IRRIGATION DEPARTMENT
GOVERNMENT OF BALOCHISTAN

PROJECT DESIGN, CONSTRUCTION SUPERVISION AND IMPLEMENTATION SUPPORT FOR BALOCHISTAN WATER RESOURCES DEVELOPMENT SECTOR PROJECT

(LOAN 3700-PAK)




Initial Environmental Examination Report

KHARZAN HATACHI IRRIGATION SUBPROJECT

Mula River Basin

MAY 2021

A Joint Venture of
National Engineering Services Pakistan (Pvt) Limited Lahore (Lead Partner)
Rehman Habib Consultants (Pvt) Limited (JV Partner)
Engineering General Consultants EGC (Pvt) Limited (JV Partner)
in association with
Asian Advisory Services (Pvt) Limited

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ACRONYMS

AB	Acquiring Body
AP	Aggrieved Party
ADB	Asian Development Bank
AJK	Azad Jammu Kashmir
BBISE	Balochistan Board of Intermediate & Secondary Education
BCIAP	Balochistan Community Irrigation and Agriculture Project
BEPA	Balochistan Environmental Protection Agency
BHUs	Basic Health Units
BOD	Biochemical Oxygen Demands
BRSP	Balochistan Rural Support Program
BWRDP	Balochistan Water Resources Development Project
CCR	Community Complaint Register
CDs	Civil Dispensaries
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
EPI	Expanded Program on Immunization
EPRCP	Environmental Planning and Resource Conservation Project
FOs	Farmer Organizations
GIS	Geographic Information System
GoB	Government of Balochistan
GRC	Grievance Redress Committee
GRM	Grievance Redressal Mechanism
H_2S	Hydrogen Sulphide
IEE	Initial Environmental Examination
IFC	International Finance Corporation
EHS	Environment, Health and Safety
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
MCHC	Maternal & Child Health Center
MCM	Million Cubic Meter
MNCH	National Maternal, Newborn and Child Health
MSDS	Material Safety Data Sheet
NCS	National Conservation Strategy

NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NOx	Oxides of Nitrogen
NTU	Nephelometric Turbidity Unit
PDEIP	Power Distribution Enhancement Investment Project
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
PPP	Public Private Partnership
PPTA	Project Preparatory Technical Assistance
PIU	Project Implementation Unit
BID	Balochistan Irrigation Department
QESCO	Quetta Electric Supply Company
RB	Requiring Body
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RHCs	Rural Health Centers
SIEE	Summary Initial Environmental Examination
SMART	Self-Monitoring and Reporting Tools
SOx	Oxides of Sulfur
SPS	Safeguard Policies
TA	Technical Assistance
TDS	Total dissolved solids
TSS	Total Suspended Solids
UNEP	United Nation Environment Program
VOCs	Volatile Organic Compounds
WHO	World Health Organization
WUA	Water User Association

EXECUTIVE SUMMARY

A. INTRODUCTION

1. Balochistan Water Resources Development Sector Project consists of implementation of 11 sub-projects in two potential river basins namely Mula and Zhob in the Balochistan. The Kharzan Hatachi Irrigation Subproject is selected as the second sub-project of Mula River Basin for implementation[1]. Feasibility study of the sub-project was prepared by the TA-Consultants (2017) under the ADB PPTA-8800 (PAK). This Intial Environmental Examination (IEE) has been updated in the light of available data at detailed design stage and following changes in the technical design of sub-project i) design discharge of Kharzan infiltration gallery has been increased from 0.3 to 0.566 (m^3/s) and of Hitachi infiltration gallery from 0.5 to 0.707 (m^3/s) as per established water rights of local communities, ii) length of lined canal of Kharzan increased from 12,689m to 17449 m, iii) length of Kharzan infiltration gallery increased from 475m to 575 m.

2. There is no major difference in conceptual design of BWRDSP schemes between Feasibility and Design stages. However, at detail design stage, after detailed surveys and investigations, some of the following minor changes occur in the project i.e minor changes in lengths of canals occurred at detail design. Depths of galleries was increased by Design consultants for easy flood passage that have positive environmental impact.

