maps showing the study area of Pishin Lora Basin is adjacent to Zhob and Mula river basins of Balochistan

Climate Risk and Vulnerability Assessment (CRVA)[6]

501. Pishin Lora Basin (PLB) falls in upland Baluchistan, which is the major fruit growing belt of the province. The majority of the population relies on agriculture and livestock for a livelihood. The PLB consists of district Pishin, Quetta, Killa Abdullah, Mastung and part of the Kalat. This Basin is adjacent to Zhob and Mula River Basins (as showns in Figure 4-6). Climate Risk and Vulnerability Analysis of Zhob and Mula river basin was conducted under ADB funded Baluchistan water Resources Development Sector Project through using different models i.e. Global Climatic Model(GCM), HEC-RAS and SWAT model.

502. Climate Change analysis was conducted using GCM. Based on GCM data, for Zhob watershed, the highest and the second highest flood years for Zhob watershed are 2059 and 2031, respectively. While, for Mula river, the highest and the second highest flood years are 2059 and 2027.

503. Data from GCM for 83 years (2017-99) show that the years 2018, 2047, 2031, 2027, 2017, 2059, and 2080 are the highest 7 years for rainfall and ultimately flows for Zhob watershed. Similarly form the same span of GCM simulations, 2018, 2027, 2031, 2038, 2047, 2059, and 2080 are identified to be the top seven high flow years in Mula river basin. Figure 40 (a) and Figure 40 (b) represents highest seven years of precipitation data for Zhob and Mula watersheds.

504. For vulnerability analysis, flood inundation modelling was done using HEC-RAS and SWAT models. A vulnerability and impact matrix were developed to evaluate the possible climatic effects on both the river basins. It was concluded from matrix that Zhob river basin is prone to losses associated with increasing temperatures, decreasing rainfall and more frequent droughts. Whereas, Mula river basin is characterized by a decreasing maximum temperature yet increasing minimum temperatures, decreasing rainfall in winters and summers (two main rainfall seasons) and an increasing trend in frequency and magnitude of floods.

Climate Risks and Vulnerabilities in the sub-project areas

505. The increasing trend in frequency and magnitude of floods in river basin adjacent to the Pishin-Lora basin area indicated that flooding may be considered the most important climate risk for the project. Water flow condition exceeding the systems' design capacity can cause flooding or inundation of water conservation structures. High flood events can also lead to increased deterioration or damage of project structures resulting in more frequent maintenance and rehabilitation.

[6] Climate Risk and Vulnerability Analysis Report (2017). Balochistan Water Resources Development Project Preparatory Technical Assistance (TA 8800-PAK)
https://www.adb.org/sites/default/files/linked-documents/48098-002-sd-04.pdf

4.3.7 Seismology

528. The whole of Baluchistan lies in a seismically active region. The province has experienced catastrophic earthquakes in the past.

529. Many areas of Pishin district, in particular areas around Khanozai are vulnerable to earthquakes. The Suleiman range, a part of the Hindu Kush, which lies southwest of the Himalaya is tectonically active. Major earthquakes in Pishin include Shahrigh earthquake of 1931, Mach earthquake of 1931 and the Quetta earthquake of 1935. The Ziarat earthquake in 2008, with a distantly located epicentre also affected Pishin district. Major recent earthquakes in Pishin include one in 1993 (5.7 on Richter scale) and one in 2000 (6 on Richter Scale).

530. Pishin district belongs to Zone 4 of the seismic zone map of Pakistan, which means high damage due to earthquakes. **Figure 4.7** shows the seismic zoning map of Pakistan indicating that project area is falling under Seismic Zone-IV, that is high seismic zone.

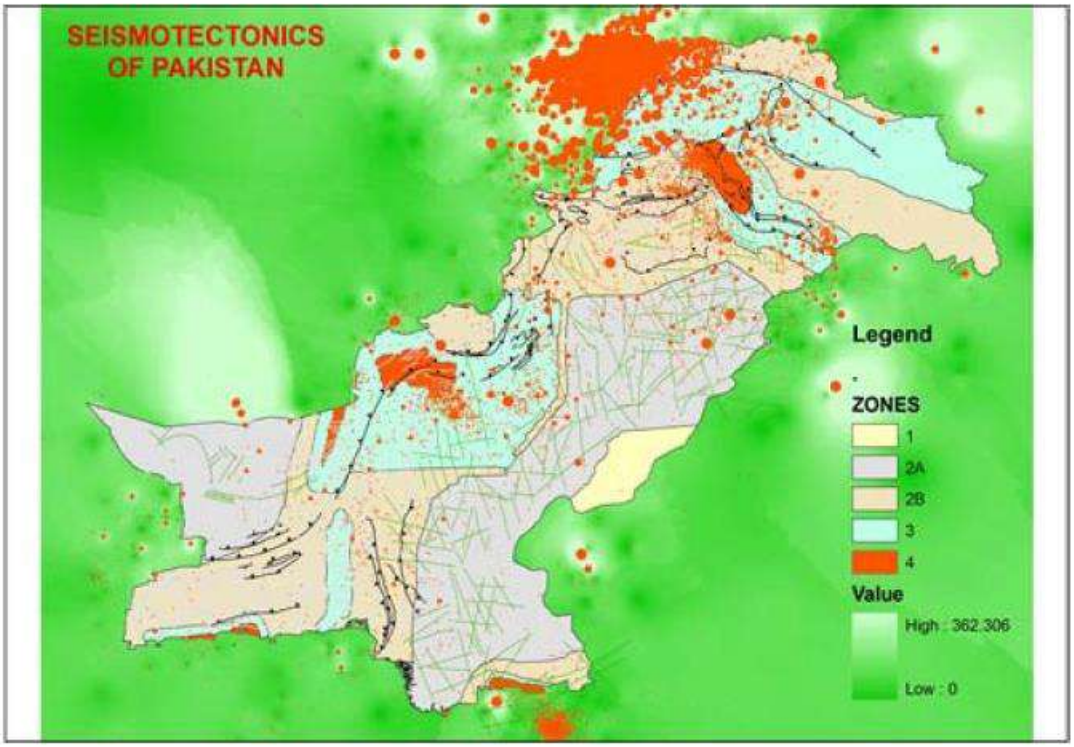


Figure 4-7: Seismic Zoning Map of Pakistan

4.3.8 Sensitive Receptors

531. The structures coming within the project area of influence (500m) are considered as sensitive receptors. Except four project sites, all the settlements having sensitive receptors i.e. schools, masjids etc. are located away from the area of Influence (500 m) of the proposed projects. Sensitive receptors and their respective sensitivity for the all-selected villages are listed in Table 4.6 for four dams as in other subproject sites sensitive receptors are not located within COI. Maps showing villages containing sensitive receptors and their distance have been provided as Figure 4-8.

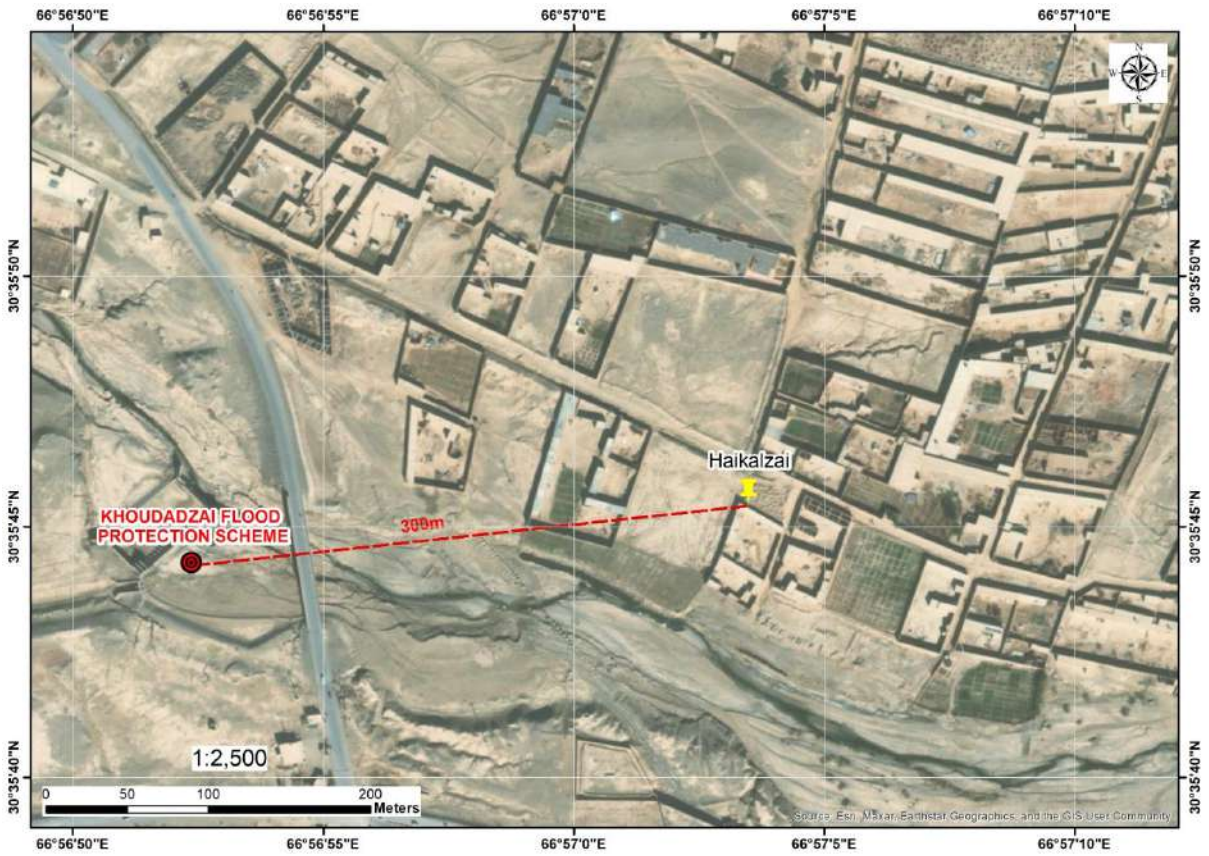
532. For the proposed project, the sensitive receptors include, but not limited to the educational, health, religious, cultural, archaeological, and ecological resources. These are the areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals and other pollutants through air and noise emissions due to construction and O&M activities within the defined COI.

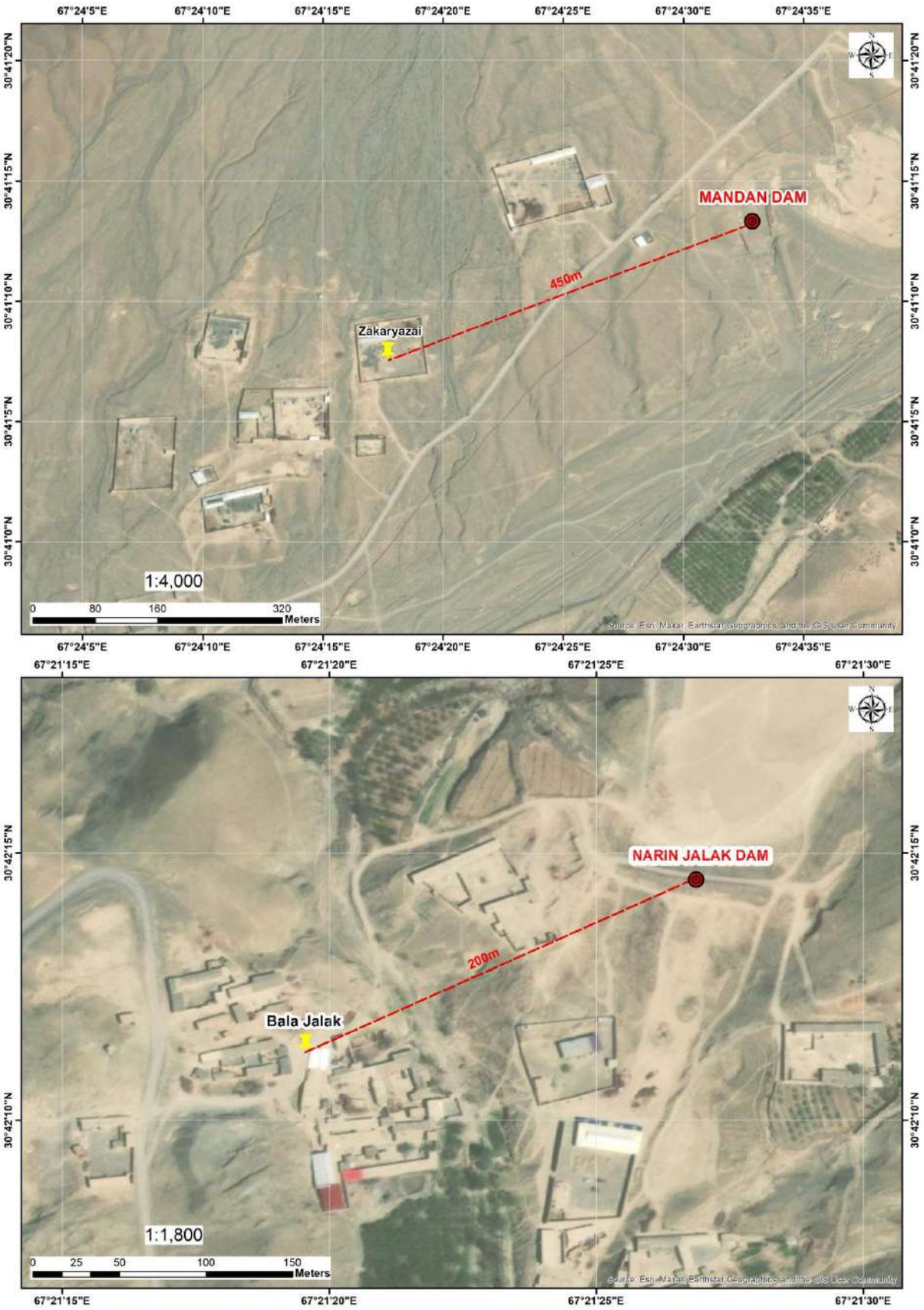
533. Major environmental sensitive receptors, including residential areas, religious places e.g. mosques, Madrasa etc. educational institutes were recognized by using Arc GIS tool and further verified through field visit for the proposed project. Figure 4-8 shows the locations of these environmental sensitive receptors indicated on the map. These identified sensitive receptors along with their distances from the site has been provided in the Table 4-2.

Table 4-2: Sensitive Receptors

Sr.No	Name of Scheme	Village containing sensitive receptors its & distance from subproject sites	Name of sensitive receptors
1	Rehabilitation of flood protection bund of Sarila Habibzai, Manzakai and Bagarzai	Kili Yasinzai (480 m)	1 boys primary school , 3 Madrasa
2	Rehabilitation of Khoudadzai flood protection scheme	Haikalzai (300m)	1 boys middle and 1 girls primary School,1 boys high school, Masjid
3	Rehabilitation of Mandan dam at district Pishin	Zakaryazai (450m)	Boys High School ,Girls Middle school, Masjid
4	Rehabilitation of Narin Jalak dam at district Pishin	Bala Jalak (200m)	Boys Middle School, Masjid

Figure 4-8: Sensitive receptor mapping




67°24'5"E
67°24'10"E
67°24'15"E
67°24'20"E
67°24'25"E
67°24'30"E
67°24'35"E
30°41'20"N
30°41'15"N
30°41'10"N
30°41'5"N
30°41'0"N
MANDAN DAM
450m
Zakaryazai
1:4,000
0 80 160 320
Meters
67°21'15"E
67°21'20"E
67°21'25"E
67°21'30"E
30°42'15"N
30°42'10"N
NARIN JALAK DAM
200m
Bala Jalak
1:1,800
0 25 50 100 150
Meters

4.3.9 Ambient Air Quality

534. The sub-project sites are located in the sparsely populated region of Pishin and are primarily rural with low population density. Although specific air quality monitoring data for this area is unavailable, the general observation indicates that the air quality in this rural setting is likely to be relatively clean. Notably, major sources of air pollution, such as industrial and commercial activities, are distant from the project site. The primary potential sources of air pollution in this area may include minor vehicular emissions on local roads, occasional dust from wind during dry weather and emissions from domestic sources like wood stoves in a few households. However, given the rural and remote nature of the project area, these sources are expected to have a limited impact on overall air quality. Conducting air quality monitoring by the Contractor(s) before starting construction activities is required to confirm these conditions.

4.3.10 Ambient Noise

535. The project areas situated in the sparsely populated rural region of Pishin typically experience low noise levels due to its remote and rural nature. While specific noise monitoring data for this area is not available, it is reasonable to assume that noise levels in this rural setting are generally low. Conducting noise quality monitoring by the Contractor(s) before starting construction activities is required to confirm these conditions.

4.3.11 Drinking Water Quality

536. Drinking water samples (surface water) were collected from Pishin by the Pakistan Council of Research in Water Resources (PCRWR) during 2017-2018. However, turbidity, sodium and sulfates were exceeding the permissible levels as per the WHO standards. Results have been provided in table 4-5 below.

Table 4-3: Water Quality of the project area

Water Parameters	Permissible limit	R
Color (TCU)	**Colorless**	Objectionable
Odor	Odorless	Unobjectionable
Taste	Tasteless	Unobjectionable
PH	6.5-8.6	8.15
Conductivity	NGVS	1900
Microbiological contamination	0/positive	Positive
Turbidity(NTU)	5 WHO	9.3
TDS(mg/i)	1000 WHO	1216
Bicarbonate(mg/l)	NGVS	140
Alkalinity(mg/i)	NGVS	2.8
Carbonate (mg(mi)	NGVS	0
Potassium (mg/l)	12(EC)	4
Sodium	200 (WHO)	240
Calcium	NGV	48
Magnesium (mg/l)	150 (WHO)	78

Hardness (mg/i)	500 (WHO)	440
Chloride (mg/l)	250 (WHO)	330
Sulfate (mg/l)	250 (WHO)	410
Nitrate-N(mg/l)	10 (WHO)	0.9
Fluoride	1.5 (WHO)	0.11

4.4 BIOLOGICAL ENVIRONMENT

4.4.1 Flora[7]

537. The major tree species found in district Pishin are Obusht (Juniperus excelsa polycarpos), Wild Ash (Fraxinus xanthoxyloides), and Shina (Pistacia khinjjak), which occupy favorable sites. The main shrubs include Janglee Badaam (Prunus spp), Sparae (Cotoneaster spp.), Tharkha (Artemisia maritime), Crataegus spp., Kala Zira (Carum bulbocastanum), Oman (Ephedra nebrodensis and Ephedra intermedia), Makhi (Caragana ambigua), Khakshir (Sisymbrium sophia), Zralg (Berberis lyceum), and Surae (Rosa spp.). The ground cover is mainly constituted by Stipa himalacia, Dichanthium annulatum, Chrysopogon aucheri, and Cymbopogon spp.

538. Out of the above-mentioned flora, Kala Zira (Carum bulbocastanum) is used as a spice and fetches a high value in the market. Additionally, Oman (Ephedra nebrodensis) and Khakshir (Sisymbrium sophia) are found in large quantities and have medicinal value. A significant amount of these herbs is marketed. Extracts of these plants are widely used by villagers for the treatment of cough and asthma. They believe there are no side effects of the drugs, and moreover, these herbs are easily available either for free or at a nominal price.

539. Vegetation zones of the district mainly consist of the following categories: -

Table 4-4: Vegetation Zones of Pishin District

Vegetation Zone	Brief Description
Uphill steep rocky cliffs	Like Tharghatu hills, at northern rim of Toba Kakari and Surghund where Juniperus Excelsa polycarpos is the predominantly climax Species associated with Pistacia khinjjak, Ephedra nebrodensis, Ephedra intermedia andFraxinus xanthoxyloides. It comprises mostly of the fertile deep soil plateaus like Toba Kakari and Kakar Khurasan range. It provides summer grazing land for both the local and nomadic graziers
Foot hills	It is dominated by a variety of shrubs like Artimesia meritima (Tharkha), Prunus ebernea (Wild Almond), Caragana ambigua (Makhi), Berberis lyceum (Zralg) and Sophora grifithii (Ghuzaira) associated with herbs and grasses. Mostly modified by the local community for agriculture and other land uses. It consists of more or less flat to undulating plains. The wasteland contains mostly
Piedmont plains	Artimesia meritima (Tharkha), Haloxylon grifithii with sporadic mixture of edible seasonal forage plants; thus supporting thousands of animals, both local and nomadic ones.

[7] Pishin District Development Profile 2011, by P&D, GoB with UNICEF. https://cms.ndma.gov.pk/storage/app/public/publications/January2021/TJz3JaWLH9Xt92GeB9nU.pdf.

Dry stream beds	Commonly found in the entire district where Tamarix Spp. is commonly seen.

Rangelands

540. The type of rangeland present in the district is classified as central Balochistan Ranges. It includes species such as Gung (Vitex agnus-castus), Ghureza (Sophora lopcuroides), Tharkha (Artemisia maritime), Zawal (Achillea santolina), Zoz (Alhagi camalorum), Spanda (Peganum harmala), Washta (Stipa pennata), Weezh (Pennisetum orientale), Sargarai (Cymbopogon jawarancusa), Margha (Pennisetum annulatum), and more. The productivity is adequate, with an average productive capacity of 160 kg per hectare. However, the rangelands have been degraded due to overgrazing and fuel wood collection, leaving only remnants of less palatable and poisonous plants like Ghuzera (Sophora grifithii). The degradation is exacerbated by traditional nomadic migrants.

541. Most of the rangelands in the district are owned by the communities living around them. Due to communal ownership, these lands are typically accessible to all members of the community and also to nomads passing through the area, with no limitations on the number, type, season, or duration of grazing. Unfortunately, no one assumes responsibility for undertaking activities aimed at restoring depleted areas or improving these rangelands. This has led to what could be termed as the "Tragedy of the Commons," resulting in overgrazing and uprooting of bushes/shrubs from rangelands beyond their carrying capacities. Consequently, most of the rangelands in the district are becoming degraded.

542. However, this is not a common practice throughout the entire district. In areas where livestock rearing is a significant source of livelihoods, rangelands are considered important resources, and there is a system in place for their management. This system primarily involves grazing management, where grazing on the rangelands is regulated through the traditional practice of declaring rangelands open or closed for grazing. Locally, this system is referred to as "Pargore" in Pashto, where rangelands are closed for grazing in one growing season, such as spring or monsoon, and then opened for herds in the next growing season. However, there are no restrictions on the number of grazing animals or the duration of grazing. Similarly, factors like range readiness and necessary facilities for grazing are not taken into account. It's worth noting that this system is practiced on a small scale near the borders of Killa Saifullah district.

Figure 4-9: Flora in the vicinity of Dams

Figure 4-10: Flora Near Settlements

4.4.2 Fauna[8]

543. In district Pishin, wildlife habitat type is dry steppe. There are no historical benchmarks to determine the status of wildlife in the area.

544. However, according to local community, the number of wildlife species has considerably declined; which could aptly be attributed to casual attitude for hunting and habitat degradation. Table 4.5 shows list of birds, mammals and reptiles observed during the site visit in the project area.

Table 4-5: Fauna of District Pishin

Sr. No.	Common Name	Scientific name	IUCN Category
Birds			
1	Chakur partridge	Alectoris chukar	Least Concern(LC)
2	See see partridge	Ammoperdix griseogularis	Least Concern(LC)
3	Kestrel	Falco tinnunculus	Least Concern(LC)
4	Magpie	Pica pica	Least Concern(LC)
5	Golden eagle	Aquila chrysaetos daphanea	Least Concern(LC)
6	Black Crowned Finch Lark	Eremopterix nigriceps	Least Concern(LC)
7	Black Kite	Milvus migrans	Least Conc ern(LC)
8	Blue Rock Pigeon	Columba livia	Least Concern(LC)
9	Cattle Egret	Bubulcus ibis	Least Concern(LC)
10	Common Myna/ Indian Myna	Acridotheres tristis	Least Concern(LC)
11	Desert Wheatear	Oenanthe deserti	Least Concern(LC)

[8] Ibid, p. 4-13.

Sr. No.	Common Name	Scientific name	IUCN Category
12	Hoopoe	Upupa epops	Least Concern(LC)
13	House Crow	Corvus splendens	Least Concern(LC)
14	House Sparrow	Passer domesticus	Least Concern(LC)
17	Hume"s Wheatear	Oenanthe alboniger	Least Concern(LC)
18	Pied Bushchat	Saxicola caprata	Least Concern(LC)
19	Purple Sunbird	Nectarinia asiatica	Least Concern(LC)
20	Red-vented Bulbul	Pycnonotus cafer	Least Concern(LC)
21	White-cheeked Bulbul	Pycnonotus leucogenys	Least Concern(LC)
22	White / Pied Wagtail	Motacilla alba	Least Concern(LC)
Mammals			
1.	Wolf	Canis lupus	Least Concern(LC)
2.	Hill fox	Vulpes vulpes grifithii	Least Concern(LC)
3.	Stripped Hyaena	Hyaena hyaena	Least Concern(LC)
4.	Cape hare	Lepus capensis	Least Concern(LC)
5.	Indian Crested Porcupine	Hystrix indica	Least Concern(LC)
6.	Afghan Hedgehog	Hemiechinus auratus megalotis	Least Concern(LC)
7.	Afghan Pica	Ochotona rufescens	Least Concern(LC)
8.	Stone Marten	Martes foina	Least Concern(LC)
9.	Asiatic Jackal	Canis aurius	Least Concern (LC)
10.	Five Stripped Palm Squirrel	Funambulus pennant	Least Concern(LC)
11.	House Mouse	Mus musculus	Least Concern(LC)
12.	Little Indian Field Mouse	Mus booduga	Least Concern(LC)
Reptiles			
1.	Afghan Tortoise	Agrionemys horsfieldii	Least Concern(LC)
2.	Afghan Agama	Trapelus megalonyx	Least Concern(LC)
3.	Indian Cobra	Naja naja	Least Concern(LC)
4.	Dwarf Dark-headed racer	Eirenis persica walteri	Least Concern(LC)
5.	Levantine viper	Macrovipera lebetina	Least Concern(LC)
6.	Brilliant Agama	Trapelus agilis	Least Concern(LC)

Sr. No.	Common Name	Scientific name	IUCN Category
7.	Indian Monitor	Varanus bengalensis	Least Concern(LC)
8.	Saw Scaled Viper	Echis carinatus	Least Concern(LC)

545. Aquatic ecology is non-existent, as there are seasonal hill torrents in the project area and no perennial stream or river, in addition dams of this project are in damaged condition since last year floods (2022).

546. There is no fisheries department in district Pishin. Some small fish are found in river/ streams. Commercial fishing is non-existent in the district. The catchment of the Pishin Lora and other streams have been over-exploited and not well managed. As a result, most of the precipitation drains out as runoff and many stretches of the river/streams remain dry in certain periods of the year negatively impacting the fish fauna[9].At Khanozai Dam, Fish species including Cyprinus carpio, Carassius auratus, Tor soro and Labeo boggut are present.

4.4.3 Protected and Historical Area:

547. There is no wildlife protected areas in the project areas of both districts, nor are any of the historical buildings protected.

4.4.4 Integrated Biodiversity Assessment Tool (IBAT)[10]

548. The project area was also screened for ecological sensitivities using the Integrated Biodiversity Assessment Tool (IBAT) with its outputs provided as **Annexure 2**. The tool was run for one buffer zone (5km). The findings of IBAT were correlated with the primary and secondary data collected as part of the detailed scoping activities conducted during preparation of this study. It was observed that IBAT correctly stated that no protected areas and/or key biodiversity areas are present within buffer zone of 5 km. Furthermore, IBAT identified that within a 50 km area of interest, there are possibly 18 species that are listed in the IUCN Red List, consisting of 6 reptiles and 12 fish species.

549. Based on actual observations during local surveys, or review of the relevant literature, **Annexure 2** Table presents the validated status of the threatened faunal species identified through IBAT. It is concluded from validation table (**Annex-2**) that there are no Threatened species at subproject sites.

4.5 SOCIO-ECONOMIC BASELINE STRUCTURE

4.5.1 Population Size, Growth and Distribution[11]

(i) Population Size and Growth

[9] Pishin District Government (2011). Pishin - Integrated District Development Vision. IUCN Pakistan, Quetta, Pakistan. xii+100 pp

[10] IBAT Multi-Site Report. Generated under licence 1400-48166 from the Integrated Biodiversity Assessment Tool on 30 August 2023 (GMT). www.ibat-alliance.org

[11] PBS. (2017). *Census - 2017*, Pakistan Bureau of Statistics, Government of Pakistan, Islamabad.

550. Pishin district was formed after the 1972 merger of the two tehsils, Chaman and Pishin. According to the 2017 census, the population of Pishin district is 736,903, a significant increase from 376,728 in 1998 and 208,007 in 1981. The district has experienced rapid population growth, with an average annual growth rate of 3.59 percent during the intercensal period from 1998 to 2017, compared to 3.57 percent during the intercensal period from 1981 to 1998.

Table 4-6: Population of different intercensal period

Description	1961	1972	1981	1998	2017
Population(thousand)	61,512	135,939	208,007	376,728	736,903
Average annual growth rate %	--	--	5.1	3.57	3.59

551. The total area of the district is 6,218 square kilometers. According to the census report of 2017, the population density of the district is 118.51 persons per square kilometer, whereas it was 47.0 persons per square kilometer according to the census report of 1998.

(ii) Household Size

552. According to census report 2017, the average household size for the district is 5.81 persons.

(iii) Rural/ Urban Distribution

553. The rural population of the district is 594,107, comprising 80.62 percent of the total population. The average annual growth rate of the rural population is 2.76 percent. In contrast, the urban population of the district is 142,796, accounting for 19.38 percent of the total population. According to the census report of 2017, the urban population has experienced an average annual growth rate of 10.08 percent.

(iv) Sex Ratio

554. Sex ratio, an important demographic indicator defined as the 'number of males per hundred females,' is a key consideration. According to the 2017 census report, the district has a sex ratio of 106.85. Notably, the sex ratio in rural and urban areas of the district is 107.52 and 104.08, respectively, indicating a higher proportion of males in urban areas compared to rural areas.

(v) Religion

555. The district's population is predominantly Muslim, making up 99.87 percent of the total population. This includes 99.92 percent in rural areas and 99.63 percent in urban areas. Additionally, there are small communities of Christians, Hindus, scheduled castes, and others, accounting for 0.13 percent of the total population.

Table 4-7: Religion of the district.

Religion	All Areas	Rural	Urban
Muslim	99.87	99.92	99.63
Christian	0.081	0.02	0.35
Hindu	0.001	0.0008	0.002
Scheduled Caste	0.001	0.001	0.002
Others	0.0001	0.0001	--

(vi) Cast and Tribes

556. The main tribes in the district are the Kakars, Tareens (including Achakzai) and Syeds. The Kakar tribe constitutes the majority of the population and resides in prominent villages such as Sanzerkhail, Bayanzai, Mehtherzai, Bazai, Ahmadkhail, Panizai, Sargari, and Gharsheen. The Syed community is prevalent in villages like Gangalzai Syed, Sulamanzai Syed, Huramzai Syed, Kakazai Syed, Shakarzai Syed, and Yaseenzai Syed. The Tareen tribe, including the Achakzai, resides in areas like Haroonzai, Alizai, and Abubakar Tareen.

(vii) Mother Tongue

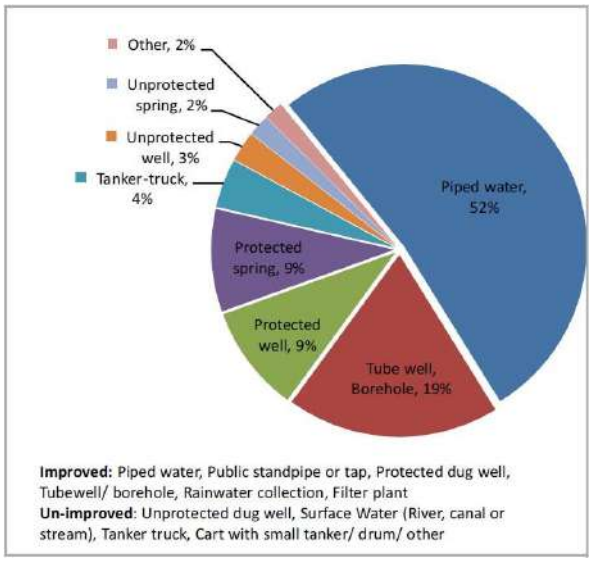
557. Pushto is the primary language spoken in the district. Historically, Persian was used for record-keeping and correspondence, and tombstones were inscribed in Persian until the late 19th century. The Tareen tribe in Pishin speaks a language similar to that spoken in Quetta, Gulistan, and Dukki, which is also akin to the language used in Kandahar. Those who have settled outside Pishin may speak local languages, such as Multani or Saraiki in Multan, Hindko in Hazara, Urdu in Bhopal, and Sindhi in Sindh. Additionally, Harnai Tareens speak Tareeno, a dialect of Pashto.

(viii) Source of Drinking Water[12]

558. According to a recent household survey conducted in 2010, approximately 90% of the population in the district has access to one or more improved water sources. Piped water accounts for the majority (52%), followed by tube wells or boreholes (19%) and protected dug wells (9%). Other minor improved sources include protected springs (9%) and filter plants (0.3%). Major unimproved sources include tanker trucks (4%), unprotected dug wells (3%), and approximately 2% rely on unimproved water sources.

559. About 27% of households do not have water on their premises, requiring them to travel to obtain water. Typically, this task falls on the responsibility of women or children within the household. It's important to note that the data provided here reflects the type of water source used but does not address water quality or quantity, which are significant concerns. Drinking water from improved sources can still be vulnerable to contamination through pipe leakages and the presence of underground arsenic. Therefore, there is a pressing need to conduct water quality testing for bacteriological and chemical contamination in drinking water sources.

[12] Pishin District Development Profile 2011, by P&D, GoB with UNICEF. https://cms.ndma.gov.pk/storage/app/public/publications/January2021/TJz3JaWLH9Xt92GeB9nU.pdf



(Multiple Indicators Cluster Survey, 2010)

(ix) Migration

560. Migration data encompasses the movement of the population from one district to another within the same province and from one province to another. It does not include individuals who have changed their place of residence within the same district.

4.5.2 Administrative Set up[13]

(i) Executive, Judiciary and Revenue System

561. On the executive side, the district is led by a Deputy Commissioner, supported by the Additional Deputy Commissioner and two Sub-Divisional Officers responsible for the city and Saddar sub-divisions. At the tehsil level in Pishin, there is a fully staffed tehsil headed by a Tehsildar, aided by a Naib Tehsildar and standard subordinate revenue personnel. In earlier times, only a Kanungo oversaw the revenue work and was assisted by patwari and Levies staff.

562. Additionally, there are extra Assistant Commissioners in Pishin who serve as first-class Magistrates. As part of the long-standing practice of separating the executive and judiciary functions, Judicial magistrates have also been appointed in Pishin.

(ii) Health[14]

563. The major provider of curative and preventive healthcare services to the local population is the highly subsidized public healthcare system. The healthcare infrastructure in the district comprises 1 hospital, 7 Rural Health Centers (RHCs), 33 Basic Health Units (BHUs), 14 Civil Dispensaries (CDs), 4 Maternal and Child Health Centers (MCHCs), 1 School Health Unit, 1 TB Clinic, and 4 Health Auxiliary Units. Among these facilities, there are a total of 120 beds, with 70 of them situated in RHCs. Additionally, there is one mobile dispensary that operates in the district to reach remote areas.

[13] Ibid, p. 4-19.

[14] Ibid, p. 4-19.

564. In addition to the mentioned healthcare facilities, three BHUs are currently under construction. Furthermore, the district has two private hospitals, each with five beds. It's important to note that the public-sector healthcare system faces challenges related to governance, funding, staffing, and resource limitations. Several health facilities lack essential staff and are significantly underutilized.

(iii) Education[15]

565. The state of education in district Pishin is not significantly different from the education situation in other districts in Baluchistan. Access and quality indicators in the district are weak, and it faces various challenges, often exacerbated by poverty and cultural constraints.

566. The education sector in the district comprises both public and private schools, each varying in quality. The public sector operates a total of 921 schools, including primary, middle, high, and high secondary schools. Of these, 89% are located in rural areas, with only 11% situated in urban areas. The rural-urban distribution of public sector schools based on the level of education and gender is detailed in the table.

Table 4-8: Public Sector Schools

	Urban			Rural			Total		
	Boys	**Girls**	**Total**	**Boys**	**Girls**	**Total**	**Boys**	**Girls**	**Total**
Primary	48	29	77	537	154	691	585	183	**768**
Middle	5	3	8	48	49	97	53	52	**105**
High	9	4	13	27	7	34	36	11	**47**
H/Sec	0	1	1	0	0	2	0	1	**1**
Total	**62**	**37**	**99**	**612**	**210**	**674**	**674**	**247**	**921**

4.5.3 Industry and Trade[16]

(i) Industry

567. In Baluchistan, industrial development gained momentum after 1970 when the Provincial Government showed a keen interest in establishing industrial estates. This development was driven by the availability of raw materials such as minerals, agricultural crops, fruits, vegetables, and fish. Industrial development plays a vital role in the economic prosperity of an area. Although district Pishin is currently underdeveloped, it holds significant potential for growth.

568. The district boasts agricultural richness, with a focus on dairy and poultry farming. Handicrafts are also a prominent feature of the local economy. However, a notable obstacle to development in the area is a sense of apathy among the population regarding their current

[15] Pishin District Education Plan (2016-2017 to 2021-2022) Baluchistan Education Sector Plan (BESP). http://www.emis.gob.pk/Uploads/PISHIN%20DISTRICT%20EDUCATION%20PLAN%20FOR%202016-2017%20TO%202020-2021.pdf

[16] Ibid, p. 4-19.

situation. With proper infrastructure facilities and financial support, the district has the potential to make substantial contributions to the country's economy."

569. In Pishin, the large manufacturing unit includes the district's only operational flour mill. Additionally, there are numerous small enterprises engaged in various activities such as tobacco production, R.C.C, ice production, dairy farming, and poultry farming. These small enterprises provide employment to a significant number of workers, with dairy and poultry farming being particularly prevalent in the area.

(ii) Trade

570. The major sources of income in the district include agriculture, trade, and commerce. Flock owning is also a significant source of income for the local population. Notably, a substantial number of individuals from Pishin are engaged in business and transportation activities, both within Pakistan and in other countries. The prosperity of Quetta in trade, commerce, and transport owes much to the investments made by the residents of Pishin.

571. However, as Pishin is located adjacent to Afghanistan, smuggling activities are prevalent. Items such as wheat, sugar, and edible oil are often smuggled into Afghanistan, while spices, dry fruits, skin, wool, and various merchandise of foreign origin are smuggled into Pishin. This trend has, in some cases, diverted focus away from industrial development within the district.

(iii) Communication

Roads and Highways

572. The total road length in Pishin is 1,253 kilometers, with 605 kilometers consisting of blacktopped or metalled roads. The district has an extensive network of inter-district and intra-district roads. A closer look at the data in the table reveals that the length of metalled roads has increased over time, while the length of shingle roads has remained relatively stagnant. This observation suggests that investments in the district are primarily directed towards the development of blacktopped roads to establish sustainable transportation means.

573. While specific data on the number of beneficiaries is not available, it can be inferred that a substantial portion of the district is covered by shingle or metalled roads, providing access to a significant portion of the local population.

574. The district boasts 605 kilometers of metalled roads and 648 kilometers of shingle roads, including important linking roads.

i. Pishin - Yaru - Quetta road
ii. Pishin - Saranan - Chaman road
iii. Pishin - Surkhab - Khanozai road
iv. Pishin - Barshore road
v. Dub-Khano-zai - Killa Abullah road

Length by Surface Type	Black Topped	Shingle	Total Length
2002	321	567	888
2010	605	648	1253

Railway, Harbor and Airports

575. The total length of the railway track in the district spans 42 kilometers, with three railway stations located at Bostan, Yaro, and Saranan. The train service to Chaman operates on alternate days, departing from Quetta to Chaman every morning and returning on the same day at night.

576. Notably, there is no airport in district Pishin. However, there is a concrete runway, previously used during the British era. There is potential for converting this runway into a small airport.

Radio and Television Station

577. Radio holds significant popularity in villages and remote areas, serving as an affordable source of recreation. Additionally, radio is utilized to deliver educational programs, with many of these programs produced by different stations in Quetta and primarily presented in local languages. While there is no available data on the number of television sets in the district, the influence of radio in the region is notable.

Telecommunication and IT Services

578. The Pakistan Telecommunication Corporation (PTC) has set up a network of telephones in the district. However, the data presented in the table below indicates a gradual decline in the number of telephone exchanges and telephone lines in the district. Interestingly, there are more privately owned public call offices (PCOs) than government-operated PCOs, with a total of 11 private PCOs. The district is home to 4,300 household and commercial telephones, and a significant portion of the local population directly or indirectly benefits from these telecommunication services.

Category	2005	2008
Telephone lines / Connections	7068	4300
Exchange and Tele Density	26	16
Mobile Phone	N/A	-
Internet Users	-	-

4.5.4 Socio Economic Environment[17]

(i) Agriculture

579. Pishin district experiences two cropping seasons: kharif and rabbi. Kharif crops are sown in summer and harvested in late summer or early winter, while rabbi crops are sown in winter or early winter and harvested accordingly. Important rabbi crops include wheat, barley, cumin, vegetables, and fodder, among others. During the kharif season, the district cultivates crops such as fruits, melons, vegetables, tobacco, potatoes, onions and fodder.

[17] Ibid, p. 4-19.

(ii) Irrigation

580. Three primary sources of irrigation, including tube wells, Karez/springs, and dug wells, are commonly used in the district. Privately owned tube wells are maintained by their respective owners, while government-owned tube wells are maintained by the BID.

581. Notably, there is no canal irrigation system in district Pishin. The majority of crop cultivation, covering an area of 25,346 hectares, relies on tube wells, accounting for 95.7% of the total irrigation sources. Karez/springs contribute to 2.5% of the irrigated area (667 hectares), and a smaller number of wells cover 1.8% of the area (465 hectares). The government has installed a total of 188 tube wells, representing 4.3% of the government-installed wells compared to the privately installed 4,178 tube wells, which make up the remaining 95.7%. Given this, it is recommended that the government consider increasing the installation of tube wells, particularly in areas where Culturable Waste Lands have remained uncultivated for years. This could potentially help exploit additional water resources.

(iii) Forestry

582. The district has a limited forest cover, with only a negligible area designated as state Forest or wildlife Protected Area. However, the natural vegetation, primarily rangelands, plays a significant role in maintaining ecological stability in important ecosystems throughout the district.

583. In Pishin district, forests can be categorized into two main groups: natural and artificial. These encompass conifers, such as Junipers, rangelands, artificial plantations, and various other tree types. There are seven Notified natural forests in the district, including Targhatu, Gawal, Surghund, Surkhab, Sarwat, Umai, and North Takatu, covering a total area of 25,866 hectares. Additionally, a 30-kilometer avenue plantation exists in the district.

(iv) Livestock[18]

584. Livestock plays a vital role in the livelihood of a significant portion of the rural population in the district. It not only serves as an income source through the sale of animals, wool, and hides but also provides essential nutrition in the form of milk, yogurt, lassi, kurt, and meat. Additionally, some livestock is crucial for transportation, especially in areas where road-based transport is unavailable or where the terrain is hilly and rugged. Many people in the district are involved in livestock grazing activities. Traditional nomadic herders, along with their herds, regularly visit Pishin district when the weather in Afghanistan becomes unfavourable.

585. In terms of cattle, 22,865 households reported a total of 91,433 animals. This included 7,018 male cattle aged three and above, with 3,858 used for breeding purposes, and 17,914 male cattle below three years of age. There were also 53,654 female cattle, out of which 47,427 were in milk, 3,577 were dry, and 2,650 had not yet calved. Additionally, there were 12,848 female cattle below three years of age. Among these households, 7,196 (32.33% of the total) opted for artificial insemination for their cows and buffaloes, while 3,228 (14.5%)

[18] Pishin : Integrated District Development Vision (2011). IUCN. https://portals.iucn.org/library/sites/library/files/documents/2011-108.pdf

preferred not to use artificial insemination. Furthermore, 2,103 (9.45%) households reported that the Artificial Insemination Centre was located at a distance that was beyond their reach.

(v) Archaeological or historical places

586. There are no archaeological or historical sites located within the area or vicinity of any of the sub-projects.

(vi) Vulnerable Groups

587. Field assessments have confirmed that there are no vulnerable groups present within the dam's Right of Way (RoW) and its vicinity.

4.5.5 The Role of Women[19]

588. The situation of Pashtun women in the district is challenging. Many women are married at a very young age and bear the primary responsibility for household chores, including cleaning, childcare, laundry, and livestock care. They often lack social status and may not have rights to property or other assets. Women in the Pashtun community face religious and cultural restrictions, and there is a strong emphasis on early marriage within the community.

4.5.6 Status of Women

589. In Pishin District, women have a negligible role in the decision-making process. However, their opinions are taken into account in matters related to marriage. They are authorized to make decisions regarding domestic activities, such as cooking and house maintenance. The majority of the population in Pishin is Muslim, yet many do not allow women to inherit, despite Islamic inheritance laws permitting this.

590. At the household level, women are primarily involved in activities like cooking, washing, house management, and childcare. Their role in community and economic activities is marginal. Women in district Pishin do not participate in politics, with only a very small number casting their votes with permission and under the instruction of their husbands.

591. In Khanozai town, a rural area, there has been some improvement in the role of women, largely due to a higher literacy rate. The social welfare department has organized training for certain women's organizations in income-generating activities.

[19] Development Profile of Pishin District (2015). Pakistan Poverty Alleviation Fund. https://www.ppaf.org.pk/doc/programmes/Situational%20Analysis%20Report%20of%20PPR%20-%20District%20Profile%20Pishin.pdf

5. ANALYSIS OF ALTERNATIVES

5.1 GENERAL OUTLINE AND SCOPE .

592. The discussion and analysis of alternatives in IEE should consider other pragmatic strategies that will promote the elimination of negative environmental and social impacts identified. This section is a requirement of the BEPA and ADB and is critical in consideration of the ideal development with minimal environmental and social disturbance. It is very imperative to assess different alternatives to reach at the finest possible option. Different alternatives were considered at the design stage of the proposed project, and at the time of performing the IEE study.

5.2 Categorical Analysis of Alternatives

593. Categorical analysis of alternatives is an integral part of the IEE process to select the best preferable option among all the possible project options as follows, and by comparing the potential positive and negative impacts for each alternative in terms of environmental, social and economic aspects as shown in Table 5-1. For the proposed project, the following project alternatives were analysed:

A. Alternative-I: Zero Alternative/Without Project

B. Alternative-II: With Project

594. Comparing the "No project" option entails evaluating the potential benefits and drawbacks of each option.

5.2.1 Alternative-I: Zero Alternative/Without Project

595. If the project is not taken up at all then all the funds, efforts and inconvenience will be saved and these will become available for diversion to other projects. No disturbance will be caused to any physical, biological and social part of the environment.

596. This alternative will increase following problems:

- ***Water Level and Aquifer Depletion****:*

597. Without any intervention, the severe threat of flooding during heavy rains can exacerbate water level fluctuations and aquifer depletion in the project area. Flash floods from high-rise hills might lead to rapid runoff and limited seepage into the ground, affecting groundwater recharge and availability.

- ***Insufficient Seepage and Flooding:***

598. The lack of effective flood protection measures and damaged water conservation structures may result in insufficient seepage into the ground during heavy rains, leading to potential water scarcity and increased flooding.

- ***Damages and Risk Reduction:***

599. Without addressing the damages and vulnerabilities of existing structures, the project area remains at high risk of devastating floods and damages during extreme weather events.

- ***Cost and Time Considerations:***

600. In the short term, the "No project" option may seem cost-effective as it avoids immediate financial investments. However, the long-term costs associated with damages, recovery, and potential water-related issues could be substantial.

5.2.2 Alternative-II: With Project *(Restoration & rehabilitation of flood protection structures and water conservation structures in district Pishin)*

- ***Water level and aquifer depletion:***

601. The restoration & rehabilitation project aims to address flooding issues, which can indirectly contribute to better water level and aquifer management. By restoring the infrastructure, there is a higher likelihood of reducing excessive water runoff and enhancing groundwater recharge.

- ***Insufficient seepage and flooding:***

602. The execution of the project intends to mitigate flooding by restoring damaged structures. This can promote better seepage into the ground, supporting groundwater replenishment and reducing the risk of flooding during heavy rainfall.

- ***Damages and risk reduction:***

603. The project seeks to reduce risks by repairing and improving affected structures and water conservation structures. This can enhance the area's resilience to floods and reduce damages to infrastructure and properties during high-velocity flash floods.

- ***Cost and Time Considerations:***

604. Implementing the project incurs initial costs for repair and improvement. While there is an upfront investment, it aims to provide long-term benefits by mitigating flood damages, ensuring water availability, and enhancing overall project sustainability.

605. In conclusion, opting for the "No project" option leaves district Pishin vulnerable to severe flooding, water scarcity, and significant damages. On the other hand, executing the project can mitigate flood risks, improve water management and contribute to the overall social, environmental and economic well-being of the project area. Although the project requires upfront investments, it aims to provide long-term benefits and address the critical challenges faced by district Pishin.

606. The Table 5.1 provides brief comparison of both alternatives with respect to environment and social viewpoint.

Table 5-1: Comparison of Alternatives

Options	Technical Comparison	Environmental Comparison	Social Comparison	Cost Comparison
No Project Option	Under the "No project" option, there are no specific technical interventions or improvements planned or	Without any project intervention, the environmental consequences are likely to remain unaddressed.	The "No project" option can have negative social implications. Severe flooding affects various aspects of	In the short term, the "No project" option may seem cost-effective as it does not involve any immediate financial

Options	Technical Comparison	Environmental Comparison	Social Comparison	Cost Comparison
	implemented. This means that the existing technical challenges related to flood protection, water management, and infrastructure damage will persist without any targeted solutions.	Severe flooding can lead to downstream ecological imbalances, soil erosion, and disruption of natural habitats, impacting vegetation, wildlife, and ecosystems that depend on the area's water resources.	people's lives, including displacement, loss of livelihoods, damage to infrastructure, and disruption of social activities in downstream.	expenditure. However, the long-term costs associated with flood damages, emergency response efforts, and potential disruptions to livelihoods can be substantial.
Project Option	The Restoration & Rehabilitation project involves technical interventions such as the repair and improvement of Flood Protection structures and Water Conservation Structures. These measures aim to enhance flood protection, water management, and overall infrastructure resilience, addressing the existing technical challenges in the region.	The Restoration & Rehabilitation project aims to mitigate environmental impacts by promoting sustainable water usage through improved water management practices. It can help prevent soil erosion, promote groundwater recharge, and minimize the downstream ecological damage caused by floods. The project may also consider incorporating environmentally friendly design and construction practice.	The execution of the project offers potential social benefits. By addressing flood protection and water management, it can improve community safety (especially in downstream side), provide a stable water supply for households and agriculture, and support local industries. The project can also contribute to overall community well-being by reducing the impacts of floods and enhancing resilience to natural disasters.	Implementing the Restoration & Rehabilitation project incurs upfront costs for planning, execution, and monitoring. These costs include materials, labor, and engineering expertise. However, the investment aims to provide long-term benefits by addressing the underlying issues, reducing future damages, and promoting sustainable water management practices.
RESTORATION/REHABILITATION OF DAMS OPTIONS VERSUS CONSTRUCTION OF NEW DAMS				

Options	Technical Comparison	Environmental Comparison	Social Comparison	Cost Comparison
Restoration/ Rehabilitation of Dams	1. Utilizes existing infrastructure, which can capitalize on established site features and configurations. 2. Requires thorough inspection, assessment, and engineering expertise to determine the extent of damage and necessary repairs. 3. Rehabilitation may involve structural strengthening, sediment removal, and repairs to ensure the dam's safety and functionality. 4. Benefits from existing topographical and geological data.	1. Preserves the existing ecosystem and landscape. 2. Avoids the environmental impacts associated with new construction activities. 3. Requires careful sediment management during rehabilitation to prevent downstream contamination.	1. May be more readily accepted by local communities due to as land acquisition and resettlement are not involved.	1. Initial costs might be lower compared to constructing a new dam. Costs depend on the extent of damage and required repairs. 2. Could have lower long-term operational and maintenance costs if the existing structure is well-preserved.

Options	Technical Comparison	Environmental Comparison	Social Comparison	Cost Comparison
New Dams Construction	1. Involves planning and designing a new structure from scratch, including site selection, geological investigations, and engineering design. 2. Requires permits, approvals, and compliance with current engineering standards and regulations. 3. Can incorporate the latest technologies and design features for improved safety and efficiency. Might require more time for planning, design, and construction.	1. May lead to habitat disruption, deforestation, and alteration of waterways. 2. Can impact local ecosystems and biodiversity. 3. Might result in increased waterlogging, changes in water temperature, and alteration of natural flow patterns.	Could require land acquisition and relocation of communities. May face resistance from communities concerned about losing their homes or traditional lands.	1. Initial costs could be higher due to design, construction, and land acquisition expenses. 2. Long-term operational and maintenance costs need to be considered.