3. The sub-project is located in District Khuzdar in Mula River Basin on Mula River. The sub-project site is located at a distance of 115km from Khuzdar city. The first 80km are via Ratodero-Gwadar motorway (commonly known as M-8) upto Karkh valley from where a 45.0 km long black top Mula road in the mountainous area leads to the Kharzan Hatachi villages.

4. The proposed intervention for the subproject include; (a) Construction of two infiltration galleries, (b) Construction and rehabilitation of water conveyance system and associated structures, (c) flood protection works for irrigation canals and command area. The sub-project is aimed to rehabilitate and improve damaged infrastructure to enhance size of command area having irrigation facility.

5. The broader objective of the Irrigation Projects is aimed at:

- Increasing command area to cultivable command area,
- Sustained water supply to the present command area.

B. LEGISLATIVE FRAMEWORK

6. The proposed project is governed by a host of national and provincial statutes and regulations. Furthermore, as the Asian Development Bank (ADB) is expected to be involved as a donor / financier, its relevant policies and guidelines will also govern the proposed project.

[1] Asian Development Bank (ADB) Project review mission from 2 to 7 October 2019,

Amongst the various rules and statutes, as summarized in Chapter-2 of this IEE Report, the most pertinent from an environmental perspective are as follows:

- National Policy on the Environment;
- National Biodiversity Strategy & Action Plan;
- The Land Acquisition (Balochistan Amendment) Act, 1985;
- National & Provincial Conservation Strategy;
- Pakistan Environmental Protection Act, 1997;
- Balochistan Environmental Protection Act, 2012;
- Pakistan EPA Review of IEE and EIA Regulations, 2000;
- Balochistan Forest Regulation 1890;

- The Balochistan Antiquities Act, 2014;
- The Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014; and
- ADB's Safeguard Policy Statement (2009).

C. DESCRIPTION OF PROJECT

7. The proposed the intervention for the subproject include; (a) Construction of two infiltration galleries, (b) Construction and rehabilitation of water conveyance system and associated structures, (c) flood protection works for irrigation canals and command area. The sub-project is aimed to rehabilitate and improve damaged infrastructure to enhance size of command area having irrigation facility.

8. Salient features of the Project are shown in below **Table A**.

Table A: Salient Features of Proposed Kharzan-Hitachi Irrigation sub-project

No.	Description of Design Parameters	Kharzan	Hatachi
1.0	**Infiltration Galleries**	01	01
1.1	Design Discharge (m^3/s)	0.566	0.707
1.2	Gallery Length (m)	575	735
1.3	Gallery Perforated Pipe Diameter (m)	1.0	1.0
1.4	Command Area (Ha)	235	446
1.5	Gallery Elevation (m)	623.72	607.22
1.6	Offtake Well (No.)	01	01
1.7	Offtake Well Diameter (m)	2.0	2.0
1.8	Outlet Size / Diameter (m)	1.0	1.0
2.0	**Flood Protection Bund**		
2.1	Design Flood (m^3/s)	2,170	2,575
2.2	Length of Protection Bund No. 1 (m)	3737	-
2.3	Length of Protection Bund No. 2 (m)	-	968
2.4	Length of Protection Bund No. 3 (m)	-	1620
2.5	Length of Protection Bund No. 4 (m)	-	516
3.0	**Irrigation System**		
3.1	Canal Length (m)	17+449	24+782
3.2	Conduit Length (m)	0+283	2+700
4.0	**Canal Appurtenant Structure**		

No.	Description of Design Parameters	Kharzan	Hatachi
4.1	Aqueduct	2	2
4.2	Super Passage	-	-
4.3	Drainage Culvert	-	-
4.4	Off-take Structures	5	13
4.5	Fall Structures	4	16
4.6	Manhole	1	1
4.7	Transition Chambers	1	1
4.8	Cattle Drinking Structure	-	-
4.9	Washing Structure	12	-
4.10	Water Storage Tank	-	-
4.11	Road Culvert	5	-
4.12	Foot Bridge	2	2
4.13	Time Division Structure	55	95
4.14	Tail Structure	8	21