5.3 Recommended Option

607. Based on a comprehensive analysis of alternatives between the proposed activity of restoration/rehabilitation of existing dams and the construction of new dams, the recommended option is the restoration/rehabilitation approach. This option demonstrates favorable technical, environmental, and social outcomes, while also proving to be cost-effective. It capitalizes on existing infrastructure, minimizing environmental disruption, and addressing the region's water resource needs while maintaining ecological balance and community well-being.

6. PUBLIC CONSULTATION AND DISCLOSURE

6.1 GENERAL

608. This section describes the outcome of the public consultation sessions held with different stakeholders that may be affected (positive/negative) by the proposed project activities. Public consultation is a mandatory part of the IEE/EIA process for development projects. The adequacy of the public consultation and information disclosure is one of the basic criteria used to determine the project compliance with the national laws.

609. The consultation process was carried out in accordance with the requirements of Pakistan environmental procedures. The objectives of this process were to:

- Informing the public about what is proposed project.
- Identify and involve all stakeholders, especially local residents, in the consultative and participation process;
- Share information with stakeholders on the design and construction of the proposed project and anticipated impacts (positive / negative) on the physical, biological and socio-economic environment of the project area;
- Understand stakeholders' concerns regarding various aspects of the project, including the existing available facilities and problems, construction of the project and the likely impacts of construction and operation related activities;
- Understand the perceptions, assessment of social impacts and concerns of the communities in the vicinity of the proposed project;
- Provide an opportunity to the public in the public consultation session to provide valuable suggestions for the project design in a positive manner; and
- Reduce the chances of conflict through the early identification of controversial issues and consult them to find acceptable solutions.

6.2 Consultation and Participation Process

610. For ascertaining the perceptions of different stakeholders about the project (during construction/operation), consultation meetings were held with them. Site visits for dams were conducted on 14th to 20th July, 2023. Consultation meetings were carried out during the site visit with local communities of Killi Pani Shakh, Killi Habibzai, Bagarzai, Killi Poti Mangalzai, Mehrab Kech, Killi Malkyar, Killi Halakzai, Killi Khanai Baba,Killi Murgha Zakaryarzai, Killi Jalak, Killi khanozai. Attendance sheets have been provided as **Annexure 3**. Consultation is a continuous process and would be carried throughout all stages of the project implementation.

6.3 METHODS OF PUBLIC CONSULTATION

611. Public consultations were carried out in order to establish stakeholder's opinion regarding project implementation. The following methods were used for public consultation with project stakeholders:

- Scoping sessions
- Informal meetings
- Individual interviews

6.4 IDENTIFICATION OF STAKEHOLDERS

612. Stakeholders are those who have a direct or indirect interest in project development, and who will be involved in the consultation process. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field survey were the local residents, private land owners, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labor and students. All the stakeholders had different type of stakes according to their professions which are listed down along with their apprehensions. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders.

6.5 MAJOR STAKEHOLDERS AND THEIR APPREHENSIONS

613. Among all stakeholders some major stakeholders were identified in the proposed project area. The Table-6.1 below contains the list of major stakeholders.

Table 6-1 Stakeholders contacted in the project area

Sr. No.	Stakeholder Category	Number of Respondents
1	Teacher	5
2	Job (Govt / Pvt)	6
3	Shop keepers	4
4	Farmers	9
5	Religious leader (Molvi/ Madrasa)	3
6	Business man	3

614. No major apprehensions were raised by the local residents during these consultation meetings. Participants showed their full support for project implementation. No private land acquisition is involved in the sub project. Figure: 6-1 shows the pictorial view of interviews and consultation meetings held with the stakeholders. Attendance sheets of public consultations are attached as **Annexure-3**.

6.6 CONSULTATION MEETINGS AND FORMAL AND INFORMAL GROUP DISCUSSIONS

615. In order to get spontaneous responses, scoping sessions in the proposed project area were held to extract qualitative information about the perception and apprehensions about the project. The views of the locals were formally recorded and effort will be made to make those beneficial for the project.

616. Consultation meetings regarding project impacts, their magnitude and mitigation measures were held with the local residents, private land, shop keepers, farmers, job holders (Govt / pvt), drivers, daily wage labor and students to know their concerns regarding proposed project in Pishin.

617. Generally, it was found that people were already aware of the proposed project. After the meetings, most of the respondents including all local residents and other stakeholders showed their full support for the proposed project. This project will be beneficial in terms of

water resource management and agricultural development, not only for the local residents but also good for the development of the area.

618. Main concerns and response have been provided in the Table 6.2 below.

Table 6-2: Community concerns and responses

Sr. No	Concerns Raised	Response
1	The rural women actively participate in outdoor socioeconomic activities such as herding livestock, agricultural activities, picking fuel wood etc. Their privacy should not suffer due to the project activities.	Local norms and customs will be respected.
2	Safety of general public residing very near to sites where excavation is to be carried will particularly be at stake. The local people, particularly the children and women, may get injuries or even fatalities.	The construction contractor will ensure proper management and utilization of the machinery to minimize the hazards during construction. Safety equipment will be provided to the labors for accident prevention. To enhance safety of local people the contractor will display warning signs along the work site and enforce the maximum speed limit of 20km/h for vehicles near settlements.
3	Whether jobs will be provided to the locals?	Unskilled labor will be hired from the project area.
4	Project activities may produce dust or gaseous emissions and noise/vibration during construction phase.	Proper mitigation measures will be taken by contractor including. regular sprinkling of water at the exposed areas (excavation sites, service roads and dirt tracks etc.) should be carried out many times a day rendering the impact minimal. Hauling trucks containing construction materials shall be covered with tarpaulin in order to minimize dust generation. To enhance safety of local people the contractor will display warning signs along the work site and Enforce the maximum speed limit of 20km/h for vehicles near settlements. Construction activities that are close to settlements will be stopped during night times if high noise values are observed.
5	It is anticipated that a large quantity of excavated material will need to be disposed off. If this waste material is not properly disposed of, it will contaminate the soil and water resources, especially during the rainy season.	Most of the excavated material will be reused after approval of quality control engineer. The rest will be dumped safely and leveled to avoid any harm to aesthetic sense. Contractor will prepare waste management plan and will ensure Proper waste management at construction sites and labor camps accordingly.
6	Contractor should establish construction camps on waste land and should not disturb productive agriculture land. The participants	Although it is the responsibility of the contractor, however, IEE would recommend it.

Sr. No	Concerns Raised	Response
	requested that labour should be hired from villages of the project area.	
7	Which type of the channels have been proposed?	Lined channels have been proposed. It will reduce seepage, losses of irrigation water and make irrigation system more efficient.
8	When the project construction will start?	Project construction will start soon after finalizing the detailed design
9	Has the project approved?	Yes, it has been approved
10	Would the local peoples be benefitted from the Project?	Yes.
11	How and which type of benefits?	i) During project construction, people can have rented out their machinery to the Contractor. ii) People can get job on the project like driver, cook, labour, guard, and helper, clerical or technical job as required. iii) Project will benefit local people also through increased agriculture productivity and avoidance of flood damages as a result of project implementation
12	We agree with the project interventions and will support their implementation	Thanks. Your support will certainly play a major role in the successful completion of the project."
13	There will be increase in respiratory diseases due to heavy dust during construction.	Contractor will sprinkle water to suppress dust Hauling trucks containing construction materials shall be covered with tarpaulin
14	Is protection wall also include in the project to protect the orchards and cultivation land?	Irrigation department may develop proposal regarding the construction of protection wall near cultivation lands.
15	Is road construction and maintenance also including in your project?	No. this is only related to rehabilitation of flood affected dams. Suggestions can be made to concerned department.
16	Will the irrigation department construct the new checks dams to store water and control the flood?	Current project is about restoration and rehabilitation of damaged check dams.
17	Will rehabilitation project provide enough water to our crops?	Main objective of this project is to restore and rehabilitate delay actions dams and certainly it will help to ensure sufficient water supply for agriculture purposes.

Figure 6-1: Pictorial View of Interviews & Public Consultation

Consultation at Pani shakh Dam, district Pishin

Consultation at Sarila Habibzai, Manzakai and Bagarzai, district Pishin

Poti Mangalzai, Mama Nikha and Mehrab Kech in Barshor, district Pishin

Consultation at Bund Khosdil Khan, district Pishin

Consultation at khoudadzai, district Pishin

Consultation at Bund Khanai Baba, district Pishin

Consultation at Narin Jalak Dam, district Pishin

Consultation at Mandan Dam, district Pishin

Consultation at Khanozai dam district Pishin

6.7 Departmental Consultation

619. In addition to public consultations, stakeholder meetings were held with the officials of government departments in district Pishin on 6-7 July 2023, the main stakeholders as far as social and environmental impact assessment of the project is concerned. The objective of the meetings was to seek their views and comments on the proposed project. IBAT results were shard with relevant department and their concerns have been addressed. The discussions and their responses are given in the Table 6.3 below.

Table 6-3: Stakeholder Consultation/Meetings

Concerned Departments/Persons	Key Concerns/Discussion	Response/Actions
Irrigation Department, Pishin Mr. Nadeem, Project Director, Irrigation Department, Quetta	Given the heavy rains and resultant flooding in the project area, the primary purpose of the dams/bunds is to effectively control and manage the inflow of water from hill torrents.	Certainly. This restoration project will protect the local population from flooding, enhance dam life, and promote groundwater recharge.
Mr. Najeeb, SDO, Irrigation Department, Pishin (Dtae 6 July 2023)	This restoration and rehabilitation project will serve as a critical safeguard, protecting the local population from the devastating impacts of flood havoc.	
	This project is aimed at significantly contributing to groundwater recharge while simultaneously extending the life and effectiveness of the dam infrastructure.	
Forest & Wildlife Department, District Pishin Mr. Ajmal Kakar, District Forest officer, Pishin (Date 7 July 2023)	Orchids of apples, grapes, apricots etc., are commonly grown in the project area.	The project will enhance the production of orchards in the project area, through sustained water availability.
	The district's vegetation cover is decreasing due to drought and extensive vegetation use as fuel etc.	The project will contribute to the restoration of storm water and rainwater harvesting systems. This collected water will be strategically utilized during periods of no rainfall, thereby significantly aiding in the augmentation of vegetation in the project area.
	Is there any tree cutting involved in the project? If any tree cutting is involved (during construction phase), who will be responsible for the compensation of the trees cutting.	No, there is no tree cutting involved in the project The BID will compensate the price of trees cutting to the owners. Average price of sapling will be Rs.100 and replantation will be done with ratio of 10 each cut tree
	Local vegetation is being affected by sedimentation and flooding. Bund Khushdil Khan has dried up	The rehabilitation and restoration of dams in the project area, particularly Bund Khushdil Khan, will

Concerned Departments/Persons	Key Concerns/Discussion	Response/Actions
	and been impacted by these issues. Rehabilitating/restoring the dams in the project area could potentially enhance water infiltration, leading to a potential recovery of its former state.	serve as vital measures to mitigate flooding and sedimentation, safeguarding the local vegetation. Furthermore, the stored water in the dam will gradually infiltrate the soil, effectively recharging the groundwater, which is pivotal for the potential restoration of its former state.
	Vegetation and plants need to be grown extensively at the project sites.	In the project 1 tree cutting will be compensated by planting 10 new trees and suggestion of additional plantation of vegetation is noted but extensive vegetation plantation is not the mandate of this project
	It is requested to construct new check dams at the suitable sites, wherever required to control the water flow, silt, and soil erosion.	Suggestion noted but construction of new Dam is not the mandate of this project
	The above two measures could result in the long sustainability of the dam life and increasing water infiltration leading to provision of clean water devoid of silt and turbidity.	Indeed, the implementation of these two measures holds the potential to significantly enhance the long-term sustainability of the dam's lifespan. Additionally, it will contribute to the increased infiltration of water, ultimately leading to the provision of clean water free from silt and turbidity.

Figure 6-2: Pictorial View of departmental consultations

Meeting with Forest & Wildlife Department

Meeting with Irrigation Department, Pishin

6.8 Women Consultations

620. According to the ADB SPS requirement, conducting 'meaningful consultations' is necessary to ensure inclusive project planning and implementation, which includes consulting all stakeholders, including women. However, due to the conservative nature of the communities near project sites of district Pishin, conducting consultations with women was not possible. However, their views were indirectly obtained through their spouses and children to ensure the requirement of ‘meaningful consultations’ as per ADB SPS, 2009 was fulfilled.

7. ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 GENERAL

621. This chapter identifies the significant potential environmental and socio-economic impacts which may occur during the project life. The appropriate mitigation measures are also discussed in this and the subsequent chapters of this report. A brief qualitative description of each aspect and the affected environment in both project areas and AOI is presented in the following sections.

7.2 METHODOLOGY FOR IMPACT SCREENING

622. Determining the significance of potential environmental impacts and their effects enables the identification of necessary mitigation and benefit enhancement measures as well as an estimation of the related financial costs associated with the impacts of a project. An impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the predicted quality once the project is under implementation or in place.

623. The procedure for determining the level of risk associated with each potential impact is described below.

624. The likelihood that the activity will have an effect on the environment, as well as the consequence of the effect occurring, are used to assess risk. It is frequently described as follows:

Risk = Likelihood × Consequence

Table 7-1: Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventive measures are not applied	3
Unlikely	May occur once or twice during the activity if preventive measures are not applied	2
Rare	Unlikely to occur during the project	1

Table 7-2: Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding communities	5
Major	The action will cause major adverse damage on the environment or surrounding communities.	3
Moderate	No or minimal adverse environmental or social impacts	2
Minor	No or minimal adverse environmental or social impacts	1

Table 7-3: Risk Score Table

		Consequence			
		Catastrophic	Major	Moderate	Minor
Likelihood	Certain	**25**	**15**	**10**	5
	Likely	**15**	**9**	6	3
	Unlikely	**10**	**6**	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

625. Any 'Medium' to 'Significant' risk requires an environmental management measure to manage the potential environmental risk. Judgment will be required concerning the application of an environmental management measure to mitigate low risk situations.

626. The impact assessment matrix presenting the potential impacts and expected impacts during the different project development phases are presented in the Table 7-4 below:

Table 7-4: Impact Assessment Matrix

Activity / Impact	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Flooding	Likely	Major	High	Low
Seismic damage	Likely	Moderate	Medium	Low
Land Acquisition	Unlikely	Minor	Low	Low
Construction Phase				
Air Quality	Likely	Moderate	Medium	Low
Noise Pollution	Likely	Moderate	Medium	Low
Vibration impacts	Likely	Minor	Medium	Low
Solid waste generation incl. Spoil material	Likely	Moderate	Medium	Low
Resource Conservation	Likely	Minor	Medium	Low
Soil Contamination	Likely	Moderate	Medium	Low
Soil erosion/ silt run-off	Likely	Moderate	Medium	Low
Community Health and Safety	Likely	Minor	Medium	Low
Occupational Health and Safety	Likely	Moderate	Medium	Low
Traffic management	Likely	Minor	Medium	Low
Communicable diseases	Likely	Minor	Medium	Low
Flora	Likely	Minor	Medium	Low
Fauna	Likely	Moderate	Medium	Low
Use of local water resources	Likely	Moderate	Medium	Low
Contamination of water resources	Likely	Moderate	Medium	Low
Social and Cultural Conflicts	Likely	Minor	Medium	Low
Religious and Cultural Heritage	Unlikely	Minor	Low	Low
Operation Phase				
Damage to infrastructure	Likely	Major	High	Medium
Biodiversity impacts	Unlikely	Minor	Low	Low

7.3 Anticipated impacts during pre-Construction/Design phase

627. Following is the description of impacts envisaged and the recommended mitigation measures during pre-construction/design phase.

7.3.1 Land acquisition

628. The proposed works will be carried out on the land of the BID and will utilize the department's owned RoW on all proposed sites. Therefore, there is no requirement for any type of land acquisition, including Voluntary Land Donation, for this project.

629. Currently, no community is occupying the existing structures for both permanent and temporary shelter and relief from floods, and no community asset has been identified for relocation. Therefore, no mitigation measures are needed.

Mitigation Measures

630. No measures required.

7.3.2 Seismic Hazard

631. The project area is situated in Seismic Zone 4, which this zone indicates severe damage. In this zone, the design of various types of structures should be based on Peak Ground Acceleration (PGA). An earthquake of severe intensity affecting the project site can have a detrimental impact on its development, which would be a significant negative consequence. This factor necessitates special consideration by the designers, taking into account the major earthquakes of 2015, 2013, 2012 and others. This impact would be of medium significance.

Mitigation Measures

632. At the detailed design stage, the safety of the proposed water conservation structures against the damages due to seismic activity need to be ensured. As such structural designs of dam body, spillway and other structures need to follow the applicable criteria for the zone 4 recommended in the Building Code of Pakistan 2021.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.3.3 Flooding

633. The valley is under a severe threat of flooding during heavy rains. The rapid floods originating from hill torrents in the surrounding area cause devastation in almost the entire region due to their high velocity and magnitude. Just like the High Magnitude Flash Flood of 2022, future flooding can breach the dam body and damage spillways and other infrastructure. This impact would be of high significance.

Mitigation Measures

- As per findings of the hydrological study, estimation of the discharge of streams/nullahs of the project area has been calculated against 500 years return period. Hydrological studies have considered peak historical floods to incorporate in dam design to avoid/minimize future flooding impacts.
- A pre-construction visit is recommended to be conducted by a team comprising route engineer, hydrologist and hydraulic engineer to validate the crossing locations and design.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4 Construction Phase

7.4.1 Impact on Air Quality

o **Fugitive Dust Emissions**

Potential Impacts

634. Air quality will be affected by fugitive dust emissions from excavating activities of construction machinery, material stockpiles & material transportation, dust from the unpaved

surfaces and movement of construction vehicles, which can be very harmful for the site worker, local population and natural vegetation. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability. These emissions may also affect the bio-physical environment. List of air sensitive receivers is given in **Chapter 4, Table 4-2.** No air quality baseline data for Pishin is available.

Mitigation Measures

635. The measures are as follows:

- The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air from fugitive emission during wind storm emissions.
- The contractor will monitor air quality on regular basis near the plant.
- Preventive measures against dust should be adopted for unloading operations. Regular water sprinkling of all excavation work the site should be carried out to suppress excessive dust emission(s);
- Grading operation will be suspended when the wind speed exceeds 20 km /hr.
- The plant should be located at least 500m away from any living area.
- Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road.
- Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work
- Proper Personal Protective Equipment (PPE) should be issued to the site worker and make sure the worker wears the PPE properly during working on site.
- Contractor will prepare Dust Management Plan in consultation with RE for implementation. (see template on Dust Management Plan in **Annex -9**).

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

- **Smoke from burning of waste and firewood**

Potential Impacts

636. A number of big and small fires in the labor camp can produce smoke and smog, which can cut off visibility, reduce traffic ability and cause suffocation along with causing diseases of respiratory tract.

Mitigation Measures

637. The mitigation measures will be as follows:

- It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labor camp.
- Cutting and burning trees or shrubs for fuel should be prohibited.
- Gas Cylinders should be used in the labor camp for cooking purposes.

o **Vehicular and Generator Exhaust Emissions**

Potential Impacts

638. Emissions of noxious gases from movement of heavy machinery, batching plant and generators etc. would release emissions which would certainly add to the ambient air levels of the immediate vicinity. Also, the movements of heavy machinery and vehicles of old make and poor engine condition tend to release more than new well-tuned vehicles while the use of low-grade fuels and lubricants also increase pollutant emission levels.

Mitigation Measures

639. The mitigation measures will be as follows:

- All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair are needed to minimize the hazardous emissions.
- Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant.
- NEQS / WHO applicable standards to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.
- Best quality fuel and lubes should be purchased where possible lead-free oil and lubes should be used.

7.4.2 Impact of Noise Pollution

o **Noise from Construction Activities**

Potential Impacts

640. Old and poorly maintained machinery generates higher decibels of noise and causes noise pollution for workers in the close vicinity of heavy machinery.

641. When the project activities would start, it is very likely that the existing noise level would be amplified. The major sources of noise pollution during construction activities would be during excavation, transportation, loading/unloading of materials and operation of construction equipment etc. The vibrators used for concreting also produce noise. The amplified noise levels will be temporary in nature and easily mitigated. Noise generated by construction machinery is likely to affect sensitive receptors located within AoI (**Refer Table 4-1**). This impact would be of medium significance.

Mitigation Measures

642. The mitigation measures will include the following:

- Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by Pak EPA (noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A).

- Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage.
- Construction activities that are close to settlements will be stopped during night times if high noise values are observed.
- Consultations will be held to discuss appropriate solutions and techniques to control noise (e.g. mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in working strategy / working environment and progress of project activities; and
- In accordance with the environmental monitoring plan, noise measurements will be carried out on regular basis at locations and schedule specified to maintain the level within the NEQS / WHO standards and to ensure the effectiveness of mitigation measures.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.3 Vibration

Potential Impacts

643. Construction activities i.e. soil compaction, excavation, moving of heavy trucks have the potential to produce vibration levels that may be annoying or disturbing to humans and may cause damage to structures if appropriate precautions are not taken. (Refer **Table 4-12**).

Mitigation Measures

644. Following mitigation measures should be implemented to combat the potential vibration impacts during the construction stage:

- Use of heavy machinery should be allowed in limited time only from 07.00 a.m. to 10.00 p.m. except for any emergency for which contractor should take prior approval; and
- Low vibration level machinery should be used and a system of regular maintenance and repairs to be employed.
- Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction.
- The physical effect of piling should be assessed prior to construction and measures.
- should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.4 Solid Waste Generation incl. spoil material

Potential Impact

645. It is expected that large quantities of solid waste will be generated at the contractor camps, and other construction sites. The types of solid wastes generated will include domestic waste, food waste, workshop waste, medical waste, packing waste, demolition materials (concrete, masonry), and debris from construction sites (excess aggregate, sand). In addition, there will be excavated material unsuitable for dam construction. Proper management of solid waste is essential due to the risks it poses to human health and environmental degradation. Careless and indiscriminate open dumping of waste can result in unsightly and unsanitary conditions in the project area. Delays in delivering solid waste to landfills can cause nuisances and unpleasant odors, attracting flies and other disease vectors. Direct contact with such waste can be dangerous, potentially leading to the spread of infectious diseases. This impact would be of medium significance.

Mitigation Measures

- All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. The contractor will coordinate with local representatives and administration of the concerned solid waste management department for the disposal of solid waste;
- The contractor must develop a plan of action with the help of concerned solid waste management department for transporting the waste to the disposal site;
- Toxic waste will be handled, stored, transported and disposed separately;
- The waste will be properly sealed in containers with proper labels indicating the nature of the waste; and
- Solid waste will be segregated at source so that it can be re-used or recycled.
- Waste management plan will be developed to implement an efficient and responsive solid waste management system during construction phase. Recyclable wastes e.g. steel bars will be sold to waste vendors;
- Reusable material will be used as a filling material during ground levelling;
- Solid waste generated during construction will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; and
- The site will be restored back to its original condition after construction completion.
- The spoil material from the excavation will be dumped at designated places. The dumping sites must be approved by environment specialist of the Construction Supervision Consultant (CSC).
- The contractor will also ensure that no spoil material is disposed into stream/nullahs and into any other water body along the project site.
- As far as possible barren/waste lands available will be used for disposal of the excavated waste material.

- The spoil material shall be deposited in layers and properly rolled and sprinkled to avoid any negative environmental impacts.
- Contractor will prepare and approve a impspoil management plan, prior any disposal of spoil.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.5 Resource Conservation

Potential Impact

646. During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities. There can be a conflict for resources between workers and local community. This impact would be of medium significance.

Mitigation Measures

- Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes;
- Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants;
- Reduction of wastage of water through training of workers involved in water use;
- Reuse of construction waste materials may be adopted wherever possible;
- Aggregates will not be sourced from river and stream beds.
- Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment;
- Efficient and well -maintained equipment and machinery will be used;
- The equipment and machinery will be turned off when not in use;
- A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.6 Soil Contamination

Potential Impacts

647. Surface soil has the potential to be contaminated by construction material, vehicle movements and various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination. Possible sources of spillage are:

- During transfer of fuel from one container to another or during refueling;
- Unloading of construction material due to careless handling;
- Maintenance of equipment and vehicles;
- Due to leakages from equipment and containers;

- It is anticipated that a large quantity of excavated material will need to be disposed of. If this waste material is not properly disposed of, it will contaminate the soil and water resources, especially during the rainy season. Improperly managed excavated material, if left exposed or not stored correctly, can easily erode and get washed away by rainwater. During the rainy season, the increased water flow can carry the eroded soil into nearby water bodies, causing sediment runoff.

648. This impact would be of medium significance.

Mitigation Measures

649. The following practices will be adopted to minimize the risk of soil contamination:

- The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval.
- Refueling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area.
- During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.
- Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage.
- Regular inspections will be carried out to detect leakages from vehicles and construction machinery.
- Vehicles and/or equipment with leakage will not be used, until repaired.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside, which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.7 Soil Erosion

Potential Impacts

650. Major considerations are as follows:

- Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities. Potential sources of soil erosion (due to wind or rain) include clearing of area for construction, preparation of camp sites, workshop areas, equipment washing-yards

access tracks for operations, off road vehicular traffic on unpaved roads during construction.

- The reduction in vegetative cover along sides of project infrastructure will reduce the binding capacity of the soil and susceptibility to erosion by the force of rainfall, resulting in increased soil erosion and removal of plant nutrients. The loss of vegetative cover can increase propensity for landslides.

651. This impact would be of medium significance.

Mitigation Measures

652. Good engineering practices will help controlling soil erosion both at construction sites and in peripheral areas, particularly in haul tracks. Soil erosion remedial measures will be based on geotechnical, geomorphic and hydrological conditions of the project area and these will vary from site to site. However, the following measures will be adopted as per site conditions:

- All the freshly cut surfaces will be restored/stabilized as soon as possible;
- Seeding or plantation of erodible surfaces will be done;
- Construction activities will be planned in such a way so as to avoid cutting of erodible surfaces and earth movement in rainy season;
- Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment.
- Proper monitoring of the soil erosion prone areas will be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.8 Community health and Safety

Potential Impacts

653. Occurrence of accidents/incidents during the construction activities, particularly from excavation activities is a common phenomenon. Safety of general public residing close to excavation work will particularly be at stake. The local people, particularly the children and women, may get injuries or even fatalities. Contractor staff while working at heavy machinery may get injuries. This impact would be of medium significance.

Mitigation Measures

654. Mitigation measures regarding the safety hazards will include the following:

- Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety material including safety boots, helmets, and gloves, hearing protection and protective masks, and monitoring their proper and sustained usage.
- The Contractor will ensure the provision of medical services, medicines, first aid kits, vehicle, etc. at the campsite and working place. For this purpose, he will install, staff, equip and operate a clinic on site. It is recommended that this clinic should also be

open to the population of the nearby villages, in order of give them some direct benefits from the project.
- Cordon off the work areas where necessary.
- The storage of all solid waste shall be practiced so as to prevent the attraction, harborage or breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odours, unsightliness, or public nuisances.

370. **Residual Impact:** By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.9 Occupational Health & Safety

655. Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning. In a nutshell, occupational health and safety issues associated with the construction of proposed sub-projects will primarily include physical hazards; chemical hazards; and noise.

Noise

656. Construction and maintenance personnel may be potentially exposed to high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources can be prevented by using personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure.

657. Lack of Emergency Response Plan (ERP) or an inefficient response plan may lead to an accident or critical injury. This impact would be of medium significance.

Mitigation Measures

658. Following mitigation measures shall be adopted by the contractor to control accidents due to deep excavations:

- Proper barricading shall be applied to all excavation deeper than 6feet.
- Warning taps shall be applied to trenches which are around 3 feet deep.
- Isolation of area must be done during excavation activities to control accidents.
- Damping down of area to control fugitive dust.
- Where necessary, apply green sheet to control fugitive dust, especially during high wind season.
- Material shall be stored at least 3 feet away from the edges of excavations.
- Designated entry and exit points at all deep excavations.
- If any confined space encounters (excavation deeper than 10 feet or any main hole etc.), procedure for confined space entry shall be followed.

659. For further details, framework for Occupational Health and Safety Management plan has been developed to handle any health and safety issue of workers and community. Mitigation measures to prevent and control physical hazards include:

Moving Equipment and Traffic Safety

660. Establishment of work zones to separate workers on foot from traffic and equipment by:

- Routing of traffic to alternative roads when possible;
- Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;
- Reduction of maximum vehicle speeds in work zones; and
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).
- Provide appropriate PPE in conjunction with training, use, and maintenance of the PPE.
- Furthermore, the noise reduction options that should be considered which include:
- Selecting equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing vibration isolation for mechanical equipment;
- Providing noise protection PPEs (ear plugs/ear muffs) to the construction workers;
- Re-locating noise sources to fewer sensitive areas to take advantage of distance and shielding;
- Developing a mechanism to record and respond to complaints; and
- Regular monitoring of noise levels at active sites or near noise producing equipment/machinery and compare it to the available occupational noise standards.

Monitoring of OHS Activities:

661. During the construction phase of proposed project, occupational health and safety monitoring programs of the contractor (s) should verify the effectiveness of prevention and control strategies. The selected indicators should be representative of the most significant occupational, health, and safety hazards at the construction site and camps, and the implementation of prevention and control strategies. The occupational health and safety monitoring program should include:

- Regular inspection and testing of all safety features and hazard control measures focusing on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used;
- Surveillance of the working environment: The contractors should document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments. Monitoring and analyses should be conducted according to internationally recognized methods and standards. Monitoring methodology, locations, frequencies, and parameters should be established individually for each project following a review of the hazards;
- Continuous and efficient surveillance of worker's health during the entire construction phase by the nominated officials of contractors; and
- Training: Training activities for employees (construction contractor & supervision consultant staff) and visitors should be adequately monitored and documented (curriculum, duration, and participants). Emergency exercises, including fire drills, should be documented adequately. Service providers and contractors should be contractually

required to submit to the employer adequate training documentation before start of their assignment.

- Contractor(s) shall prepare a comprehensive OHS Plan as part of Site Specific Environmental Management Plan (SSEMP).

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.10 Traffic Management

Potential Impacts

662. During construction activities, large number of light and heavy vehicles is expected to use the community roads. Similarly, heavy machinery will be stationed in and adjoining areas of the project site. This may create a burden on the capacity of the existing road network and the project-generated traffic may be a nuisance for surrounding communities. This impact would be of medium significance.

Mitigation Measures

- Construction traffic hindrance should be avoided by providing proper diversion and signage.
- Traffic management plan will be prepared by the contractor after consultation with RE for its implementation. (See template in **Annex-12**)
- GRM will be put in place to address community grievances in this regard.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.11 Communicable diseases

Potential Impacts

663. The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists. Majority of the people living in the surrounding of the Project, and potential Labor are not aware of the source, mode of communication or consequences of HIV/AIDS. Although their religious and cultural value system, to a large extent excludes the outbreak or rapid communication of HIV/AIDS, yet its occurrence in such a situation cannot be precluded. It is necessary that awareness and preventive campaigns are run from time to time in the Labor camps and the field offices of the Project to prevent the communicable diseases like Cholera, Typhoid and Tuberculosis.

664. There is a chance of spreading of an epidemic of Coronavirus disease (COVID-19) due to close interaction of the labor force during construction not only among the workers but also in the area. This impact is medium adverse in nature.

Mitigation Measures

665. The Contractor shall:

- Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS;
- Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored;
- Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages;
- Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department;
- Locating a labour camp at least away from the villages (local settlement), and
- Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.12 Flora

Potential Impacts

666. No tree cutting is expected in the ROW of proposed project during construction activities. The Contractor's workers may damage the vegetation and trees (for use as firewood to fulfil the camps requirements). The cutting of small trees and shrubs will cause degradation of local environment as under:

- It will enhance soil erosion. Without the branches and leaves, to break its fall, heavy storms can quickly wash away the soil from even a gentle slope. Cutting down of trees/shrubs also takes away the roots that would otherwise help in binding the soil.
- During the entire construction period dust, laden polluted air will form a dust film on leaves thus blocking sunshine and stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

Mitigation Measures

667. Following measures will be adopted:

- Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area.
- Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.

- The Contractor's staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes. They will use the paths and tracks for movement and will not be allowed to trespass through farmlands.
- Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed.
- The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion
- As far as possible digging in the cultivated land should be done when the land is barren to avoid damage to agricultural crops.
- Open fires should be banned in the area to avoid hazards of fire in the project area.
- Ten trees will be replanted for each tree cut as per EPA rule.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.13 Fauna

o **Mammals and Reptiles**

668. The impact on mammals and reptiles will include the following:

- During the construction phase, there will be negative impacts on the mammals and reptiles of the area, due to construction activities involving excavation, movement of labour, carriage of goods and machinery to various sites.

669. The key terrestrial species in the project area are:

Mammals:

- Asian jackal (*Canis aureus*),
- Indian crested porcupine (*Hystrix indica*),
- Cape hare (*Lepus capensis*),
- Hill fox (*Vulpes vulpes grifithii*),

Reptiles:

- Indian cobra (*Naja naja*)
- Afghan Agama (*Trapelus megalonyx*)
- Saw-scale viper (Echis carinatus),
- Levantine viper (Macrovipera lebetina), etc

670. Mammals, such as jackal, fox, porcupine, mongoose etc. will avoid these areas for fear of being persecuted. Same will be the case with reptiles; some reptiles might be killed during the digging and dragging operations. Movements of the mammals and reptiles will be restricted during the construction phase.

671. Eatable and refuse goods of the Contractor's camps may attract wildlife that might be hunted by the workers. The accidental striking of all terrestrial fauna by project vehicles on access routes is a considerable risk during the project. This impact will be of medium significance.

Birds-Avian Fauna

672. The presence of migratory and sedentary birds is considered likely throughout the area surrounding the project footprint. Avifauna prefers undisturbed marshy habitats, such as that surrounding the larger steams and away from agricultural land. However, they are also observed within cultivated lands and around settlements of the project area. The presence of avifauna will increase during the winter months, with the arrival of migratory birds. However, there are no landing zones used by migratory birds in the immediate project area.

673. The key avifauna species in the project area are:

- Grey francolin (Francolinus pondicerianus)
- Common Quail (Coturnix coturnix)
- Chukar partridge (Alectoris chukar),

674. During construction, avifauna may be disturbed due to sensory disturbance from construction; movement of vehicles and crew personnel; location and operation of camps; operation of large plant; and site restoration. This will be a temporary disturbance within the project area. Following construction, there will be availability of wetland areas in the project area

675. Birds will try to find shelter and food somewhere else and will tend to move away from the project area due to the activities mentioned above for fear of being hunted/trapped.

Mitigation Measures

o **Mammals and Reptiles**

- Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labor accordingly.
- Noise generating activities will be avoided during the night.
- The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them.
- Vehicles will be maintained in good condition and provided with mufflers to reduce noise.

676. After adopting the above-mentioned mitigation measures, the residual impact will be of low risk of striking fauna on access routes.

o **Birds-Avian Fauna**

- Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding.
- The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project.
- Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.14 Use of Local Water Resources

Potential Impacts

677. The water resources of the project area mainly comprised of surface water (springs, etc) and groundwater that is being used by all communities for drinking purpose. There will be ample need of water not only for construction purposes (of concrete side slopes) but also for meeting the consumptive and non-consumptive needs of the campsites, workshop, washing yard, etc. It is obvious that these needs will be met from the existing resources of the areas in close proximity to the dam. This impact would be of medium significance.

Mitigation Measures

678. Mitigations measures regarding use of local water supplies as follows:

- Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources.
- Contractor will ensure that the water availability of the existing local users remains unimpeded by the project interventions. The Contractor will make arrangements for the availability of drinking water at site. The Contractor will arrange for the water required for construction works on his own. For this purpose, he will install hand pumps/tube wells accordingly.
- The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.
- The Contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.15 Contamination of Water Resources

Potential Impacts

679. The water resources (surface and sub-surface water) may get polluted from hazardous construction materials, wastewater effluent, solid waste, silt from construction and soil erosion, etc. both during construction and operation phases. This normally occurs when waste material is disposed of improperly. Pollution of water resources and its consequences may occur through following ways:

- Implementation of the project may aggravate the pollution of surface water resources of the project area through contamination by the wastewater effluent and solid waste material generated from the kitchens and toilets at construction campsites.
- Subsurface water may be contaminated from the spills of chemicals, oil, lubricants, detergents, etc. through runoff from the construction area, construction camp, workshops and equipment washing-yards.

680. This impact would be of medium significance.

Mitigation Measures

681. Measures to prevent contamination of surface and ground water will include the following.

- Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of hill torrents, etc.
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream.
- Borrow pits and natural depressions lined with impervious liners will be used to dispose of scraped obnoxious material, and then covered with soil. Cost of this item will be made part of Bill of Quantities. This will check potential groundwater contamination. Such measures will also be provided at stream side disposal of waste material in addition to retaining walls or gabions. Available stone (boulders) from excavated rocks will be used for retaining walls as well as for gabions. It will reduce the quantity of dumping material. However, all types of hazardous waste will have to be collected on site separately and stored in appropriate containers to be finally removed from site and be brought to adequate handling, recycling or disposal facilities.

682. Specific measures for water quality protection to be taken on the construction site will be the following:

- Fuels, lubricants and other hazardous material will have to be properly stored in adequate containers in sites equipped with retaining structures, including oil skimmers for the treatment of contaminated runoff water.
- Repair and maintenance work on machines and vehicles will only be done in specific places designed and equipped for this purpose (oil skimmer). These must be at a safe distance from the stream/nullah. No washing of vehicles will be done in or near the stream/nullah.
- Water contaminated with concrete or cement should be channeled into a contractor constructed wastewater collection system. This system must be designed as per the discharge of effluents to efficiently gather and treat the wastewater, ensuring it complies with environmental standards and doesn't harm local ecosystems or water resources.
- Contamination of the springs/nullah with concrete or cement must be avoided.
- Sewage water from the camp will have to be collected and treated in septic tank before being released into the streams.
- Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.16 Social and Cultural Conflicts

Potential Impact

683. During the construction phase of the proposed project, conflicts may arise between labor force and local community. Use of local resources and products by the construction workers can generate stress on the local resources. Furthermore, difference in cultural values may also cause discomfort to local residents. This impact would be of medium significance.

Mitigation Measures

- Local labor especially from nearby communities should be given preference for the construction works;
- Careful planning and training of work force to minimize disturbance to the local people;
- Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and
- Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.4.17 Religious and Cultural Heritage

Potential Impacts

684. No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area. So no mitigation measured for graves, cultural and historical sites needed.

Mitigation Measures

685. Currently no graveyard is affected by this project. However, if any graves affected by the project, they will have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. As referred earlier, no relocation of historical site is involved, so no mitigation is required except that contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties.

686. There are no cultural sites located within the study area and no impacts on archaeological sites are envisaged. However, the Contractor will be required to instruct the construction crews and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform

Department of Archaeology & Museums through Irrigation Department and hand over such sites to the department if instructed by Engineer / Irrigation Department. The Chance Find Procedure is provided as **Annexure 8**.

7.5 Operational Phase

7.5.1 Damage to infrastructure

Potential Impacts

687. Breach of dam, damage to spillway and other irrigation structures is likely to occur. This impact would be of high significance However, it will threat system sustainability and following factors may also contribute to this process:

- Improper operation of water control facilities;
- Reservoir sedimentation
- Deterioration of free board due to cattle trespass and other factors;
- Inadequate supervision;
- Lack of timely and adequate repairs; and
- Lack of coverage of hydraulic gradient;
- Natural hazard i.e. flooding and earthquakes.

Mitigation Measures

688. To mitigate the above-mentioned impacts, the following measures shall be adopted:

- BID to monitor the system regularly;
- Annual checks and maintenance of embankment dam, falls and control structures and bed levels which are affected by siltation or scour.
- Repairs on urgent basis; and
- Emergency response plan for dam breach shall be followed, which is attached as **Annexure-4** of this report.

Residual Impact: By adopting the aforementioned measures, the residual impact would be of low significance.

7.5.2 Biodiversity Impacts

Potential Impacts

689. The proposed works are only limited rehabilitation works of the dam structures are proposed to repair and reconstruct the dam structural aspects damaged by the floods. Since these dams have already been operational in the past, thus, the respective ecological characteristics have already adjusted to the flow regimes from these dams and thus there will be no changes and/or negative impacts on the ecology/biodiversity and environmental flows (e-flows)[20] in the respective water bodies downstream of these dams. Furthermore, the

[20] Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and wellbeing that depend on these ecosystems.

rehabilitation of the dams will restore the pre-flood ecological and e-flow dynamic that was present downstream of these dams.

Mitigation Measures

690. No mitigation measures required.

7.6 Induced Impacts

691. The proposed works will not result in any induced impacts. The works to be conducted will be in remote locations that will be away from any settled areas and based on the limited nature of the scope and scale of works, no stress on any of the resources or infrastructure will be caused and thus no induced impacts will take place.

7.7 Cumulative Impacts

692. There are no cumulative impacts expected from the proposed project activities since there will be no other works going on in parallel while the works proposed in this IEE study are being conducted in the respective project areas.

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1.1 General

693. The EMP is a strategic approach towards the effective implementation of the mitigation measures and environmental protection of the project area and its surroundings. This EMP ensures that the undue or reasonably adverse impacts of a project are prevented and the positive benefits of the project are enhanced. According to this plan, all the activities related to various phases of the project are controlled and monitored.

694. This EMP encompasses all the phases of the project and may be used as a quick reference by the personnel(s) of client and contractors for effective implementation of the proposed mitigation measures and tracking the overall environmental performance of the project.

695. This EMP addresses all the significant impacts that are identified during the impacts identification process. It should be amended in consultation with the concerned regulatory authority; if any issue has been overlooked or if any need would arise as the project continues.

8.1.2 Structure of EMP

696. The contents of this chapter are given below:

- Regulatory Requirements
- Purpose & Need of the EMP
- Objectives of the EMP
- Scope of the EMP
- Institutional Arrangement for Implementation of EMP

- Institutional arrangements for implementation of EMP during construction phase
  - Role and responsibilities of the functionaries involved in EMP Implementation
  - Reporting mechanism
  - Non-compliance of the EMP
- Institutional arrangements for implementation of EMP during operation phase
  - Role and responsibilities of the functionaries involved in EMP implementation
  - Reporting mechanism
  - Environmental Mitigation Plan
  - Environmental Monitoring Plan
  - Implementation of EMP
- NOC and other approvals
- Stakeholder coordination
- Trainings
- Communication & documentation
  - Environmental management cost

- Change management

8.1.3 Regulatory Requirements

697. This EMP refers to the applicable national and international legal framework for the proposed project for the protection of the environment.

8.1.4 Purpose & Need of the EMP

698. Primarily, the purpose of this EMP is to serve as a quick reference for the consultants, contractor as well as the proponents to implement the proposed mitigation measures effectively and to monitor the overall environmental performance of the project.

699. Furthermore, to house the procedure, which the proponent follows to implement and maintain this EMP. The need of the EMP is mentioned as follows:

- Ensure that attention is paid to the actual environmental effects arising from construction, and operation of the proposed project;
- Ensure that anticipated impacts are maintained within the levels predicted;
- Ensure that unanticipated impacts are managed or mitigated before they become a problem; and
- Ensure that environmental management brings about real environmental benefits and achieves environmental sustainability, rather than the environmental approval process being a mere paper chase to secure a development approval.

8.1.5 Objectives of the EMP

700. The main objectives of the EMP during different phases of the project is to implement mitigation measures and to evaluate the effectiveness of mitigation measures as proposed in the IEE and recommend improvement if any need would arise.

8.1.6 Scope of the EMP

701. The scope of the EMP includes the following phases of the project:

- Design phase
- Construction phase; and
- Operation phase.

702. All the activities performed during these phases will be controlled and monitored according to this EMP.

8.1.7 Institutional Arrangement for Implementation of EMP

703. The following is a broad guideline has been proposed for institutional setup under this project as a reference for BID. It is based on the recommendations for BID of ADB's current project. The final organizational structure, working and monitoring of Institutional setup would be proposed by the BID and endorsed by NDRMF.

a) Institutional Arrangements for Implementation of EMP during Construction Phase

704. The BID is the project's executing agency (EA). The key players involved during construction stage of the proposed project are the Project Director –Environmental Safeguards Staff; BEPA, the Contractor and the Supervisory Consultants (SCs).

705. The following staff will be involved in the implementation of EMP:

- Project Director –Environmental Safeguards Staff;
- SC's Environmental Specialist/Engineer; and
- Contractor's Environmental Engineer/Scientist.
- BEPA

706. The Construction Contractor will make a bond through contract documents to implement the EMP. The whole EMP will be included as a clause of the contract documents. The organizational setup for implementation of EMP is given below:

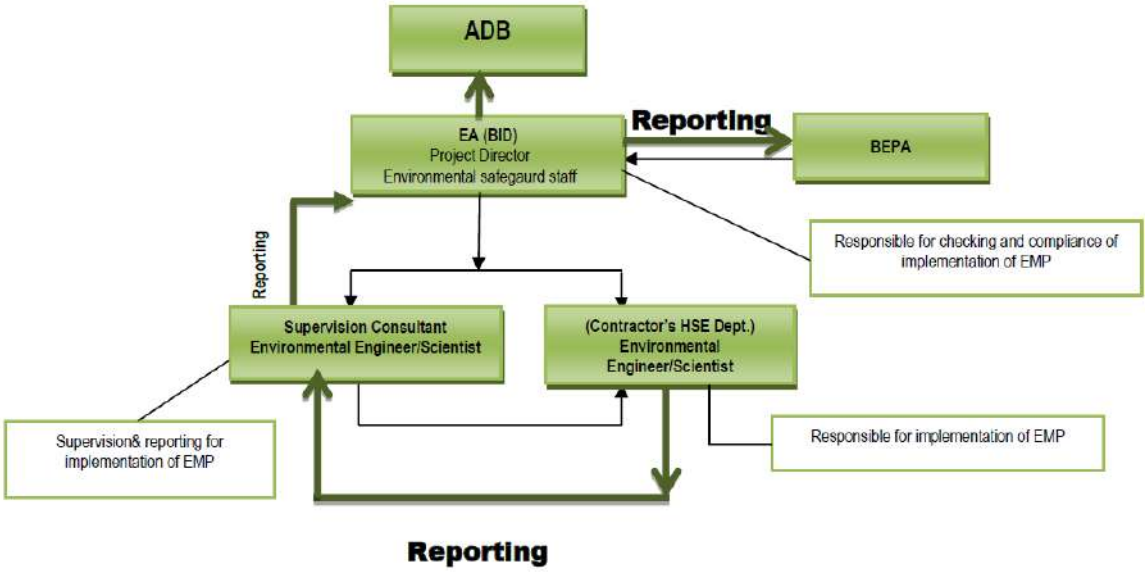


Figure 8-1: Organizational Setup for Implementation of EMP

Roles and Responsibilities

707. The roles, remits and responsibilities of organizations that will be involved in EMP implementation are outlined below.

a) BEPA

708. BEPA is the regulatory authority for issuance of NOC for the proposed sub-projects. As part of its mandate, protection of environment is its responsibility. Therefore, this agency will undertake an audit (as and when required) of project activities with respect to the protocols as defined in EMP.

b) Project Director:

709. Project Director through environmental safeguards staff will have responsibility for assuring implementation of EMP. This includes the following:

- Ensuring that required environmental training is provided to the concerned staff.
- Carrying out random site visits to the construction site to review the environmental performance of the construction contractors.
- Review monitoring reports for the progress of environmental related activities.
- Make sure that the construction contractor is implementing the additional measures suggested by the supervision consultant in environmental monitoring reports.
- To assist contractor for obtaining necessary approval from the concerned departments.
- Maintaining interference with the other lined departments / stakeholders.
- Reporting to Baluchistan EPA on status of EMP Implementation.
- Reporting to ADB on status of EMP implementation.

c) Supervision Consultant: Resident Engineer

710. Resident Engineer's (RE) roles and responsibilities will be:

- To oversee the performance of Construction Contractor to make sure that he is carrying out the work in accordance with the tender design and follow the specifications;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner;
- Strong coordination with the Construction Contractor and ESMMC.

d) Supervisory Consultant: Resident Engineer

711. Resident Engineer (RE) roles and responsibilities:

- To oversee the performance of construction contractor to make sure that the construction contractor is carrying out the work in accordance with the tender design and follow the specifications;
- Ensuring that the day to day construction activities are carried as per EHS method statement and in safe manner.
- Strong coordination with the construction contractor and PMO.

e) Supervisory Consultant: Environmental Specialist-Field

712. Supervisory consultant (SC)'s Environmental Engineer / Scientist will perform following responsibilities.

- Directly reporting to R.E
- Preparing training materials and implementing programs
- Ensure the implementation of the mitigation measures suggested in the EMP.
- To supervise and monitor environmental activities being performed at site
- To organize periodic Environmental Training programs and workshops for the Consultants and Contractor's staff.

- Periodic reporting as mentioned in the EMP.
- Suggest any additional mitigation measures if required.

f) Construction Contractor: Environmental Engineers / Managers

713. Its contractor contractual obligation to appoint site Environmental Engineer / Manager with relevant educational back ground and experience. Contractor Environmental Engineer / Manager will carry out the following activities.

- Implementation of mitigation measures and SSEMP recommendations at construction sites.
- Plan, manage, monitor and coordinate the entire construction phase in term of HSE.
- Take account of health and safety risk to everyone effected by the work.
- Liaise with the client and consultant for the duration of the project to ensure that all the risks are effectively managed.
- Maintain and practice good housekeeping and keep everything at work in its proper place.
- Ensure suitable welfare facilities are provided from the start of project and maintained throughout the construction phase.
- Contractor will be bound through contract to take action against all the special and general provision of contract document.
- Ensure the provision of Personal Protective Equipment (PPE), conduct the environmental, health & safety training to the workers / Labour and coordinate with Environmental Engineer of SC.
- The Contractor will prepare and submit the Site-Specific Environmental Management Plan (SSEMP) to the CSC and PMU for approval at least ten (10) days prior to commencement of the physical works.

8.1.8 Employees/ Workers Responsibility/ Obligations

714. Employees / workers have obligation to take reasonable care for the health and safety of themselves and of other persons who may be affected by their acts or omissions at work. The other responsibilities are

- To cooperate with employer in assisting them to fulfill their statutory duties.
- Comply with safety instructions and procedures.
- Use all safety equipment properly and do not tamper it.
- Not to interfere with deliberately or misuse anything provided, in accordance with health and safety legislation, to further health and safety at work.

8.1.9 Reporting Mechanism

715. Progress reporting related to environmental activities will be responsibility of Supervision Consultant, Environmental Specialist. He will also be responsible for submitting monthly EMP compliance report for the project to the PD Office. A bi-annual report of environmental activities shall be submitted to ADB by BID.

716. PD will in turn add his remarks / comments / feedback and submit the Report to ADB and BEPA in accordance with the frequency defined by them. In case the frequency is not

defined and/or communicated, bi-annual monitoring reports based on the monthly monitoring report will be submitted to ADB for disclosure on ADB website.

8.1.10 Inclusion of EMP in Contract documents

717. In order to make Contractors fully aware and responsible of the implications of the EMP and to ensure compliance, it is recommended that mitigation measures be treated separately in the tender documentation and that payment milestones should be linked to performance, measured by execution of the prescribed mitigation measures. Such a procedure would help ensure adequate management of project impacts is carried out during the construction and operation phases, where a consistent approach will be expected on behalf of the Contractor and its sub-contractors so that data and information collected from monitoring programs is comparable with baseline monitoring data.

718. The Contractor shall be made accountable through contract documents and/or other agreements for fulfilling the environmental safeguard obligations and delivering on the environmental safeguard components of the Project. Contractors shall be prepared to co-operate with the executing agency and supervising consultants and local population for the mitigation of adverse impacts. After the EMP's inclusion in the contract documents, the Contractor will be bound to implement the EMP and will engage appropriately trained environmental and social management staff to ensure the implementation and effectiveness of the mitigation measures.

719. The Contractor is required to bid for executing the EMP, including the recommended mitigation measures and monitoring programs, as part of its Bill of Quantities (BoQ).

8.1.11 Environmental Management and Monitoring Plan

720. Potential impacts and their mitigation measures are devised against the project activities to minimize their significance. Responsibilities for the collection and analysis of data as well as the reporting requirements have been outlined in Table 8-1. Implementation of environmental impact mitigation measures during construction is to avoid and reduce short- and long-term potential environmental impacts. Incorporation of environmental impact mitigation considerations into the tender and contract documents is a fundamental pre-requisite for effective implementation of the EMP.