D. PROJECT ALTERNATIVES

a) No Project Alternative

9. The Project Area is considered as poor from an economic perspective. Subsistence farming is the economic mainstay. In case the proposed project is not implemented, the socio-economic conditions will not change as such. With the increasing population and scarcity of resources, residents are forced to abandon their homes in search of livelihood and grazing grounds for their cattle stock. Over the years, some part of gabion wall has been damaged due to flood flows in the Mula River. The intake structure is damaged and not supplying water to the supply channel. Water availability is scarce in area hence the proposed project will contribute positively to the project area.

b) Subprojects Alternative

10. The following two options were considered at Hatachi-Kharzan at feasibility stage:

- A water intake structure, as head works, with proper flood protection works for canal system and lining the entire water channel to the command area including drainage structures.
- An infiltration gallery along with lined irrigation channel up to the command area.

11. **Table B** below provides comparison of alternatives with respect to cost, design and environment for Mula River interventions:

Table B: Comparison of Alternatives

Parameters	Weir	Infiltration Gallery
Cost	Costly	Cheaper

Design	Weir can only be operateable during surface flow of river.	Infiltration gallery can provide water to agricultural field around the year
Perceived Environmental Impacts	Soil erosion, loss of natural vegetation, deployment of external labor force.	Soil erosion, loss of natural vegetation, deployment of external labor force.

E. BASELINE CONDITIONS

a) Physical Environment

12. The geological features of **Kharzan-Hatachi subproject area** comprise of Paleocene sedimentary rocks. Area adjacent to the subproject location, and also some part of the command area has underlying Eocene sedimentary rocks.

13. The seismic zoning map of Pakistan, indicates that the project area lies in the **zone 2B**. This zone is liable to MSK VI or less and is classified as the Low Damage Risk Zone. The Medvedev–Sponheuer–Karnik scale, also known as the MSK or MSK-64, is a macro seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence.

14. **Kharzan-Hatachi subproject area** is located in the middle reach of Mula River. The subproject is proposed on relatively wide gorge where the river is bounded by high mountains on both sides. The river has a width of 530 m and an elevation of 638 m above mean sea level at the subproject location. Moreover, the river is very steep in this reach having a longitudinal slope of 1:70. The terrain is generally flat in the subproject area and is suitable for command area development. The new command area is on a degraded rangeland

15. The hottest months are June and July while the coldest months are January and February. March received the maximum rainfall, while June, July and September received approximately same amount of rainfall (around 37 mm).

16. The soil type is very deep clay. The soil was moderately calcareous. No salinity and sodacity was encountered in soils

17. Ambient air and noise conditions in the Project Area, is generally clean and quiet, because only a few houses were visible in the project areas. There are no industrial setups within the area of influence of the Project Area. Vehicular traffic is absent as well as road infrastructure.

b) Biological and Natural Environment

18. The proposed project does not interfere with any ecological parameters, however, can be seen as a positive contributor in improving the carrying capacity and overall improvement of the ecosystem.