Table 8-1 ENVIRONMENT MANAGEMENT AND MONITORING PLAN (EMP)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
A. Design & Planning Phase					
1.	Seismic Hazard	• Failure of design	• At the detailed design stage, the safety of the proposed water conservation structures against the damages due to seismic activity need to be ensured. As such structural designs of dam body, spillway and other structures need to follow the applicable criteria for the zone 4 recommended in the Building Code of Pakistan 2021.	Design Engineer	BID
2.	Flooding	• Failure of design	• As per findings of the Hydrological Study, estimation of the discharge of streams/Nullahs of the project area has been calculated against 500 years return period. • A pre-construction visit is recommended to be conducted by a team comprising Route Engineer, Hydrologist and Hydraulic Engineer to validate the crossing locations and design.	Design Engineer	BID
B. Implementation & Construction Phase					
1.	Impact on Air Quality	Air quality will be affected by fugitive dust emissions from excavating activities of construction machinery, material stockpiles & material	**Fugitive Dust Emissions** • The material being transported or stored at the stockpiles will be kept covered with plastic to ensure protection of ambient air	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
		transportation, dust from the unpaved surfaces and movement of construction vehicles, which can be very harmful for the site worker, local population and natural vegetation.	from fugitive emission during wind storm emissions. • The contractor will monitor air quality on start of construction activates and on biannual basis as per /WHO. • Preventive measures against dust should be adopted for unloading operations. Regular water sprinkling of all excavation work the site should be carried out to suppress excessive dust emission(s); • Grading operation will be suspended when the wind speed exceeds 20 km /hr. • Any batching plants will be located at least 500m away from any living area. • Enforce the maximum speed limit to 20km/h for vehicles using embankments and access road. • Road damage caused by project activities will be promptly attended to with proper road repair and maintenance work • Proper Personal Protective Equipment (PPE) should be issued to the site worker and make sure the worker wears the PPE properly during working on site. **Smoke from Burning of Waste Material or Burning Firewood**		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• It is contractor's contractual obligation to use and provide clean and smoke free fuel in the labor camp. • Cutting and burning trees or shrubs for fuel should be prohibited. • Gas Cylinders should be used in the labor camp for cooking purposes. **Vehicular and Generator Exhaust Emissions** • All vehicles during construction activities will be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; • Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions. • Batching plant should be set up considering the wind direction so that the nearby communities are not affected by the emissions from batching plant. • NEQS / WHO applicable standards to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works.		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Best quality fuel and lubes should be purchased where possible lead free oil and lubes should be used.		
2.	Impact of Noise Pollution	Disturbances to local residents in the form of increased noise levels due to movement of construction machinery	• Vehicles and equipment used should be well fitted, as applicable, with silencers and properly maintained; that will reduce noise hazards according to permissible limits as fixed by Pak EPA (noise is 85 dB (A) while the WHO noise guidelines prescribed a limit of 55 dB (A). • Construction workers will be provided suitable hearing protection like ear cap, or earmuffs and will be trained about their usage. • Construction activities that are close to settlements will be stopped during night times if high noise values are observed. • Consultations will be held to discuss appropriate solutions and techniques to control noise (e.g. mud or brick walls, bushes, etc.). Such hearings consultations should also be regularly conducted to solicit public feedback, to avoid public inconvenience and suggestions for improvement in working strategy / working environment and progress of project activities; and In accordance with the Environmental Monitoring Plan, noise measurements will be carried out at the start of construction activities and on biannual basis at locations and schedule specified to maintain the level within	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			the NEQS / WHO standards and to ensure the effectiveness of mitigation measures.		
3.	Vibration impacts	Construction activities i.e. Soil compaction, excavation, moving of heavy trucks have the potential to produce vibration levels that may be annoying or disturbing to humans	• Use of heavy machinery should be allowed in limited time only from 07.00 a.m. to 10.00 p.m. except for any emergency for which contractor should take prior approval; and Low vibration level machinery should be used and a system of regular maintenance and repairs to be employed.	CC	SC
4.	Solid Waste Management (Domestic, Hazardous, Medical)	• Water and soil contamination HSE related issues	• Training on handling, use and disposal of hazardous material must be included in the contractors training plan for specified personnel; • Minimize hazardous waste generation by implementing stringent waste segregation to prevent mixing of non-hazardous and hazardous waste to be managed. • Hazardous areas must be secure, and access only permitted to those who have received specific training. • The spoil material from the excavation will be dumped at designated places. The dumping sites must be approved by CSC environment specialist. • Approximately 4234.56 m3 material will be excavated most of which will be reused after approval of quality control engineer. The leftover will be dumped safely and leveled to avoid any harm to aesthetic sense.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• All waste from the construction activities should be disposed on government owned land and according to the Waste Management Plan which will be a part of the EMP. • Domestic waste generated at the contractor camp and site offices to be collected and temporarily stored at the designated bonded area within the camp area before transportation off site. • A temporary domestic waste storage area to be prepared, maintained and visually inspected on a regular basis by the contractor to prevent adjacent land from contamination. • The location of construction waste disposal site to be such that no tree cutting, crop destruction or private land acquisition occurs. • Contractor will prepare a spoil management plan. Construction waste not to be mixed with domestic waste as the construction waste could be reused as a fill material or disposed off separately.		
5.	Resource Conservation	During the construction, overburden on local resources is possible if construction facilities such as workers camp and construction camp built near rural areas and can create problems for local communities.	• Use potable water bowsers for construction works and mineral water bottles/ ground water for drinking purposes;	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Plan for the provision/purchase of adequate insulation to reduce heat loss through construction plants; • Reduction of wastage of water through training of workers involved in water use; • Reuse of construction waste materials may be adopted wherever possible; • Aggregates will not be sourced from river and stream beds. • Diesel and fuels with low sulphur content should be used to operate construction machinery and equipment; • Efficient and well -maintained equipment and machinery will be used; • The equipment and machinery will be turned off when not in use; A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand,		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			wastewater and solid waste volumes to the lowest levels.		
6.	Soil Contamination	Surface soil has the potential to be contaminated by construction material, vehicle movements and various construction activities. Spillage of fuel, lubricants, cement and chemicals has the potential to result in contamination.	• The Contractor will be required to train its workforce in the storage and handling of materials like oils, diesel, petrol, other chemicals, concrete and cement, etc., that can potentially cause soil contamination. The Contractor will be required to prepare a training manual and module for all the construction related activities along with the schedule of training program and submit to the supervising consultants for approval. • Refuelling areas will have impervious concrete bases with appropriate drainage to prevent spills from contaminating the surrounding area. • During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil. • Oils, fuels and hazardous materials will be stored in appropriately bounded areas. Fuel tanks will have to be placed within sealed bunds capable of containing 120% of the total volume of the tank in case of leakage.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Regular inspections will be carried out to detect leakages from vehicles and construction machinery. • Vehicles and/or equipment with leakage will not be used, until repaired. • Solid waste generated during construction and at camp sites will be properly treated and safely disposed of only in demarcated waste disposal sites. The construction phase will consume lot of cement additives and oils and the empty containers will contain dangerous amount of chemicals inside, which can impact the humans as cancer producers. All such containers must not be sold to general public and must be destroyed and sent for recycle. This will be contractor's responsibility who must seek consultant's supervision. The people must be warned against use of empty chemical containers through local press and erecting banners in project area.		
7.	Soil erosion/ silt run-off	Phenomenon may pose serious environmental impacts like landslides, slumps, slips and other mass movements.	• All the freshly cut surfaces will be restored/stabilized as soon as possible; • Seeding or plantation of erodible surfaces will be done; • Construction activities will be planned in such a way so as to avoid cutting of	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			erodible surfaces and earth movement in rainy season; • Along cross-drainage structures of the access road where embankments are more susceptible to erosion by water runoff stone pitching or a riprap will be provided across the embankment. Proper monitoring of the soil erosion prone areas will be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.		
8.	Community health and Safety	Occurrence of accidents/incidents during the construction activities.	• Training of workers in construction safety procedures, environmental awareness, equipping all construction workers with safety material including safety boots, helmets, and gloves, hearing protection and protective masks, and monitoring their proper and sustained usage. • The Contractor will ensure the provision of medical services, medicines, first aid kits, vehicle, etc. at the campsite and working place. For this purpose, he will install, staff, equip and operate a clinic on site. It is recommended that this clinic should also be open to the population of the nearby villages, in order of give them some direct benefits from the project.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Cordon off the work areas where necessary. • The storage of all solid waste shall be practiced so as to prevent the attraction, harbourage or breeding of insects or rodents, and to eliminate conditions harmful to public health or which create safety hazards, odours, unsightliness, or public nuisances.		
9.	Occupational Health and Safety	Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, foundations, finishing, testing & commissioning.	• All suggested project-specific health and safety plans would include appropriate training and supervision of employees and enforcement of workplace safety policies. • All processes and equipment will be designed and constructed for safe operation. • A process of safety management program will be developed and implemented to identify hazards associated with each applicable chemical. • All project related staff will be provided with the required personal PPE and shall be trained to make sure that they are aware of the usefulness and correct use. • Working at heights and in confined spaces should be done after obtaining approvals from the safety supervisors and should regularly be monitored.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Emergency preparedness and response plan and emergency escape routes shall be identified and all the workers will be made aware of them. • Use of correct signage for better understanding of all the health safety instructions and precautions for the workers. Signage will be in languages appropriate to the workforce employed.		
10.	Traffic Management	Inconvenience to public mobility. due to movement of contractor light & heavy vehicles, construction machinery/equipment on local /access roads	• Construction traffic hindrance should be avoided by providing proper diversion and signage. • Traffic management plan will be prepared by the contractor after consultation with RE for its implementation. • GRM will be put in place to address community grievances in this regard.	CC	SC
11.	Communicable diseases	The laborers in the Contractor Camp, truck drivers and like personnel who interact with each other have the potential for the spread of HIV/AIDS if the incidence exists.	• Arrange to run an active campaign, in the labour camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS; • Latest / Updated SOPs by WHO, national and provincial Government related to the construction industry to control spreading of COVID-19, should be implemented by the contractor and should be strictly monitored;	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Strengthen the existing local health & medical services for the benefit of labour as well as the surrounding villages; • Ensure cleanliness and hygienic conditions at the labour camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by the Health Department; • Locating a labour camp at least away from the villages (local settlement), and • Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents.		
12.	Flora	• No tree cutting is expected as this is restoration /rehabilitation project and being executed within its already available ROW. The Contractor's workers may damage the vegetation and trees (for use as firewood to fulfil the camps requirements).	• Campsites and Elevated Ground Storage Tanks (EGST) will be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it will be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees and undergrowth or agricultural area. • Construction vehicles, machinery and equipment will remain confined within their designated areas of movement. • The Contractor's staff and labour will be strictly directed not to damage any vegetation such as small trees or bushes. They will use	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			the paths and tracks for movement and will not be allowed to trespass through farmlands. • Contractor will provide gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel will not be allowed. • The compaction of trenches should also be done properly. Inadequate compaction of trenches will result in flow of soil during rainy season resulting in increased soil erosion • As far as possible digging in the cultivated land should be done when the land is barren to avoid damage to agricultural crops. • Open fires should be banned in the area to avoid hazards of fire in the project area. • Ten trees will be replanted for each tree cut as per EPA rule.		
13.	Fauna	The accidental striking of all terrestrial fauna by project vehicles or equipment/machinery • Avifauna may be disturbed due to sensory disturbance from construction equipment; movement of vehicles and crew personnel; location and operation of camps	**Mammals and Reptiles** • Hunting, poaching and harassing of wild animals will be strictly prohibited and Contractor will warn their labor accordingly. • Noise generating activities will be avoided during the night. • The camps will be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly, wastes of the camps will be properly disposed off to prevent the chances of eating by wild animals, which may become hazardous to them.	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Vehicles will be maintained in good condition and provided with mufflers to reduce noise. **Birds-Avian Fauna** • Special measures will be adopted to minimize impacts on the wild birds, such as avoiding noise generating activities during the critical periods of breeding. • The contractor should be committed to ensuring the conservation and protection of wildlife within the project area. To achieve this goal, a strict "No Hunting" policy shall be implemented and enforced among all workers and personnel involved in the project. • Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.		
14.	Use of local water resources	• Burden on local water resources and possible social conflicts	• Availability of water for camp site facilities and construction purposes will be ensured by the contractor prior to start of construction activities. As per Local Government Act, the contractor will seek approval from the Local Government for exploitation of the water resources. • Contractor will ensure that the water availability of the existing local users remains unimpeded by the project	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			interventions. The contractor will make arrangements for the availability of drinking water at site. The contractor will arrange for the water required for construction works on his own. For this purpose, he will install hand pumps/tube wells accordingly. • The Contractor will be required to act as a go-between closely with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly. • The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.		
15.	Contamination of Water Resources	• The water resources, may get polluted from may get polluted from hazardous construction materials, wastewater effluent, solid waste, silt from construction and soil erosion, etc..	• Camps will be located at least 500 m away from the nearest local settlement to prevent the contamination of hill torrents, etc. • Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through an oil skimmer and to gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams. Similarly, the wastewater effluent from the campsite will be treated before disposal into a stream. • Borrow pits and natural depressions lined with impervious liners will be used to	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			dispose of scraped obnoxious material, and then covered with soil. Cost will be added in Contractor's BOQs. • Fuels, lubricants and other hazardous material will have to be properly stored in adequate containers in sites equipped with retaining structures, including oil skimmers for the treatment of contaminated runoff water. • Repair and maintenance work on machines and vehicles will only be done in specific places designed and equipped for this purpose (oil skimmer). These must be at a safe distance from the stream/nullah. No washing of vehicles will be done in or near the stream/nullah. • Water contaminated with concrete will have to be collected in sedimentation ponds and, if required, will have to neutralized before being discharged to the natural streams/Wetlands. Contamination of the springs/nullah with concrete or cement must be avoided. • Sewage water from the camp will have to be collected and treated in a suitable septic tank before being released into the streams.		

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			• Generally, waste should be reduced, re-used, recycled and the disposal has to be controlled. • Contractor will have to get water quality testing of dam sites at the start of construction and biannual basis as per NEQS.		
16.	Social and Cultural Conflicts	• During the construction phase of the proposed project, conflicts may arise between labor force and local community.	• Local labor especially from nearby communities should be given preference for the construction works; • Careful planning and training of work force to minimize disturbance to the local people; • Public notification through print or electronic media during the entire construction phase to avoid any inconvenience in accessibility to the locals; and • Adequate training especially for the transitive workforce of the station (involved both in the construction process and in the commissioning) to regard the customs of the area so that the locals do not feel insecure.	CC	SC
17.	Religious and Cultural Heritage	• No graveyard will be disrupted due to this project. No historical or archaeological site has been observed or reported along the project area.	• If any graves affected by the project, they will have to be shifted. The proponent will obtain Fatwa from local Mufti before shifting the graves. During such operation the proponent will inform local administration and seek their assistance for security. The	CC	SC

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility	
				Execution	Monitoring
			request will also be extended to Health Department for deputation of medical and paramedical staff during the operation. • Contractor will follow the prayer timing particularly at prayer of Juma and the workforce will observe the sanctity of religious properties. • Contractor will be required to instruct the construction crews and site supervisors in respect of archaeological site recognition, conservation procedures, and temporary site protection. • In case of a chance finding during excavation, the contractor will protect the site and notify the Engineer who will inform Department of Archaeology & Museums through Irrigation Department and hand over such sites to the department if instructed by Engineer / Irrigation Department.		

Table 8-2 Environmental Management Plan (Operation Phase)

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
C. Operation & Maintenance Phase				
1.	Damage to Infrastructure	Fatal accidents System sustainability	• BID to monitor the system regularly; • The important facilities that need attention and annual maintenance are embankment dam, falls and control structures and bed levels which are affected by siltation	EA Staff

S. No.	Aspect	Project Impact	Mitigation Measures	Responsibility
			or scour. The dam section has been designed to ensure safety by adhering to standard design principles. • The construction and rehabilitation of flood protection bunds as part of the project will be regularly checked to undertake any prone damage; • Repairs on urgent basis; and • Emergency response plan for Dam breach shall be followed, which is attached as **Annexure-4** of this report.	
2.	Biodiversity impact	Low impacts are envisioned for any biodiversity impacts since these are existing schemes and thus minimal risks are posed during the operation phase.	• Prohibit hunting of animals by Irrigation site staff • Prohibit any damage to terrestrial and aquatic flora and fauna.	EA Staff

Key: CC=Construction Contractor, DC=Design Consultant, EA=Executing Agency, SC=Supervision Consultant, PD = Project Director

8.2 Monitoring Parameters

721. A monitoring plan for the pre-construction/design and construction phases of the project, indicating environmental parameters, mitigation measures of the negative environmental impacts, responsible authority and frequency is provided below as Error! Reference source not found. and Error! Reference source not found. below.

722. During the procurement/pre-construction period, the monitoring activities will focus on (i) checking the contractor's bidding documents particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.

723. During the construction period, the monitoring activities will focus on ensuring that any required environmental mitigation measures are implemented to address possible impacts.

724. In general, the construction impacts will be manageable, and no insurmountable impacts are predicted, provided that the EMP is implemented to its full extent as required in the Contract documents. However, experience suggests that some Contractors may not be familiar with this approach or may be reluctant to carry out some measures. For the proposed project, in order that the Contractor is fully aware of the implications of the EMP and to ensure compliance, environmental measures must be costed separately in the tender documentation and listed as BOQ items, and that payment milestones must be linked to environmental performance, vis a vis the carrying out of the EMP.

725. The effective implementation of the EMP will be inspected as part of the loan conditions by both NDRMF and ADB, and as part of regulatory/NOC compliance by BEPA. In this regard, the PMU/CSC will guide the design engineers and Contractors on the environmental aspects and necessary EMP documentation.

Table 8-3: Pre-Construction' Environmental Monitoring Plan for Baseline Development

Parameter to be measured	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility	
						Implementation	Monitoring
Ambient Air Quality	To establish baseline air quality levels	CO, NO2 & PM10 (particulate matter smaller than 10 microns) concentration at receptor level, PM2.5	1-hr and 24-hr concentration levels	At one random receptor location at each of the sub-project sites.	Once	Contractor	CSC
Ambient Noise	To establish baseline noise levels	Ambient noise level near receptors in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour, and then averaged	At one random receptor location at each of the sub-project sites.	Once	Contractor	CSC
water Quality in vicinity of project area	To establish water quality in project area	water quality in project area	Water samples for comparison against NEQS parameters	At each of the sub-project locations.	Once	Contractor	CSC

Table 8-4: Construction Phase Monitoring Requirements

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Noise Disturbance due to noise from construction activity	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level at different locations in project area	A-weighted noise levels 24 hours, readings taken at 15 s intervals over 15 min. every hour at 15 m from receptors, and then averaged	At two random sensitive receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Air Quality Dust emissions from construction vehicles and equipment	To determine the effectiveness of dust control program on dust at receptor level	CO, NO2 & PM10 (particulate matter smaller than 10 microns), PM2.5 concentration at receptor level	1-hr and 24-hr concentration levels	At two random sensitive receptor locations in project area	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
		Visible dust	Visual observation of size of dust clouds, their dispersion and the direction of dispersion	Construction site	Once daily during peak construction period	Contractor's Environmental officer, CSC
Water quality monitoring for drinking water and wastewater	To determine the effectiveness of mitigation measures	As per WHO/NEQS	Water samples for comparison against NEQS parameters	Worker's camp and active construction site	Quarterly basis on a typical working day	Contractor's Environmental officer, CSC
Safety precautions by Safety workers	To prevent accidents for workers and general public	Number of near miss events and accidents taking place	Visual inspections	Construction site	Once Daily	Contractor's Environmental officer, CSC

Soil Contamination	To prevent contamination of soil from oil and toxic chemical spills and leakages	Incidents of oil and toxic chemical spills	Visual inspections	At construction site and at vehicle and machinery refueling & maintenance areas	Once a month	Contractor's Environmental officer, CSC
Solid Waste & Effluent disposal Insufficient procedures for waste collection, storage, transportation and disposal	To check the availability of waste management system and implementation	Inspection of solid and liquid effluent generation, collection, segregation, storage, recycling and disposal will be undertaken at all work sites in project area	Visual inspections	At work sites in project area	Once daily	Contractor's Environmental officer, CSC

8.3 Environmental Training

8.3.1 Capacity Building and Training

726. Capacity building and training programs are necessary for the project staff in order to control the negative impacts resulting from the project construction and during its operation phase. They will also require trainings on monitoring and inspecting of such a project for environmental impacts and for implementation of mitigation measures.

727. The details of capacity building and training program are presented in the Error! Reference source not found..

Table 8-5: Capacity Development and Training Programme

Provided by	Organized by	Contents	Target Audience	Venue	Duration
Pre-construction Phase PMC offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan Group exercise and participatory workshop to measure effectiveness of program	Contractor staff	BID Office	One day long training seminar including group exercise/workshop
Construction Phase PMC offering specialized services in social management and monitoring	CSC & PMU	Short seminar on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues Group exercise and participatory workshop to measure effectiveness of program	Contractor staff	BID Office	One day long training seminar including group exercise/workshop

8.4 Environmental Management Costs

728. The **Error! Reference source not found.** below provides cost estimates for 'Pre-Construction phase' monitoring while **Error! Reference source not found.** provides cost estimates for 'Construction phase' monitoring of key environmental parameters.

729. The costs associated with implementation of the EMP and the necessary mitigation measures are provided as

730. below. The **Error! Reference source not found.** below provides the cost for capacity development and training programme for project contractors for the proposed sub-projects.

Table 8-6: Annual Cost Estimates for 'Pre-Construction Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Air Quality[21]	CO, NO2, SO2, O3 PM10, PM2.5	24 (Once only at each of the 24 sub-project)	720,000	24 readings @ PKR 30,000 per sample
Noise Levels[22]	dB(A)	24 (Once only at each of the 24 sub-project	144,000	24 readings @ PKR 6,000 per reading
Groundwater Quality	BEQS /NEQS	24 (Once only at each of the 24 sub-project	480,000	24 readings @ PKR 20,000 per sample
Surface water Quality	BEQS /NEQS	24 (Once only at each of the 24 sub-project	480,000	24 readings @ PKR 20,000 per sample
Contingencies			91,200	5% of monitoring cost
Total (PKR)			**1,915,200**	

[21] For air quality monitoring: 'Passive samplers' such as test tubes can be used or 'Active samplers' with sorbent tubes can also be used

[22] For noise monitoring: sampling equipment with duration greater than 1 hour can be used.

Table 8-7: Annual Cost Estimates for 'Construction Phase' Environmental Monitoring

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Surface water Quality	NEQS / WHO	48 (Quarterly basis at 24 locations)	960,000	48 readings @ PKR 20,000 per sample
Ground water quality	NEQS / WHO	48 (Quarterly basis at 24 locations)	960,000	48 readings @ PKR 20,000 per sample
Air Quality	CO, NO2, PM10, PM2.5	48 (Quarterly basis at 24 locations)	1,440,000	48 readings @ PKR 30,000 per sample
Noise Levels	dB(A)	48 (Quarterly basis at 24 locations)	288,000	48 readings @ PKR 6,000 per reading
Total				**3,648,000**
Contingencies			182,400	5% of monitoring cost
Total (PKR)			**3,830,400***	

*Subject to monitoring requirements of EPAs as per conditions of Environmental Approval for construction phase.

Table 8-8: Estimated Costs for EMP Implementation

Item	Sub-Item	Estimated Total Cost (PKR)
Contractor Environment Specialist	2 persons for 7 months (@ 100,000 per month)	**1,400,000**
Monitoring Activities	Provided separately in Tables 8.6 and 8.7.	-
Mitigation Measures	As prescribed under EMP and IEE.	**5,200,000**
(i) Water sprinkling	To suppress dust emissions	1200,000
(ii) Solid waste collection & disposal (including hazardous waste)	From construction sites (based on initial estimates)	1,800,000
(iii) Cost of Hard Barricades	Provision of hard barricades in case the trench is 1.5 meter deep	1,200,000

(iv) SSEMP preparation and Implementation	Preparation and Implementation of SSEMP	1,000,000
Total		**6,600,000**
Contingencies	5% of EMP implementation cost	330,000
Total Estimated Cost (PKR)		**6,930,000**

Table 8-9: Cost of Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	No.of training events	Duration	Cost (PKR)
Pre-construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Two seminars for Contractor management staff and project staff	1 day	100,000
Construction Phase Monitoring Consultants / Organizations offering specialized services in environmental management and monitoring	CSC & PMU	Short seminars on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Two seminars for Contractor management staff and project staff dealing in environment and social issues	1 day	100,000
Total			**200,000 (PKR 0.2 million)**		

8.5 Performance Indicators

731. For evaluating the performance of the environmental management and monitoring plan, performance indicators are identified for the efficient and timely implementation of measures/actions proposed in EMP. The indicators are defined both for the implementation phase and for the operation phase. QA/QC Consultant will be responsible for compiling the information on these indicators and report to PMU.

732. To measure the overall environmental performance of the project, a list of performance indicators is given below:

- The number of inspections carried out by environmental team of CSC per month.
- The number of non-compliances observed by CSC.
- Availability of environmental, and OHS specialists in CSC .
- Availability of environmental, and OHS specialists with Contractors.
- Timely reporting of documents (as defined in EMMP and monitoring plan).
- Number of training imparted to stakeholders/other capacity building initiatives.
- Number of grievances received.
- Number of grievances resolved.
- Number of constructions related accidents.

9. GRIEVANCE REDRESSAL MECHANISM

9.1 General

733. This section deals with the Grievance Redressal Mechanism (GRM) to be developed for proposed sub-projects. The proposed project, at stage of construction may involve some disturbance to local community and thus this GRM is necessary for the successful resolution of potential disputes.

734. The ADB Policy (SPS 2009) requires establishment of a local grievance redress mechanism to receive and facilitate resolution of concerns and grievances regarding the project's social and environment performance. The measures have been identified to mitigate any potential environmental and social impacts to be caused due to implementation of the project works.

735. However, despite of best efforts, there is chance that the individuals / households affected by the project or other stakeholders are dissatisfied with measures adopted to address adverse social impacts of the project. To address, such situation an effective GRM will be established at the time of award of contracts to ensure timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their objections and the GRM would address such issues adequately. It will receive, evaluate and facilitate the resolution of complaints and grievances about the social and environmental performance at the level of the project.

736. The GRM will aim to investigate charges of irregularities and complaints received from any displaced persons and provide a time-bound early, transparent and fair resolution to voice and resolve social and environmental concerns link to the project.

737. The PMU shall make the public aware of the GRM through public awareness campaigns. The name of contact person(s) and his/her phone number, PMU contact numbers will serve as a hotline for complaints and shall be publicized through the media and placed on notice boards outside their offices, construction camps of contractors, and at accessible and visible locations in the project area. The project information brochure will include information on the GRM and shall be widely disseminated throughout the project area. Grievances can be filed in writing, via web-based provision or by phone with any member of the PMU.

First tier of GRM:

738. The PMU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The PMU staff for environment and social safeguards will be designated as the key officers for grievance redressal. Resolution of complaints will be completed within seven (7) working days. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included, unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

739. Initial grievance sheet (including the description of the grievance), with an acknowledgement of receipt handed back to the complainant when the complaint is registered;

740. Grievance monitoring sheet, mentioning actions taken (investigation, corrective measures);

741. Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

742. The updated register of grievances and complaints will be available to the public at the PMU office, construction sites and other key public offices in the project area. Should the grievance remain unresolved, it will be escalated to the second tier.

Second Tier of GRM:

743. The PMU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU, who will pass unresolved complaints upward to the Grievance Redress Committee (GRC). The GRC will be established by PMU before start of site works. The GRC will consist of the following persons: (i) Project Director; (ii) representative of district government; (iii) representative of the affected person(s); (iv) representative of the local deputy Commissioners office (land); and (v) representative of the BEPA (for environmental-related grievances). A hearing will be called with the GRC, if necessary, where the affected person can present his/her concerns/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. The Contractor will have observer status on the committee. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

744. The functions of the local GRC are as follows: (i) resolve problems and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social issues and land acquisition (temporary or permanent if any); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons (if any at any stage of project), categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

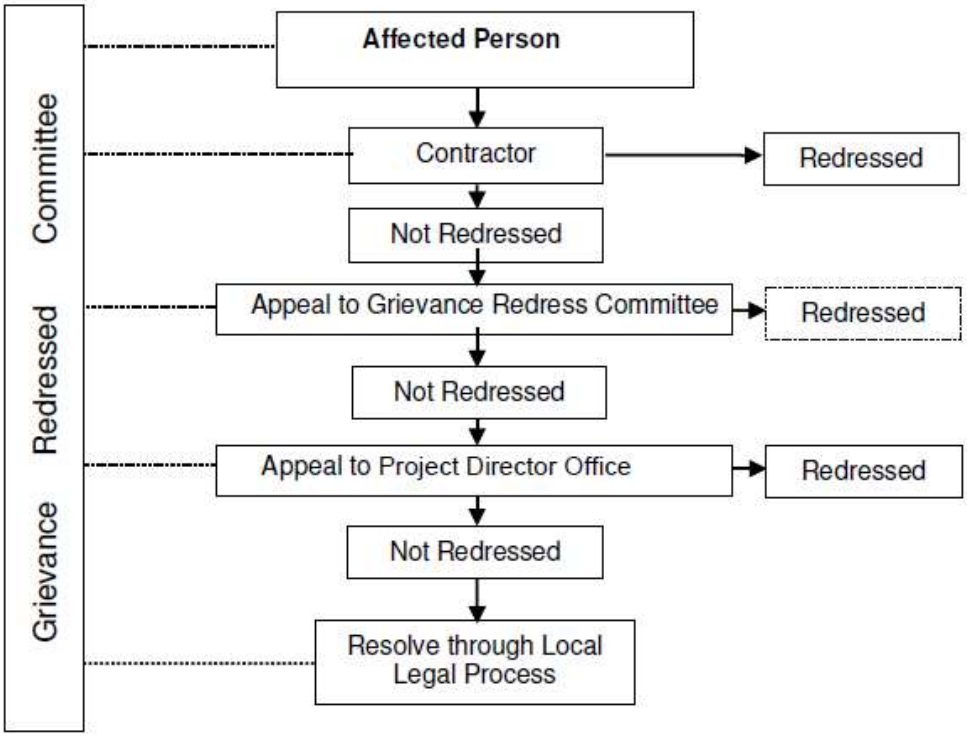
745. The PMU officers will be responsible for processing and placing all papers before the GRC, maintaining a database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

Third tier of GRM:

746. In the event that a grievance cannot be resolved directly by the PMU (first tier) or GRC (second tier), the affected person can seek alternative redressal through the district or sub-district committees, as appropriate. The PMU or GRC will be kept informed by the district, municipal or national authority. The grievance redress mechanism Process Flow Diagram (PFD) is provided in the **Figure 9-1** below. The monitoring reports of the EMP implementation will include the following aspects pertaining to progress on grievances: (i) Number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases;

and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e. open, closed, pending). In order to provide greater clarity, the pictorial description of the GRM is provided in **Figure 9-1** below.

Figure 9-1 Process Flow Diagram of Grievance Redressal Mechanism



9.2 Grievance Redress Committee (GRC)

747. A Grievance Redress Committee will be notified under the project for all proposed schemes in the Project Implementation Unit (PIU) and will be chaired by the Project Director.

- The GRC's members phone number, fax, address, email address will be disseminated to the people through displays at the respective irrigation offices, and at all the project sites of target district. In case of civil works construction contractor will also display this information prominently at their site offices.
- The GRC will log complaint and date of receipt onto the complaint database and inform the E&S staff at PIU level
- The GRC will instruct contractors and Grievance Focal Person (GFP) to refer any complaints that they have received directly to the GRC
- The GRC, with the contractors and GFPs, will investigate the complaint to determine its validity, and to assess whether the source of the problem is due to project activities, and identify

appropriate corrective measures. If corrective measures are necessary, GRC, through the GFPs, will instruct the contractors to take necessary action

- The GRC will inform the Complainant of investigation results and the action taken
- The GRC will review the Contractors response on the identified mitigation measures, and the updated situation
- The GRC will undertake additional monitoring, as necessary, to verify as well as review that any valid reason for complaint does not recur

748. During the complaint investigation, the GRC should work together with the contractors and GFPs. If mitigation measures are identified in the investigation, the contractor will promptly carry out the mitigation. GFPs will ensure that the measures are carried out by the contractor and community representatives in plantation interventions.

749. The PIU will establish a Grievance Redress Committee (GRC) with the following composition:

- Project Director Head of PIU (Chairman)
- Environment and Social Specialist PIU (Member)
- Project Manager Contractor (Grievance Focal Person)
- Environment and Social Specialist Contractor (Member)
- Community Representatives at least two (Members)

10. CONLUSIONS AND RECOMMENDATIONS

10.1 GENERAL

750. This section presents the major conclusions and key recommendations of the IEE study.

Findings and Recommendations

751. This study was carried out at the planning stage of the project. Predominantly both primary and secondary data with site reconnaissance were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The report has provided a picture of all potential environmental impacts associated with the subprojects and recommended suitable mitigation measures.

752. There are some further considerations for the planning stages such as submission of IEE report to BEPA for grant of No Objection Certificate for the proposed subproject interventions under Balochistan Environmental Protection Act 2012.

753. No land acquisition or involuntary settlement is involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence.

754. The environmental impacts from the project will mostly take place during the construction stage. The impacts are likely to be similar at most locations and impacts have been reviewed in the relevant section of this IEE report.

755. Environmental impacts during the construction phase are related to the establishment of campsite which are temporary and can be minimized with better management. Construction worker camps will not necessarily be based on the scale of the works needed. If for some unforeseen reason a larger workforce is needed, the construction camp will not be located in settlement areas or near sensitive water resources and will be provided with lavatories. Local employment will be preferred to avoid cultural conflicts.

756. This project entails various significant impacts across different stages. The potential threat of severe flooding requires adherence to hydrological findings and pre-construction validation. Seismic considerations should be integrated into the detailed design, following seismic criteria. Proper disposal of soil material is crucial to prevent negative environmental effects. Noise pollution and air quality degradation should be controlled by adhering to noise and emissions standards. Waste generation necessitates a waste management plan and training for workers. Wildlife impacts, including mammals, reptiles, avian fauna, and flora, should be minimized through no-hunting policies, habitat protection, and avoiding disturbances. Traffic and safety hazards demand traffic management plans, immediate repairs, and safety protocols for workers. Local water resource usage necessitates prior approvals and adherence to local regulations. To maintain system sustainability, dam breach and structural damage risks must be monitored, addressed through community engagement, and managed with a comprehensive emergency response plan.

757. The restoration and rehabilitation of the Check dam and Flood Protection Bunds subproject will bring various benefits. Firstly, it will involve the restoration and strengthening of dams, ensuring their

long-term functionality and resilience. Additionally, measures will be taken to stabilize slopes, minimizing the risks of landslides and erosion. The improved condition of the dams will extend their operational life, enabling continued benefits such as water storage and flood control. The subproject will also contribute significantly to groundwater recharge. It aims to protect the local population from the havoc caused by floods, as well as safeguard physical infrastructure, reducing the need for costly repairs and disruptions. Furthermore, the implementation of the subproject will lead to a reduction in flood peaks and damages downstream, mitigating the adverse effects of flooding on surrounding populations. Moreover, it will provide opportunities for livelihood and promote production activities, fostering economic growth and development in the area.

758. The proposed project does not impact biological component of the area, at construction phase as well as its operation phase. However, the project is likely to bring significant change in opportunities for the community and its surrounding ecosystem in the form of social uplift, agricultural productivity and prosperity.

759. Careful planning and management is recommended to avoid air pollution and generation of solid waste during construction phase especially during storage & transport of overburden soil.

10.2 Conclusions

760. As the project is exclusively an irrigation system, all identified adverse environmental impacts during the rehabilitation and improvement works of the project will be of minor to moderate in nature, easily to be mitigated by adequate implementation of the Environmental Management and Monitoring Plans. Entire command of the project components does not include any environmentally sensitive areas or threatened species. The measures taken to adequately mitigate negative impact in the construction phase will be the most important task. Implementation of proposed mitigation measures are deemed to be sufficient for negating the potentially identified impacts. The supervision of the mitigation measures provided in the contractor's documents is the key for completing this project in an environmentally sound manner.

761. The final conclusion is that, the project is environmentally safe and socially acceptable project.

762. A few, essentially minor, negative residual impacts identified in the Impact Assessment during the feasibility study design are all unavoidable and there are no technically or economically feasible alternatives which would remove them altogether.

ANNEXURES

Annexure 1: Rapid Environmental Assessment Checklist

The projects are screened through Rapid Environmental Assessment (REA) checklist to determine environmental categorization. The environmental and social rapid screening depicts that:

(i) the subproject will not require any land acquisition;
(ii) the subproject will not involve any involuntary resettlement
(iii) the subproject does not fall in any protected area.

Screening Questions	Yes	No	Remarks
A. Project Site Is the project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Protected Area		✓	
▪ Wetland		✓	
▪ Mangrove		✓	
▪ Estuarine		✓	
▪ Buffer zone of protected area		✓	
▪ Special area for protecting biodiversity		✓	
B. Potential Environmental Impacts Will the proposed project cause…….			
▪ Loss of precious ecological values (e.g. result of encroachment into forest/swampland or historical/cultural buildings/area, disruption of hydrology of natural waterways, regional flooding and drainage hazards)?		✓	
▪ Conflicts in water supply rights and related social conflicts?		✓	
▪ Impediments to movements of people and animals?		✓	
▪ Potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		✓	
▪ Insufficient drainage leading to salinity intrusion		✓	
▪ Over pumping of groundwater, leading to salinization and ground subsidence?		✓	Limited use of water for project activities which will not be significant
▪ Impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?		✓	
▪ Dislocation or involuntary resettlement of people?		✓	No dislocation or involuntary resettlement of people will occur
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups		✓	
▪ Potential social conflicts arising from land tenure and land use issues?		✓	No land acquisition will be required
▪ Soil erosion before compaction and lining of canals?			N/A

Screening Questions	Yes	No	Remarks
▪ Noise from construction equipment?	✓		It will be managed through mitigation measures and will be documented in EMP
▪ Dust during construction?	✓		It has moderate Impact for labors during construction, but It will be managed by water sprinkling. Dust generated will be managed through sound planning and good management practices with implementation of EMP
▪ Waterlogging and soil salinization due to inadequate drainage and farm management?		✓	
▪ Leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?		✓	
▪ Reduction of downstream water supply during peak seasons?		✓	
▪ Soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?		✓	
▪ Soil erosion (furrow, surface)?		✓	
▪ Scouring of canals?		✓	
▪ Clogging of canals by sediments?		✓	
▪ Clogging of canals by weeds?		✓	
▪ Seawater intrusion into downstream freshwater systems?		✓	
▪ Introduction of increase in incidence of waterborne or water related diseases?		✓	
▪ Dangers to a safe and healthy working environment due to physical, chemical and biological hazards during project construction and operation?	✓		The subprojects do not involve usage of any hazardous chemicals during construction. However, health and safety measures for laborers will be taken to implement HSE Plan that will be developed and documented in EMP
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	✓		Local people will be employed as much as possible from close by villages/ towns and the same will be documented in EMP
▪ Social conflicts if workers from other regions or countries are hired?	✓		Priority will be given to local for employment and the same will be documented in EMP

Screening Questions	Yes	No	Remarks
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		Earth work will not lead to any risk for community during construction time, however, Health and safety Plan and Emergency response procedures will be prepared and implemented. The same will be documented in EMP.
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., irrigation dams) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		Safety measures for community will be taken to avoid any risk and consequence. It will be documented in EMP. However, it has major positive impact, because the construction of the new dam will save community/infrastructure from flood threat if any.
Climate Change and Disaster Risk Questions			
▪ The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	**Yes**	**No**	**Remarks**
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	✓		Project area is prone to floods and earthquakes. Appropriate engineering measures to minimize negative impacts, such as designing water diversion structures on the basis of calculating 500 years return period of Nullahs to maintain downstream flows and considering seismic resilience in construction.
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased glacial melt affect delivery volumes of irrigated water; sea level rise increases salinity gradient such that source water cannot be used for some or all of the year)?	✓		climate resilience considerations will be incorporated into the project design and Restoration and rehabilitation of water conservation structures will be done
▪ Are there any demographic or socio-economic aspects of the Project area that		✓	

Screening Questions	Yes	No	Remarks
are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?			
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by diverting water in rivers that further increases salinity upstream, or encouraging settlement in earthquake zones)?		✓	

Annexure 2: Validation of IBAT Proximity Report

Scientific Name	Common Name	Red List Category	Validation Status (Local survey)	Validation Status (Literature Review)
Schizothorax plagiostomus	Snow Trout	VU	Not found	Reported in only Zhob River of Balochistan[23]
Triplophysa brahui	Brahui Loach	EN	Not found	Reported in Pishin Lora Basin in 1990[24]
Schizocypris brucei	Waziristan snowtrout	VU	Not found	According to IUCN Red List, geographically not present in Balochistan
Bagarius bagarius	Goonch	VU	Not found	only reported in Hub dam Reservoir[25]
Geoclemys hamiltonii	Spotted Pond Turtle	EN	Not found	According to the IUCN Red List, Balochistan is not within the geographic range of these species.
Hardella thurjii	Crowned River Turtle	EN	Not found	
Nilssonia gangetica	Indian Softshell Turtle	EN	Not found	
Nilssonia hurum	Indian Peacock Softshell Turtle	EN	Not found	
Pangshura tecta	Indian Roofed Turtle	VU	Not found	
Lissemys punctata	Indian Flapshell Turtle	VU	Not found	
Wallago attu	Mullee	VU	Not found	Reported only in Pat Feeder Canal of Balochistan[26]
Tor putitora	Golden mahseer or Himalayan mahseer	EN	Not found	Tor putitora is reported in Bolan River[27] and Zhob River[28] Balochistan
Glyptothorax punjabensis	Punjab Loach	EN	Not found	According to the IUCN Red List, Balochistan is not within the geographic range of these species.
Glyptothorax stocki		EN	Not found	
Naziritor zhobensis	Zhobi mahseer	EN	Not found	Reported in Zhob River, Balochistan[29]
Paraschistura punjabensis	Punjab Loach."	VU	Not found	According to the IUCN Red List, Balochistan is not within the geographic range of this species.
Schistura kohatensis	Kohat loach.	VU	Not found	Its local name is Kohat Loach. Reported in KP[30] and not in Balochistan

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28 Baz Gul, Dr. M. Iqbal, Dr. Ghulam Rabbani, Dr. Sanaullah Khan (2018), Fish fauna of River Zhob and Anambar; IJB, V13, N2, August, P271-275

29 Mirza, M.R.; Javed, M.N. A note on the Mahseer of Pakistan with the description of Naziritor a new subgenus (Pisces: Cyprinidae) Pakistan J. Zool 1985, 17: 225–227

30 Mirza, M. R.; Nalbant, T. T.; Bănărescu, P. M. (1981). A review of the genus Schistura in Pakistan with description of new species and subspecies (Pisces, Cobitidae, Noemacheilinae). Bijdragen tot de Dierkunde. v. 51 (no. 1): 105-130

Scientific Name	Common Name	Red List Category	Validation Status (Local survey)	Validation Status (Literature Review)
Schistura pakistanica	Pakistan Loach	VU	Not found	Reported in Zhob River, Balochistab[31]

31 Mirza. M.R. and M.N. Javed. 1995. Final report on fish survey of the river Zhob. Pakistan, pp: 1-22.

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Integrated Biodiversity Assessment Tool

MULTI-SITE REPORT
IBAT REPORTS-PISHIN REAS-NDRMF

Number of sites selected: 24

Buffer applied: 5.0 km

Date of analysis: 30 August 2023 (GMT)

Generated by: Shazia Shahid

Organisation: ADB

About this report

The Multi-site Report serves to improve the inclusion of biodiversity within annual sustainability reporting. The report enables users to assess the biodiversity-related features of multiple operational sites for corporate disclosure. In particular, this report is relevant for Global Reporting Initiative (GRI) standard GRI 304: Biodiversity. For each operational site chosen by the user, the following biodiversity-related features are provided: counts of protected areas and Key Biodiversity Areas (KBAs) within the selected radius of operational sites, counts of Critically Endangered, Endangered and Vulnerable IUCN Red List species that are potentially found within a 50 km radius. Scores associated with the Species Threat Abatement and Restoration Metric are also provided to allow users to determine the relative opportunities for positive biodiversity action at sites.

Report package contents

This report is part of a package generated by IBAT on 30 August 2023 (GMT) which includes the following files:

1. This PDF report.
2. PDF "README" containing recommended use of IBAT, limitations, and glossary.
3. Compressed CSV file "iucn_red_list" containing the total number of IUCN Red List species by level of extinction risk within 50 km buffer of each operational site.
4. Compressed CSV file "protected_areas" containing names and designations of protected areas found within the selected buffer of each operational site.
5. Compressed CSV file "sites_of_biodiversity_importance" containing names of Key Biodiversity Areas (and details such as biodiversity elements triggering identification of the KBA) found within the selected buffer of each operational site.
6. Compressed CSV file "overlaps" listing the operational sites and the numbers of protected areas and Key Biodiversity Areas that occur within the selected buffer of each operational site.
7. Compressed CSV file "species_threat_abatement_and_restoration_star" listing the total and mean STAR Threat Abatement and STAR Restoration scores for each operational site.

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Overlap with protected areas and Key Biodiversity Areas (KBAs)

The following table shows the number of protected areas and KBAs overlapped by a 5.0 km buffer for each operational site where an overlap occurs.

Site	Area (km²)	Protected Areas	KBAs

% Summary of protected areas overlap

- 0 (0.00% of sites) are within 5.0 km of a protected area.
- 24 (100.00% of sites) are not within 5.0 km of a protected area.

% Summary of KBAs overlap

- 0 (0.00% of sites) are within 5.0 km of a Key Biodiversity Area.
- 24 (100.00% of sites) are not within 5.0 km of a Key Biodiversity Area.

IUCN Red List of Threatened Species

The following table shows counts of species categorized as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) under the IUCN Red List of Threatened Species and found within 50 km of each site. For counts of all IUCN Red List species within a 50 km radius of each site please refer to the "iucn_red_list" CSV file located in the download package.

Site	CR	EN	VU	TOTAL
1- Bund Khoshdil Khan-Pishin	1	5	15	21
10-Khoudadzai FPS-Pishin	1	6	14	21
11-Kar Dam-Pishin	1	6	15	22
12-Surchah Delay Action Dam-Pishin	2	5	13	20

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List of selected operational sites assessed in this report

1- Bund Khoshdil Khan-Pishin, 10-Khoudadzai FPS-Pishin, 11-Kar Dam-Pishin, 12-Surchah Delay Action Dam-Pishin, 13-Chengai CD-Pishin, 14-Wachobi Dam-Pishin, 15-Surkai Ghez Dam- Pishin, 16-Pani Shakh Dam-Pishin, 17- Aizai Dam-Pishin, 18- Khchani Tamark Check Dam Pishin, 19-Mandan Dam-Pishin, 2- Thora Murgha Dam-Pishin, 20- Ghargai D.A Dam-Pishin, 21-Bostan Dara Dam-Pishin, 22.Dargai Delay Action Dam-Pishin, 23. Shadaa Dam Toba Kakari Shasa M. Dam, 24- Nanai Jalak Dam-Pishin, 3-Weir and Earthen Bund Khanai Baba, 4- Khazoai Balozai Headwork (pishin), 5-Khazoai Delay Action Dam, 6- Kezh Dam (Pishin), 7-Khasro Dam-Pishin, 8-FPB Sarila , Maruzakai,Bagarzai-Pishin, FPW Poti Mangalzai, Mehrab Kech,Pishin

Recommended citation

IBAT Multi-site Report. Generated under licence 1400-48166 from the Integrated Biodiversity Assessment Tool on 30 August 2023 (GMT). www.ibat-alliance.org

Limitations

This report provides an indication of potential biodiversity related features; protected areas, Key Biodiversity Areas and species close to the specified location. While it provides an early indication of potential biodiversity concerns, the report does not provide details of potential direct, indirect, downstream or cumulative impacts. Furthermore, the report provides a set of conservation values sourced from global data sets and is not a substitute for additional investigation and due diligence, especially concerning national and/or local conservation priorities.

Subproject wise Threatened Species predicted by IBAT

Subproject No.	Name of Dams	Name of Species	Red List Category
Fish Species			
1	Bund Khushdil Khan	Schizothorax plagiostomus	VU
2	Thora Murgha Dam and Weir		
3	Weir and Earthen Bund Khanai Baba		
4	Khazoai Balozai Headworks		
5	Khazoai Delay Action Dam		
6	Kezh Dam		
8	Flood Protection Bund of Sarila Manzakai Bagarzai		
9	Flood Protection Wall Poti Mangalzai Mehrab Kech	Triplophysa brahui	EN
16	Pani Shakh Dam		
10	Khoudadzai Flood Protection Scheme		
17	Aizai Dam		
18	Khchani Tamark Check Dam		
19	Mandan Dam		
21	Bostan Dara Dam		
22	Dargai Delay Action Dam		
24	Narai Jalak Dam		
14	Wachobi Dam	Schizothorax plagiostomus Bagarius bagarius	VU VU
13	Chengai Begharzai Check Dam	Schistura pakistanica Schizothorax plagiostomus Bagarius bagarius	VU VU VU
15	Surkai Ghez Dam	Schizothorax plagiostomus	VU
7	Khasro Dam		
12	Surchah Delay Action Dam		
20	Ghargai DA Dam		
23	Shadaka Dam & Shasa Muhammadzai Dam		
11	Kar Dam	Schizothorax plagiostomus	VU
		Bagarius bagarius	VU
		Wallago attu	VU
		Tor putitora	VU
		Glyptothorax punjabensis	EN
		Glyptothorax stocki	EN
		Naziritor zhobensis	EN
		Paraschistura punjabensis	VU
		Schistura kohatensis	VU
		Schistura pakistanica	VU
Reptiles			
11	Kar Dam	Geoclemys hamiltonii	EN
		Hardella thurjii	EN
		Nilssonia gangetica	EN
		Nilssonia hurum	EN
		Pangshura tecta	VU
		Lissemys punctata	VU

Annexure 3: Attendance Sheets

List of Participants

Pani Shakh Dam 14-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Ubaid ullah	Teacher	0334-1898120
2)	Kaleem ullah	Teacher	0333-6579886
3)	Muhammad Ajmal	Teacher	03318358954
4)	Saifullah	Farmer.	0333318
5)	Rafi ullah	Farmer	03138372914
6)	Dur, Muhammad	Farmer	
	=		

Bund of Sarila Habibzai

Mankazai, Bagarzai **List of Participants** 15-7-2023

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Haji Qadeem	0306-3447794 Farmar	
2)	Syed, Sanaullah	037-3024097- Hotel	
3)	Shabir Ahmed	Hotel	
4)	M. Qasim	Farmar	
5)	Syed Abdullah	0301-2537160 Farmar	
	=		

Bashore Nala.

List of Participants 15-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Ubaid-ul Allah	0333-7797346 Molvi	
2)	M. Naseem	0333-3097496 Teacher	
3)	M. Saleem	0335-0234259 Farmar	
4)	M. Qasim.	Farmar	
5)	Abdul Salam	Farmar.	
	=		

0335-0234259
0332377 86067

Band Khashdil Khan

List of Participants

15-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Qurban Ali	Govt. Nadra 0301-2333990	
2)	M. Anwar	Bussiness 03422362826	
3	Zaffar ul Allah	Govt. Servant	
4)	M, Asif	Shop Keeper	
5)	Haji Shah Muhamm	Farmer.	
	=		

0301-3894696

S.3

Band Khangi
BABA

List of Participants

20.7.23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Fida Muhammad	0312-8611627 Govt. employ.	
2)	Mufti Ameen	0315-3980493 Land Lord	
3)	H. Wali Muhammad	Social Activitest Farmer	
	=		

S.10 Khoodadzai **List of Participants** 15-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Malik Hafeez	03333354873 Naib Resaldar	
2)	Ehsan ul Allah	03K-8040761 Constable	
3)			
	=		

S.24 Narin Jalak DAM

List of Participants 26-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Rozi Khan	0302-9408887 Councelor	
2)	Khageel Muhammad	0303-2266590 Trader.	
3)	Ameen ul Allah	0312-8991875 Farmer	03[illegible]2877032
4)	Ashraf.	Farmer.	
5)	Ain ul Allah.		
	=		

S.14. (Mandan DAM) **List of Participants** 26-7-23

Sr. No.	Name	Occupation	Signature/ Thumb
1)	Dr. Mula Dad	0313-8205421 Chairman	
2)	Tameel Ahmed	Govt. emp Education dep	0313-85 44483.
3)	Zahoor Ahmed	Land Local Farmar	
4)	Abdul Baki	0301-3704696 Govt. employ.	
5)	Tajmoor Shah	0306-2492473 Farmar -	Tajmoor Shah
6)	Zaffar ul Mulk	0301-3700655 Food department	
	=		

Khanozai Dam 26-7-23

1-S-5

S)	Name	occupation	Signature
1)	Akhunzada Qutub taban	0300-3059377 Social worker Land owner Bussiness	
2)	Haji Muhammad AkBar	Farmar commitee member-	
3)	Ahmed Zeshan.	Bussiness 03002930568	

4)

Annexure 4:Emergency Response Plan for Breach of Dam

1. DAM EMERGENCY PLAN

The purpose of this Dam Emergency Plan (DEP) is to reduce the risk of human life loss and injury and minimize property damage during an unusual or emergency event at proposed project.

This DEP has been prepared with the intent of coping and responding to the disaster in case of dam failure or breaching.

2. BASIC DAM DESCRIPTION

This project will be implemented for restoration and rehabilitation of 24 dam sites that have received severe damages during Recent High Intensity Rainfall in July and August 2022. Details of dams and damage Nomenclature are presented in below Table

Sr. No.	Name of Scheme	District	Coordinates		Name (Damage Nomenclature)
			Latitude (N)	Longitude (E)	
1.	Bund Khoshdil Khan	Pishin	30°42'38.00"	67°5'13.84"	Earthen Embankment, Gated Spillway
2.	Thora Murgha Dam	Pishin	30°46'56.18"	67°11'22.15"	Weir, Stilling Basin
3.	Weir and Earthen Bund Khanai Baba	Pishin	30°29'39.81"	67°6'32.75"	Weir, Protection Bund, F.P Wall, Flood Channel
4.	Khazoai Balozai Headwork	Pishin	30°38'40.47"	67°23'1.93"	Cutoff wall, Gabion Apron, Feeding Cannel
5.	Khazoai Delay Action Dam	Pishin	30°37'35.04"	67°20'51.83"	Dam Body, Flood Channel, Culvert
6.	Kezh Dam	Pishin	30°58'12"	67°30'3"	Dam Body, Spillway
7.	Khasro Dam	Pishin	30°59'57.46"	67°36'10.02"	Dam Body, Spillway
8.	Flood Protection Bund of Sarila Habibzai, Manzakai and Bagarzai	Pishin	30°41'59.03"	67°2'20.99"	Bund
9.	F.P Wall Poti Mangalzai Mama Nikah and Mehrab Kech	Pishin	30°45'10.36"	67°12'17.43"	F.P Wall
10.	Khoudadzai Flood Protection Scheme	Pishin	30°35'44.89"	66°56'52.89"	Abutment Wall, Bund, Stilling Basin, Weir
11.	Kar Dam	Pishin	30°55'35.60"	67°37'23"	Dam Body, Spillway, F.P Wall
12.	Surchah Delay Action Dam	Pishin	31°06'22"	67°18'26"	Dam Body
13.	Chengai Begharzai Check Dam	Pishin	30°52'16"	67°31'44"	Dam Body, Spillway

14.	Wachobi Dam	Pishin	30°58'40.29"	67°39'57.84"	Dam Body, Spillway
15.	Surkai Ghez Dam	Pishin	31°02'33.86"	67°34'15.36"	Dam Body, Spillway
16.	Pani Shakh Dam	Pishin	30°35'19"	67°37'23"	Dam Body, Spillway
17.	Aizai Dam	Pishin	30°36'42.57"	66°58'3.83"	Spillway
18.	Khchani Tamark Check Dam	Pishin	30°42'14"	67°10'09"	Spillway
19.	Mandan Dam	Pishin	30°41'12"	67°24'38"	Spillway
20.	Ghargai D.A Dam	Pishin	30°59'8.8"	67°21'0"	Dam Body, Spillway
21.	Bostan Dara Dam	Pishin	30°23'45.66"	67°1'25.54"	Spillway
22.	Dargai Delay Action Dam	Pishin	30°46'8.84"	67°7'9.54"	Dam Body
23.	Shadaka Dam Toba Kakari and Shasa Muhammadzai Dam	Pishin	30°58'20" 30°45'15.23"	67°24'47" 67°25'7.84"	Dam Body
24.	Narin Jalak Dam	Pishin	30°42'14.28"	67°21'27.64"	Spillway

The Scope of work for this project includes following design of interventions related to all components of this subproject.

a) Restoration of Water Conservation Structures (Small Dams, Check Dams, Delay Action Dams, Spillways, Outlet Works)
b) Restoration of River Training / Flood Mitigation Structures

2. Disaster Risk Management

Disasters can be divided into four major phases:

1. Non-Disaster Phase
2. Pre-Disaster Phase
3. During-Disaster Phase
4. Post-disaster phase

PRE-DISASTER PHASE

1. Use Guidance notes provide as **Annexure A** of this document, to quality of emergency.
2. In the event of any emergency / disaster, inform the relevant following departments:

Level	Agency	Contact Person Details (to be updated)
National Level	National Disaster Management Authority (NDMA)	Prime Minister's Office,2nd Floor Sector G-5-1, Constitution Avenue, Islamabad Post Code 44000
Provincial Level	Administration, Infrastructure & Coordination Department (AI&C)	Secretary 091-9214013 Director Irrigation 091-9212149
	Provincial Disaster Management Authority (PDMA)	Emergency Help line: 081-111-400-400 Assistant Director Admin Phone: (92-42) 99203302, 36375526
District Level	Provincial Disaster Management Authority (PDMA)	Deputy Commissioner (DC) Pishin District

	Administration such as Assistant Commissioner (AC)	AC Pishin
Dam Level	Dam Operator	Sub Divisional Officer Irrigation

3. Provincial Disaster Management Authority and its field office in Pishin District Administration of the Pishin District, to prepare Evacuation Plan for events such as Dam failure including evacuation area and route. They should have an idea of the population that will need to be evacuated.
4. Provincial Disaster Management Authority (PDMA) and District Administration should also initiate capacity building and train local community for such events.

DISASTER PHASE

The following are the basic emergency planning and response roles and responsibilities for the key agencies involved when an emergency occurs.

1. Merged Areas Secretariat to undertake appropriate remedial actions as given in **Annexure B** of this document.
2. Issue immediate evacuation warnings to people in the vicinity of the dam likely to be affected,
3. Merged Areas Secretariat to provide updates of the situation to the press and local emergency authority to assist them in making timely and accurate decisions regarding warnings and evacuations.
4. Provincial Disaster Management Authority support and coordinate the overall emergency response activities within its geographical or functional jurisdiction.

POST DISASTER PHASE

1. Pishin District administration to undertake DEP exercises as appropriate.
2. Provincial Disaster Management Authority to provide leadership to assure the DEP is reviewed and updated annually and copies of the revised DEP are distributed to all who received copies of the original DEP including the records for the local emergency authorities.
3. Provincial Disaster Management Authority will decide when to terminate the emergency.

Appendix A: Guidance for Determining the Emergency

Event	Situation
Seepage	New seepage areas in or near the dam
	New seepage areas with cloudy discharge or increasing flow rate
	Seepage with discharge greater than 10 gallons per minute
Sinkholes	Observation of new sinkhole in reservoir area
	Rapidly enlarging sinkhole
Instruments	Instrumentation readings beyond predetermined values
Earthquake	Measurable earthquake felt or reported on or within 50 kilometers of the dam Earthquake resulting in uncontrolled release of water
	Earthquake resulting in visible damage to the dam or appurtenances
	Earthquake resulting in uncontrolled release of water from the dam

Event	Situation
Security threat	Verified bomb threat that, if carried out, could result in damage to the dam Damage to dam or appurtenances with no impacts to the functioning of the dam 1
	Detonated bomb that has resulted in damage to the dam or appurtenances
Sabotage/ vandalism	Damage to dam or appurtenance with no impacts to dam function
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam
	Damage to dam or appurtenances that has resulted in seepage flow
	Damage to dam or appurtenances that has resulted in uncontrolled water release

Appendix B: Emergency Remedial Actions

The following emergency remedial actions should be considered and immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam.

Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions.

Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam.

Seepage and sinkholes

1. Open the low-level outlet gate to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. If the gate is damaged or blocked, pumping or siphoning may be required. Continue lowering the water level until the seepage stops.
2. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage.
3. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

Earthquake

Although risk related with the seismic activities has been taken into account while designing the structure and type of dam, yet there is risk in the case of unexpected earthquake of high magnitude. In case of earth quake;

1. Immediately conduct a general overall visual inspection of the dam.
2. Perform a field survey to determine if there has been any settlement and movement of the dam / spillway, and low-level outlet works.
3. Drain the reservoir, if required.

Adverse or unusual conditions that can cause the failure of a dam are typically related to aging or design and construction oversights. Extreme weather events that exceed the original designed conditions can cause significant flow through the spillway or overtopping of the embankment. However, accidental or intentional damage to the dam may also result in emergency conditions. The conditions have been grouped to identify the most likely emergency-level condition. The groupings are provided as guidance only. Not all emergency conditions may be listed, and the dam operator is urged to use conservative judgment in determining whether a specific condition should be defined as an emergency situation at the dam.

Urgent; dam failure appears imminent or is in progress Seepage and Sinkholes
Potential dam failure situation; rapidly developing:

1. Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.
2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or enlarging sinkhole(s) near the dam or settlement of the dam is observed.
4. Reservoir level is falling without apparent cause.
5. The following known dam defects are or will soon be inundated by a rise in the reservoir:
   - Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
   - Transverse cracks extending through the dam, abutments, or foundation.

Urgent; dam failure appears imminent or is in progress:

1. Rapidly increasing cloudy seepage or soil deposits at seepage exit points to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapidly enlarging sinkhole(s) are forming on the dam or abutments to the extent that failure appears imminent or is in progress.
6. Rapidly increasing flow through crack(s) eroding materials to the extent that failure appears imminent or is in progress.

Potential dam failure situation; rapidly developing:

1. Settlement of the crest, slopes, abutments and/or foundation of the dam that may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam that may eventually result in breaching of the dam.

Urgent; dam failure appears imminent or is in progress:

1. Sudden or rapidly proceeding slides, settlement, or cracking of the crest, slopes, abutments, and/or foundation, and breaching of the dam appears imminent or is in progress.

Annexure 5: Departmental Land Acquition Certificate

RESTORATION/REHABILITATION OF FLOOD PROTECTION STRUCTURES AND WATER CONSERVATION STRUCTURE IN DISTRICT PISHIN

LAND ACQUISITION CERTIFICATE

This is to certify that the proposed schemes in District Pishin have no requirement for any type land acquisition including the Voluntary Land Donation as the existing Right of Way will be used for restoration and rehabilitation of flood protection and water conservation structures.

At present no community (s) was found occupying the existing structures for both permanent and temporary shelter and relief from the floods and there has been no community asset found to be relocated.

Communities along the proposed schemes are vulnerable and at threat from the future unexpected climatic events of floods and in dire need of the proposed works. At the same time community's willingness has been acquired through meetings during damages assessment survey after floods of 2022 and their main concern is to restore the damages as early as possible to make them resilient.

Proposed works will be carried out on the Irrigation Department (Govt of Balochistan) land and will utilized the department owned Right of Way on all proposed sites. List of the proposed flood mitigation and water conservation sites is annexed with GPS locations.

Moreover, Irrigation Department of Balochistan will comply with NDRMF's Environment & Social Management System and schemes will be assessed for site specific safeguards impacts and mitigation measures and management plan will be addressed in the Initial Environmental Examination study after the Grant Implementation Agreement prior to commencement of works on the ground.

Executive Engineer
Irrigation Division Pishin
081-9201117

Superintending Engineer
Irrigation Circle Quetta
081-9201117

Chief Engineer (Quetta)
Irrigation Balochistan
Ph # 081-9211605

Secretary
Irrigation Department
Government of Balochistan
Ph # 081-9201074

Annexure 6: Occupational Health and Safety Plan

General

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank/IFC EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces. and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

a. Screening and regular unannounced checking of workers

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

b. Minimizing hazards and risks at the workplace.

To ensure safety at all work sites, the following will be carried out:

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.
v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;
vii. Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontals.
viii. Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.
ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.
x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.
xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

c. Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of Personal Protective Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

i. High visibility clothing for all personnel during road works must be mandatory.
ii. Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.
iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.
iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.
v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.
vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.
vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.
viii. Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.
The specific PPE requirements for each type of work are summarized below.

Table 6.1 PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.
Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

d. Procedures to Deal with Emergencies such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

i. Provision of dispensaries by the individual EPC contractor.
ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.
iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.
iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

e. Record Maintenance and Remedial action

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigation actions to change any unsafe or harmful conditions.

f. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

g. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

h. Nomination of a Health and Safety Focal Person

Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

i. Function as the focal person/representative for all health and safety matters at the workplace;
ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;
iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;
iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;
v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

Annexure 7: Emergency Response Plan

PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the project. The aim of the Emergency Response Procedure is to:

(i) Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.
(ii) Ensure all personnel are aware of the importance of this procedure to protection of life and property.

EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

(i) Construction Accident
(ii) Road & Traffic Accident
(iii) Hazardous material spills
(iv) Structure collapse or failure
(v) Trauma or serious illness
(vi) Sabotage
(vii) Fire
(viii) Environmental Pollution
(ix) Loss of person
(x) Community Accident

RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table 7.1** below.

Table 8.1 Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	Overall control of personnel and resources. The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	Overall responsibility for activating emergency plan and for terminating emergency actions. Be alternative of emergency response chairpersons. Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. Notify outside authorities if assistance is required. Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. Establish and appoint all emergency organization structure and team. Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. Ensure resources available to purchase needed emergency response equipment and supplies. Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.
Security Team	Ensure that the exit route is regularly tested and maintained in good working order. Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. Assist with strong/activation of services during an emergency. Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
	Protect the injured from further danger and weather.

Action Group	Responsibility
Rescue & Medical Team	Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. Remain familiar with the rescue activities and rescue apparatus. Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	Call up of personnel into the safe location for protective life and property. Take immediate and appropriate action while Emergency Response Team is being mobilized. Keep in touch with the Emergency Commander Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure 8.2. Emergency Procedure for Fire

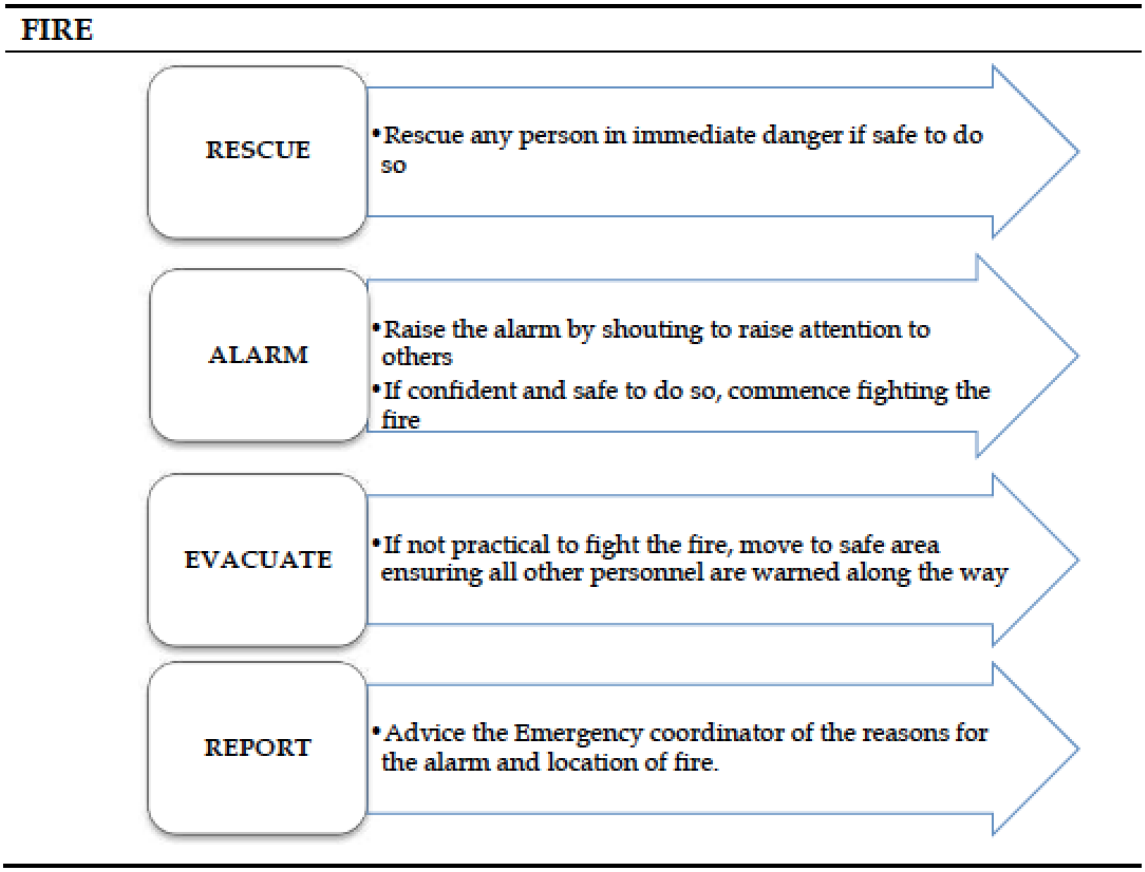
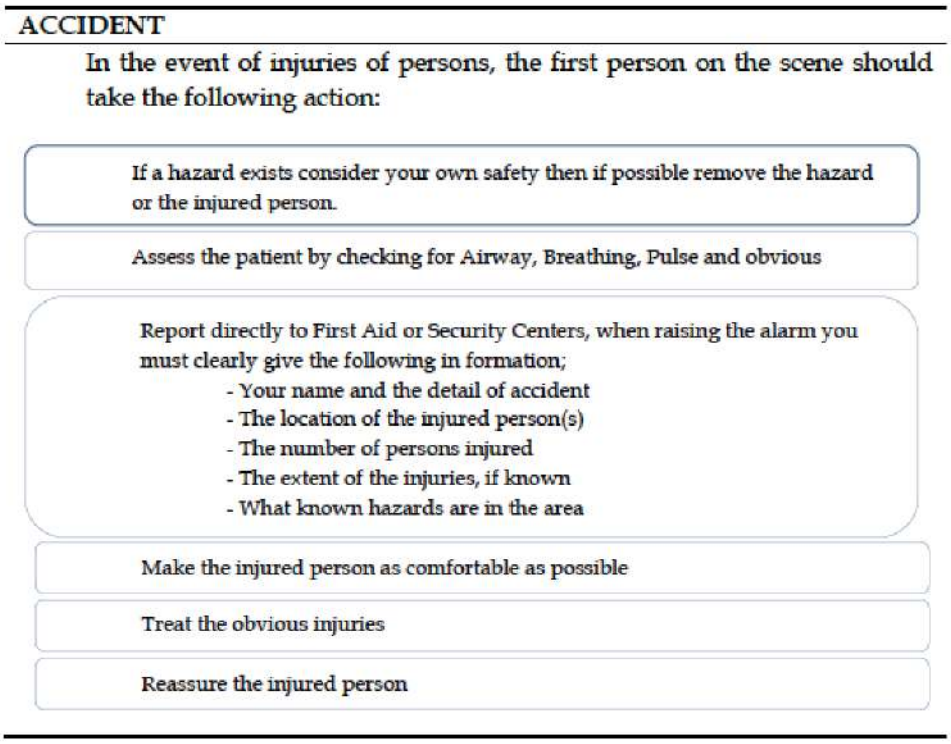


Figure 8.3 Emergency Procedure for Serious



COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that “the matter is under investigation and relevant information when available will be provided by our Head Office” Do not ever give your opinion or story.

First Aid Persons

- Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,
- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

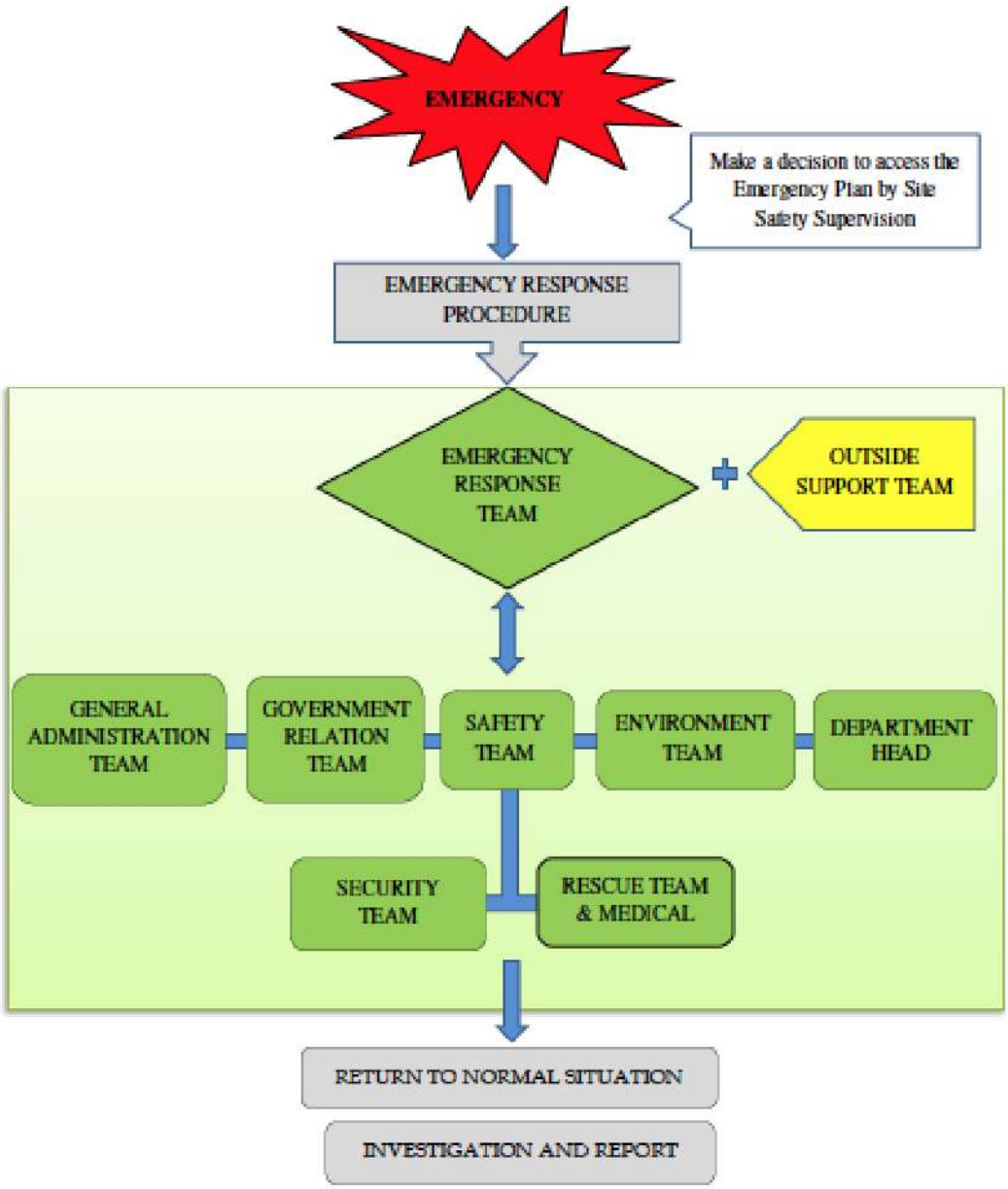
- Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/Contractor to be determined.

Annexure 8: Archaeological 'Chance Find' procedure

Background

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling/ It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

Archaeological 'Chance Find' Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.
(iii) If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA) will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.
(iv) Work will not re-commence in this location until agreement has been reached between DoA and proponent as to any required mitigation measures, which may include excavation and recovery of the item.
(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall,

after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.

Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.

If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.

Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.

The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.

The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.

No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.

Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.

If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part as for a public purpose.

Annexure 9: Dust Management Plan

General

The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

Dust emissions from construction can cause ill health effects to Contractor staff along with nuisance and annoyance to members of the local community. Dust will be controlled through:

- Elimination
- Reduction/Minimization
- Control

This dust management plan shall be implemented based on the measures already provided in the Environmental Management Plan (EMP) relating to controlling dust emissions.

Methodology

The following methodology will be undertaken for each project section:

Step 1 – Identify the dust generating activities

Construction activities that are likely to produce dust will be identified. The activities that will be taken into account are:

- Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant
- Roads, surfaces and public highways
- Static and mobile combustion plant emissions
- Tarmac laying, bitumen surfacing and coating
- Materials Handling, Storage, Spillage and Disposal
- Storage of material
- Stockpiles
- Spillages
- Storage of Waste
- Site Preparation and Restoration after Completion
- Earthworks, excavation and digging
- Storage of spoil and topsoil
- Demolition
- Construction and Fabrication Processes

Step 2 – Identify Sensitive Receptors

Sensitive receptors have already been identified. The nature and location of the sensitive receptors will be taken into account when implementing control measures.

Step 3 – Implement Best Practice Measures to Control

Based on the nature of the activity producing the dust, the likelihood of dust being produced and the possible consequence of dust based on the sensitive receptors, the most effective control measure will be identified and implemented.

Step 4 – Monitor effectiveness of control

Construction Supervision Staff (CSC) will have the responsibility to ensure that dust control measures are being implemented and are effective.

Step 5 – Record and report result of monitoring

All inspections, audits and results of monitoring will be recorded and kept as part of the site filing system.

Method Statements and Risk Assessments

- The Contractor's Risk Assessments and Method Statements will be required to be approved by the CSC prior to commencing work and will be required to contain environmental aspects of the task, including dust control measures where required.
- Where dust has been identified within the risk assessment as a significant issue, the method statement will be required to cover the following:
- Methods and materials that will be used to ensure that dust generation is minimized.
- The use of pre-fabricated materials where possible.
- Optimum site layout:
- Dust generating activities to be conducted away from sensitive receptors
- Supply of water for damping down.
- Good housekeeping and management
- All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

All Contractor staff will be required to attend training seminars as already mentioned in the EMP document. A site-specific induction will also be required before being allowed to work on site. These will include site-specific sensitive receptors and details regarding dust control measures to be taken.

Toolbox talks on air pollution and minimizing dust emissions will be provided on a regular basis to Contractor staff.

Identification of Dust Generating Sources and Control Methods Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant

Dust Source	Dust Control Methods
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	Site traffic will be restricted to constructed access roads as far as possible. Site speed limit will be set at 10 mph as this will minimize the production of dust.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	Dusty materials will be dampened down Drop heights will be kept to a minimum and enclosed where possible.
Storage of Materials	
Bulk cement, bentonite etc.	Bentonite will be delivered in tankers and stored in dedicated enclosed areas. Bulk cement will be transported through tractor trollies or trailers.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.
Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	Where possible, stockpiles will be placed under sheeting. Dusty material will be damped down. Wind barriers (protective fences) of a similar height to the stockpiles will be erected, if required.
Large and long term stockpiles	Long-term stockpiles will be vegetated and stabilized as soon as possible. Stock piles will be dampened down until stabilized, where necessary. Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Waste Material from Construction	
Disposal method	A dedicated lay-down area will be available for waste. Waste will not be allowed to build up and will be disposed off at the designated locations as per EMP.
Site Preparation and Restoration	

Dust Source	Dust Control Methods
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	
Crushing of material for reuse, transportation and disposal	Authorization will be obtained from PMU and ADB before using any mobile plant on site for activities such as crushing and screening. Any crushing or screening activities will be located away from sensitive receptors.
Cutting, grinding, drilling, sawing, trimming, planning, sanding	These activities will be avoided wherever possible. Equipment and techniques that minimize dust will be implemented. Water will be used to minimize dust.
Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction

Monitoring Arrangements

Monitoring will be conducted at sensitive receptor locations in the project area as provided in the EMP. Furthermore, at locations where PM levels are exceeding applicable guidelines, additional stringent measures will be implemented at the respective location(s) in the project area to ensure dust levels are controlled as far as possible.

Annexure 10:Site Specific EMP (SSEMP) Guide & Template for Guidance to Contractor

Guide for Development of SSEMP
Step 1: Define Boundaries
Step 2: Identify Sensitive Receptors
Step 3: Specify construction activities
Step 4: Conduct Risk Assessment
Step 5: Assign Environment Management measures
Step 6: Prepare Site Plans
Step 7: Prepare Environment Work Plans (if required)
Step 8: Monitoring

Step 1: The project area needs to be clearly defined.
Step 2: The mapping of sensitive receptors has already been conducted and needs to be presented clearly in a map.
Step 3: The tentative construction activities to be conducted are as follows:
Site Surveying and Vegetation (Trees and plants) Clearance
Establishment of Work Camp, Batching and Asphalt plant and access roads
Dismantling of Asphalt and existing structures including Utilities
Preparation of ground for Asphalting
Asphalting
Landscaping
Step 4: The Risk Assessment matrix template is provided in the table below.
Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence
Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventative measures are not applied	3
Unlikely	May occur once or twice during the activity if preventative measures are not applied	2
Rare	Unlikely to occur during the project	1

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding community e.g. extreme loss of soil and water resources and quality from storm water runoff extreme pollution of soil and water resources including major contamination from hazardous materials widespread effects on ecosystems with deaths of fauna/flora widespread community impacts resulting in illness, injury or inconvenience loss or destruction of archaeological or historical	5

	sites Occurrence will almost certainly result in the work being halted and a significant fine.	
Major	The action will cause major adverse damage on the environment or surrounding communities' e.g. major loss of soil and water resources and quality from storm water runoff major pollution of soil and water resources including contamination from hazardous materials significant effects on ecosystems with isolated deaths of non-vulnerable flora and fauna significant annoyance or nuisance to communities major damage to or movement required to archaeological or historical sites Occurrence may result in work being halted and a fine	3
Moderate	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in storm water quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	2
Minor	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in storm water quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	1

Risk Score Table

Likelihood	Consequence				
		Catastrophic	Major	Moderate	Minor
	Certain	25	15	10	5
	Likely	15	9	6	3
	Unlikely	10	6	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

Any Medium to Significant risk requires an environmental management measure to manage the potential environmental risk. Judgement will be required concerning the application of an environmental management measure to mitigate low risk situations.

The higher the risk the more intensive the required mitigation measure will need to be; e.g. where site sedimentation is deemed to be low risk, then silt fences may be needed but as the risk increases, then sediment traps may be required. The selection of the appropriate

mitigation measure will require judgement based on the level of risk and the specific site parameters.

Step 5: The Environmental Management measures are to be extracted from the IEE study for the project and should be added in the last column of the table below.

No.	Construction Activity	Hazards to Consider	Likelihood that the site or sensitive receptors will be affected?	Consequence of the site or sensitive receptors being affected?	Risk Score (consequence x likelihood)	Environmental Management Measures
i	Site Surveying & vegetation clearance	Damage to vegetation beyond project footprint				These can be taken from the EMP provided in the IEE report (If Risk Score is 6 or more)
		Erosion of exposed areas and sediment				
		Loss of topsoil				
		Dust generation				
		Noise				
ii	Establishment of Work Camp, Batching plant etc.	Soil deposited onto roads from tires				
		stockpiles erosion				
		Noise & Vibration				
		Traffic congestion				
		Fuel spills				
iii	Dismantling of Asphalt and existing structures including Utilities	Noise and vibration				
		Dust generation				

		Community safety				
		Worker safety				
		Traffic Congestion				
iv	Preparation of Sub-Base	Noise and vibration				
		Dust generation				
		Traffic Congestion				
v	Asphalting	Noise and vibration				
		Dust generation				
		Traffic Congestion				
		Community safety				
		Labor safety (PPEs)				
vi	Landscaping	Dust generation				
		Sediment runoff				
		Failure of vegetation to take root				

Step 6: The Site plans are a critical part of the SSEMP and will need to be prepared, otherwise the ADB will consider the document as incomplete.
The site plan will need to provide the following:

- Indication of North and scale
- Existing and planned supporting infrastructure (e.g. access roads, water supplies and electricity supplies)
- Location of planned work
- Contours
- Drainage systems
- Locations of sensitive receptors

Step 7 (if required)[32]: The completed SSEMP provides details of all the environmental management requirements for all stages of the construction process. For individual work teams who are responsible for only a small part of the overall construction works it can be confusing as to what is required for their particular work component. For example, the work team responsible for stripping soil for the construction areas are not going to be interested in the requirements for pouring concrete for footings and foundations. However, it is essential that the soil stripping team knows exactly what to clear and what to leave and where to put stockpiles of soil for later use.
In situations where different work activities are required at different times or at different locations, environmental work plans can be prepared. These are similar to the work method statements that are often produced for major construction projects.
Step 8: A detailed monitoring plan will be provided along with frequency and responsibilities to ensure all key environmental parameters are monitored to ensure compliance with both national and ADB requirements.

Template for SSEMP

- Introduction
- Project Overview
- Scope of SSEMP
- Objectives of SSEMP
- Map of Sensitive Receptors
- Construction Activities
- Risk Assessment
- Risk Assessment Matrix & Mitigation Measures
- Site Plan(s)
- Environmental Monitoring Plan
- Instrumental Monitoring of Environmental Parameters by Contractor as per EMP
- In-house monitoring
- Third Party environmental monitoring
- Visual monitoring of Environmental Parameters by Contractor as per EMP
- Responsibilities
- Organizational Responsibilities and Communication
- Responsibility of EA
- Responsibility of Construction Supervision Consultant (CSC)
- Responsibility of Contractor
- Responsibility of EPA

[32] ADB, Safeguards Unit for Central & West Asia Department, *Environmental Management for Construction Handbook.*

Annexure 11: Accident and Incident Investigation Procedure

INCIDENT / NEAR MISS REPORT	QUALITY RECORDS / FORMS	
	Doc. Level:	Doc. Version:1
	Doc. No	

HS.T.02	INCIDENT / NEAR MISS REPORT	
Title of Project:		
Location:		Date:

Objective(s)

To implement immediate and effective process in order to provide immediate treatment against any fatality, Injuries, Casualty.

SECTION A: TO BE COMPLETED BY PERSON INVOLVED (OR BY SUPERVISOR OR HEALTH AND SAFETY REPRESENTATIVE IF WORKER IS INCAPACITATED) AND BY THEIR SUPERVISOR

Details of the person involved in the incident/near miss

Employee #: ..... **Site Address** ..... **Work phone:** .....

Name: ..... **Father Name:** .....

Position: ..... **Date of birth:** ..... ☐ **Male** ☐ **Female**

Please select one: ☐ Member ☐ Client Member ☐ Sub Contractor ☐ Visitor/Other

Details of the: ☐ Incident ☐ Near miss ☐ Medical

Date: ..... **Time:** ..... A.M /P.M

City: ..... **Location:** .....

Was the incident/near miss reported to your supervisor, immediately: ☐ Yes ☐ No

Part of the body injured

Head	Trunk	Internal	Arm	Hand	Leg	Foot eye
☐ neck	☐ heart	☐ left	☐ left	☐ left	☐ left	☐ ear
☐ hip	☐ lungs	☐ right	☐ right	☐ right	☐ right	☐
☐ nose	☐ chest	☐ systemic	☐ shoulder	☐ thumb	☐ knee	☐ great toe
☐ mouth	☐ stomach		☐ upper arm	☐ fingers	☐ lower leg	☐ other toes
☐ teeth	☐ groin		☐ elbow	☐ palm	☐ ankle	
☐ face	☐ back		☐ forearm		☐ thigh	
☐ skull	☐ multiple		☐ wrist		☐ upper leg	☐ psychosocial

Nature of injury

☐ abrasion	☐ puncture	☐ heart attack	☐ sprain	☐ burn	☐ traumatic shock
☐ bruise	☐ laceration	☐ hearing loss	☐ strain	☐ scald	☐ electric shock
☐ fracture	☐ amputation	☐ foreign body	☐ hernia	☐ rash	☐ psychosocial
☐ concussion	☐ bite	☐ minor cuts		☐ allergy	☐ chemical

☐ aggravation of previous injury or medical condition *(please describe)*: .....

Type of incident which caused injury

☐ striking against	☐ stumbling	☐ lifting	☐ pushing	☐ ingestion
☐ struck by	☐ slipping	☐ bending	☐ pulling	☐ absorption
☐ caught in/on	☐ tripping	☐ twisting	☐ jumping	☐ inhalation
☐ stepping on	☐ falling	☐ stress	☐ vehicle	☐ needlestick

☐ other *(please describe)*: .....

Annexure 12: Traffic Management Plan

Need for Plan

The construction of the Landfill will take over 24 months and in this period, huge vehicular movement carrying large amount of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

The plan

The Objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

- The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas and wash-out areas. It is intended to compliment and work alongside relevant ESMMP. The TMP will be classed as “live” and therefore be subjected to updates as required.
- Contractor, at the time of the execution of the project will prepare a comprehensive TMP in coordination with local traffic police department, PMU, emergency services and local administrative department. The PMU and CSC will review and approve contractors TMP. The contractor’s TMP shall include following mitigation measures during its preparation:
- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project construction.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to Project site to minimise journey distance and limit movements to site access roads.
- Concrete mixing plant located at Project site limiting traffic movements associated with concrete delivery to site access roads
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site
- Provision of bus/minibus services for personnel living in nearby settlements
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods
- Road maintenance fund to leave a useful asset for communities after the construction phase.
- Driver training for HGV drivers and refresher course every six months for Project drivers
- Speed restrictions for project traffic travelling through communities (to be agreed with Traffic Management Authority)
- Run a safety campaign to improve the people’s knowledge of the traffic hazard on their roads, public information and other activities to address the issues.
- Run a pedestrian awareness Programme.

- Temporary signage
- The traffic management plan is provided below.
- Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the project site would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

- Public Access Routes
- The use of public road for site access may be restricted in terms of:
- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts
- Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

Site Workers Traffic

Site personnel should not be permitted to park vehicles near the site boundary; this will lead to disruption in material deliveries. Designated parking area with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

Contractor's Obligation

The traffic management plan of the Contractor should be safe enough and widening of access roads and construction of the detours must be completed before start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. While widening the access roads, the safe movement of the vehicles, people, animals and wildlife must be ensured. It will be sole responsibility of

Contractor. The roads widening should be designed on the basis of the traffic survey, summarized and estimated site traffic. Contractor must ensure that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to CSC, PMU, emergency services and Traffic Police, and also publish weekly programme in local newspapers.

Annexure 13: Solid Waste Management Framework

INTRODUCTION

Construction contractors may use this framework as guiding document for preparation of site specific solid waste management plan. The purpose of this Framework Solid Waste Management Plan is to ensure that wastes arising from the proposed construction works are managed, reused, recovered or disposed of by a method that ensures the provisions of the BEPA rules and ADB SPS, 2009. It also ensures that the optimum levels of waste reduction, re-use and recycling are achieved.

Waste management priorities for project are based following waste management hierarchy.

- Prevent material wastage
- Minimize the quantity of waste
- Reuse of site materials
- Recycling of waste
- Energy recovery
- Disposal
-

WASTE MANAGEMENT AT Balochistan Project sites
National Level
Waste management of the project will be carried as per national rules including:

- Solid Waste Management Policy, 2000
- Requirements of Balochistan Environmental Protection Act
- Draft Guidelines on Solid Waste Management, 2005.
- Section 11 of PEPA, 1997 prohibits discharge of waste in amount that violates the NEQS.
- Draft Hazardous Substances rule of 1999
- Section 132 of Cantonment Act, 1942
- Provision Contains in the Local Government Ordinance, 2001

Regional Level

- Asian Development Bank (ADB) SPS, 2009
- IFC guidelines for Solid Waste Management
- Best practices of waste management on construction sites

Details of the wastes to be produced

During construction/civil works, potential sources of waste will include spoils generated during excavation, concrete and construction waste, domestic wastes (solid & wastewater), fuel or oil leakages or spills, onsite effluents from vehicle wash & cleaning, and cement spills. It is the responsibility of all personnel on site including Contractors, Sub-Contractors and their Employees to ensure compliance with this Waste Management Plan.

Main Waste Categories

Contractors are required to develop inventory of main waste categories that will be generated during construction phase of the project. Anticipated main waste categories include construction debris, concrete waste, scrap wood, bricks, concrete, asphalt, plumping fixtures, piping, insulation (asbestos and non-asbestos), metal scraps, oil, electrical wiring and components, chemicals, paints, solvents.

Anticipated Hazardous Waste Arising

Fuels stored on site that will be used during the construction phase are classed as hazardous. There will be fuel stored on site for machinery and construction vehicles. All fuel tanks and draw off points will be bonded. If the fuel is correctly contained and bonded, it is not expected that there will be any fuel wastage at the site. Other sources of hazardous waste include used paints, used oil/lubricants, electrical waste and chemicals. Project contractors are required to develop SOPs for handling, storage and disposal of hazardous waste arising from the project.

ESTIMATED WASTE GENERATION

Construction Waste Generation

Project contractors are required to develop and maintain waste inventory clearly showing the type, amount and location of waste generated from different activities at the site. Waste record keeping is key to successful implementation of waste management plan.

Proposed Waste Management Options

Waste will be segregated on site. Contractor will ensure that sufficient number of waste drums are placed at site with appropriate color coding. All recyclable waste will be handed over to recycling contractor. The appointed waste contractor will collect and transfer the recyclable wastes as receptacles are filled. The non-recyclable waste will be transferred by an authorized waste collector to an appropriate facility. Project contractors will identify both recycling and non-recycling contractor working in the project area. Contractors through bidding documents will be bound to hire such waste contractors for efficient waste management at project sites.

A successful Waste Management Plan is largely dependent on how readily it can be changed in to normal site operations by the person responsible. It is recognized that the plan should not be obstructive to site operations and the construction program by placing the responsibility of construction waste management with the Manager, all reuse, recycling, wastage and necessary disposal can be monitored as close to the source as possible. An Environmental Representative from each Works Sub-Contractor will also be nominated responsible for all waste management in their own operations. In this way, it is possible to identify where the greatest material wastage occurs, with a view to implementing better management.

The site Construction Manager will be designated as the Responsible Person and have overall responsibility for the implementation of the on-site Waste Management Plan. The Responsible Person will be assigned the authority to instruct all site personnel to comply with the specific provisions of the plan. At the operational level, a nominated Environmental Representative from each sub-contractor company on the site shall be assigned the direct responsibility to ensure that the discrete operations stated in this framework for solid waste management are performed on an on-going basis.

Tracking and documentation procedures for off-site waste

The site construction Manager will maintain a copy of all waste collection permits. If waste (soil & stone) is being accepted on-site, a waste docket must be issued to the collector. If the waste is being transported to another site, a copy of the waste permit for that site must be provided to the manager. Record of waste collection docket, a receipt from the final destination of the material will be kept as part of the on-site waste management records. All information will be entered in a waste management system to be maintained on-site.

Disposal Waste

Contractors are required to develop SOP for disposal of recyclable, non-recyclable and hazardous waste generated at site. Food waste will be disposed at food waste pit which will be fenced. Recycling waste will be handed over to recycling waste contractor. Hazardous waste will be disposed through incineration facility available in close proximity of the project

area. Workers on the site will be encouraged to recycle as much municipal waste as possible i.e. cardboard, plastic, metals and glass. Prior to removal, the municipal waste will be examined to determine if recyclable materials have been placed in other containers. If this is the case, effort will be made to determine the cause of the waste not being segregated correctly.

ESTIMATED COST OF WASTE MANAGEMENT

Contractors are required to estimate and budget cost for waste management through BOQ items. Such waste management cost should include cost of waste drums, cost of waste handling crew, cost of waste transportation, cost of EPA approved waste contractor services and associated incineration costs if any. By reusing materials on site, there will be reduction in transport and disposal costs for a waste contractor taking the material away.

TRAINING PROVISIONS FOR WASTE MANAGER AND SITE CREW

A waste manager will be appointed or designated by construction contractors to ensure commitment, operational efficiency and accountability during the project execution.

Site Manager Training and Responsibility

The waste manager will be given responsibility and authority to select a waste team if required i.e. members of the site crew that will aid him in the organization, operation and recording the waste management system implemented on-site. The waste manager will have overall responsibility to oversee record and provide feedback to the CSC on everyday waste management at the site. Authority will be given to the waste manager to delegate responsibility to sub-contractors where necessary and to co-ordinate with suppliers, service providers and sub-contractors to prioritize waste prevention and salvage. The waste manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on-site. He will also be trained in the best method for segregation and storage of recyclable materials, have information on the materials that can be reused on-site and know how to implement this Framework for Solid Waste Management.

Site Crew Waste Management Training

Training of the site crew is the responsibility of the waste manager and as such, a waste training program should be organized. A basic awareness course will be held for all crew to outline the construction waste management plan and to detail the segregation of waste at source. This may be incorporated with other training needs (e.g. general site induction, safety training etc.). This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A subsection on hazardous wastes will be incorporated and the particular dangers of each hazardous waste will be explained.

RECORD KEEPING

Records will be kept for each waste material which leaves the site, either for reuse on another site, recovery, recycling or disposal. A system will be put in place to record the construction waste arising on-site. The waste manager or delegate will record the following:

- Waste taken off-site for reuse
- Waste taken off-site for recovery
- Waste taken off-site for recycling
- Waste taken off-site for disposal
- Waste (soil & stone) accepted on-site for recovery

For each movement of waste off-site, a signed waste collection docket will be obtained by the waste manager (or delegate) from the contractor. This will be carried out for each material

type. This system will also be linked with the delivery records. A signed waste acceptance docket will be issued for each movement of waste on-site.

OUTLINE WASTE AUDIT PROCEDURE

Contractors are required to develop SOP for waste auditing at the construction sites. Such SOP should reflect frequency and types of waste audits, audit criteria and way forward to close non-compliances.

Responsibility for Waste Audit

The appointed waste manager will be responsible for conducting a waste audit at the site during project execution.

Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site, as well as waste accepted, should be undertaken. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. Each material type will be examined in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. Waste management costs will also be reviewed. Upon completion of the construction phase a final report will be prepared summarizing the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

CONSULTATION WITH RELEVANT BODIES

Local Authority

Project contractors are required to maintain close coordination with focal government departments/agencies to ensure that all available waste reduction, re-use and recycling opportunities are identified and utilized.

Annexure 14: WHO advice on Use of Masks for the COVID-19 Virus

masks away from those in health care who need them most, especially when masks are in short supply.

Persons with symptoms should:

- wear a medical mask, self-isolate, and seek medical advice as soon as they start to feel unwell. Symptoms can include fever, fatigue, cough, sore throat, and difficulty breathing. It is important to note that early symptoms for some people infected with COVID-19 may be very mild;
- follow instructions on how to put on, take off, and dispose of medical masks;
- follow all additional preventive measures, in particular, hand hygiene and maintaining physical distance from other persons.

All persons should:

- avoid groups of people and enclosed, crowded spaces;
- maintain physical distance of at least 1 m from other persons, in particular from those with respiratory symptoms (e.g., coughing, sneezing);
- perform hand hygiene frequently, using an alcohol-based hand rub if hands are not visibly dirty or soap and water when hands are visibly dirty;
- cover their nose and mouth with a bent elbow or paper tissue when coughing or sneezing, dispose of the tissue immediately after use, and perform hand hygiene;
- refrain from touching their mouth, nose, and eyes.

In some countries masks are worn in accordance with local customs or in accordance with advice by national authorities in the context of COVID-19. In these situations, best practices should be followed about how to wear, remove, and dispose of them, and for hand hygiene after removal.

Advice to decision makers on the use of masks for healthy people in community settings

As described above, the wide use of masks by healthy people in the community setting is not supported by current evidence and carries uncertainties and critical risks. WHO offers the following advice to decision makers so they apply a risk-based approach.

Decisions makers should consider the following:

1. **Purpose** of mask use: the rationale and reason for mask use should be clear– whether it is to be used for source control (used by infected persons) or prevention of COVID-19 (used by healthy persons)
2. Risk of **exposure** to the COVID-19 virus in the local context:
   - The population: current epidemiology about how widely the virus is circulating (e.g., clusters of cases versus community transmission), as well as local surveillance and testing capacity (e.g., contact tracing and follow up, ability to carry out testing).
   - The individual: working in close contact with public (e.g., community health worker, cashier)
3. **Vulnerability** of the person/population to develop severe disease or be at higher risk of death, e.g. people with comorbidities, such as cardiovascular disease or diabetes mellitus, and older people
4. **Setting** in which the population lives in terms of population density, the ability to carry out physical distancing (e.g. on a crowded bus), and risk of rapid spread (e.g. closed settings, slums, camps/camp-like settings).
5. **Feasibility**: availability and costs of the mask, and tolerability by individuals
6. **Type** of mask: medical mask versus nonmedical mask (see below)

In addition to these factors, potential advantages of the use of mask by healthy people in the community setting include reducing potential exposure risk from infected person during the "pre-symptomatic" period and stigmatization of individuals wearing mask for source control.

However, the following potential risks should be carefully taken into account in any decision-making process:

- self-contamination that can occur by touching and reusing contaminated mask
- depending on type of mask used, potential breathing difficulties
- false sense of security, leading to potentially less adherence to other preventive measures such as physical distancing and hand hygiene
- diversion of mask supplies and consequent shortage of mask for health care workers
- diversion of resources from effective public health measures, such as hand hygiene

Whatever approach is taken, it is important to develop a strong communication strategy to explain to the population the circumstances, criteria, and reasons for decisions. The population should receive clear instructions on what masks to wear, when and how (see mask management section), and on the importance of continuing to strictly follow all other IPC measures (e.g., hand hygiene, physical distancing, and others).

Type of Mask

WHO stresses that it is critical that medical masks and respirators be prioritized for health care workers.

The use of masks made of other materials (e.g., cotton fabric), also known as nonmedical masks, in the community setting has not been well evaluated. There is no current evidence to make a recommendation for or against their use in this setting.

WHO is collaborating with research and development partners to better understand the effectiveness and efficiency of nonmedical masks. WHO is also strongly encouraging countries that issue recommendations for the use of masks in healthy people in the community to conduct research on this critical topic. WHO will update its guidance when new evidence becomes available.

In the interim, decision makers may be moving ahead with advising the use of nonmedical masks. Where this is the case, the following features related to nonmedical masks should be taken into consideration:

- Numbers of layers of fabric/tissue
- Breathability of material used
- Water repellence/hydrophobic qualities
- Shape of mask
- Fit of mask

Home care

For COVID-19 patients with mild illness, hospitalization may not be required. All patients cared for outside hospital (i.e. at home or non-traditional settings) should be instructed to follow local/regional public health protocols for home isolation and return to designated COVID-19 hospital if they develop any worsening of illness.[7]

Home care may also be considered when inpatient care is unavailable or unsafe (e.g. capacity is limited, and resources are unable to meet the demand for health care services). Specific IPC guidance for home care should be followed.[3]

Persons with suspected COVID-19 or mild symptoms should:

- Self-isolate if isolation in a medical facility is not indicated or not possible
- Perform hand hygiene frequently, using an alcohol-based hand rub if hands are not visibly dirty or soap and water when hands are visibly dirty;
- Keep a distance of at least 1 m from other people;
- Wear a medical mask as much as possible; the mask should be changed at least once daily. Persons who cannot tolerate a medical mask should rigorously apply respiratory hygiene (i.e. cover mouth and nose with a disposable paper tissue when coughing or sneezing and dispose of it immediately after use or use a bent elbow procedure and then perform hand hygiene.)
- Avoid contaminating surfaces with saliva, phlegm, or respiratory secretions.
- Improve airflow and ventilation in their living space by opening windows and doors as much as possible.

Caregivers or those sharing living space with persons suspected of COVID-19 or with mild symptoms should:

- Perform hand hygiene frequently, using an alcohol-based hand rub if hands are not visibly dirty or soap and water when hands are visibly dirty;
- Keep a distance of at least 1 meter from the affected person when possible;
- Wear a medical mask when in the same room as the affected person;
- Dispose of any material contaminated with respiratory secretions (disposable tissues) immediately after use and then perform hand hygiene.
- Improve airflow and ventilation in the living space by opening windows as much as possible.

Health care settings

WHO provides guidance for the use of PPE, including masks, by health care workers in the guidance document: Rational use of PPE in the context of COVID-19.[24] Here we provide advice for people visiting a health care setting:

Symptomatic people visiting a health care setting should:

- Wear a medical mask while waiting in triage or other areas and during transportation within the facility;
- Not wear a medical mask when isolated in a single room, but cover their mouth and nose when coughing or sneezing with disposable paper tissues. Tissues must be disposed of appropriately, and hand hygiene should be performed immediately afterwards.

Health care workers should:

- Wear a medical mask when entering a room where patients with suspected or confirmed COVID-19 are admitted.
- Use a particulate respirator at least as protective as a US National Institute for Occupational Safety and Health-certified N95, European Union standard FFP2, or equivalent, when performing or working in settings where aerosol-generating procedures, such as tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, and bronchoscopy are performed.
- Full infection prevention and control guidance for health care workers is provided here.

One study that evaluated the use of cloth masks in a health care facility found that health care workers using cotton cloth masks were at increased risk of infection compared with those who wore medical masks.[25] Therefore, cotton cloth masks are not considered appropriate for health care workers. As for other PPE items, if production of cloth masks for use in health care settings is proposed locally in situations of shortage or stock out, a local authority should assess the proposed PPE according to specific minimum standards and technical specifications.

Mask management

For any type of mask, appropriate use and disposal are essential to ensure that they are effective and to avoid any increase in transmission.

The following information on the correct use of masks is derived from practices in health care settings:

- Place the mask carefully, ensuring it covers the mouth and nose, and tie it securely to minimize any gaps between the face and the mask.
- Avoid touching the mask while wearing it.
- Remove the mask using the appropriate technique: do not touch the front of the mask but untie it from behind.
- After removal or whenever a used mask is inadvertently touched, clean hands using an alcohol-based hand rub or soap and water if hands are visibly dirty.
- Replace masks as soon as they become damp with a new clean, dry mask.
- Do not re-use single-use masks.
- Discard single-use masks after each use and dispose of them immediately upon removal.

WHO continues to monitor the situation closely for any changes that may affect this interim guidance. Should any factors change, WHO will issue a further update. Otherwise, this interim guidance document will expire 2 years after the date of publication.

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