19. Vegetation zones of the ***Hitachi Area*** consist mainly of following:

#	Taxon	Family	Life form	Vernacular name
01	Acacia nilotica	Fabaceae	Tree	Babbur
02	Acacia sengal	Fabaceae	Shrub	Babbur
03	Prosopis cineraria	Fabaceae	Tree	Kandi
04	Prosopis glandulosa	Fabaceae	Shrub	Kandi
05	Prosopis juliflora	Fabaceae	Shrub	Devi
06	Tamarix sultanii	Tamaricaceae	Shrub	Kirri
07	Zizyphus nummularia	Rhamnaceae	Shrub	Ber
08	Aerva javanica	Amarantheaceae	Shrub	Gujo
09	Periploca aphylla	Ascalpidaceae	Shrub	
10	Capparis decidua	Capparidiaceae	Shrub	
11	Haloxylon recurvum	Amarantheaceae	Shrub	
12	Suaeda fruiticosa	Amarantheaceae	Shrub	
13	Suaeda ferinosa	Amarantheaceae	Shrub	
14	Grewia domaine	Malvaceae	Shrub	
15	Alhaji marorum	Fabaceae	Shrub	
16	Salvadora oleoides	Salvadoraceae	Shrub	
17	Salvadora persica	Salvadoraceae	Shrub	
18	Heliotropium sp	Boragenaceae	Shrub	Merin
19	Calligonum polygonoides	Polygonaceae	Shrub	
20	Rhazya stricta,	Apocynaceae	Shrub	
21	Euphorbia caducifolia	Euphorbiaceae	Shrub	
22	Commiphora mukal	Burseraceae	Shrub	Gugul
23	Inula montaine	Asteraceae	Herb	Kulumurak
24	Inula grantoides	Asteraceae	Herb	Kulumurak
25	Grewia tenex	Malvaceae	Shrub	Chill
26	Phoenix dyctylefera	Palmea	Tree	Khajoor
27	Cymbopogon sp	Poaceae	Grass	
28	Cenchrus sp	Poaceae	Grass	
29	Aristida sp	Poaceae	Grass	Nadak
30	Chrysopogon sp	Poaceae	Grass	
31	Sericostoma pauciflorum	Boraginaceae	herb	
32	Typha sp	Typhaceae	Shrub	
33	Convolvulus spinosus	Convulvolaceae	Twiner	
34	Fagonia indica	Zygophyllaceae	Shrub	
35	Salsola sp	Chenopodiaceae	Shrub	

20. Wildlife habitat type is Steppic Forest in Intermediate Latitude. There are no historical bench marks to determine the status of wildlife in the area. However, according to the community the number of wildlife species has declined; which could aptly be attributed to casual attitude for hunting and habitat degradation.

21. Cumulative faunal list of the ***Hitachi Area*** consist mainly of following:

#	Taxon	Common name	Life form	Conservation status
01	Gazella bennettii	Chinkara	Mammals	Rare
02	Capra aegagrus	Sindh Wild Goat	Mammals	Occasional
03	Ovis orientalis blanfordi	Urial (Gut)	Mammals	Occasional
04	Vulpes grifithii	Hill fox	Mammals	Occasional
05	Hysrix indica	Porcupine	Mammals	Common
06	Felis libyca	Desert Cat	Mammals	Occasional
07	Hyaena	Striped Hyaena	Mammals	Occasional
08	Vulpes	Desert Fox	Mammals	Occasional
09	Canis aureus	Asiatic Jackal	Mammals	Occasional
10	Canis lupus	Wolf	Mammals	Occasional
11	Hemiechinus auritus megalotis	Hedgehog	Mammals	Common
12	Goluda ellioti	Bush rat	Mammals	Common
13	Lepus capensis	Cape hare	Mammals	Common
14	Chlamydotis undulata	Houbara Bustard	Bird	Migratory
15	Ammoperdix griseogularis	See-see Partridge	Bird	Reported
16	Dupetor flavicollis	Black Bittern	Bird	Reported
17	Aquila heliaca	Imperial Eagle	Bird	Reported
18	Falco peregrinus	Peregrine Falcon	Bird	Reported
19	Pterocles coronatus	Crowned Sandgrouse	Bird	Migratory
20	Falco naumanii	Lesser Kestrel	Bird	Reported
21	Falco concolor	Sooty Falcon	Bird	Reported
22	Pterocles lichtensteini	Close-barred/ Lichtenstein Sandgrouse	Bird	Reported
23	Francolinus pondicerianus	Grey Partridge	Bird	
24	Pseudibis papillosa	Black Ibis	Bird	Reported
25	Corvus ruficollis	Brown-necked Raven	Bird	
26	Varanus griseus knoiecznyi	Indian desert monitor	Reptile	

27	Naja	Indian Cobra	Reptile	Common
28	Ablepharus pannonicus	Easter dwarf skink	Reptile	
29	Eristicophis macmahonii	Leaf nose viper	Reptile	

22. There were some five areas initially documented in Khuzdar district, however after administrative adjustments, they were left over as follows:

#	Area	Status	Tehsil	Distance from Karkh River Interventions	Distance from Haatachi Khizran Infiltration Gallery
1	Kera Dhori 8,094 hectares	Wildlife Sanctuary	Khuzdar	51 km away	55 km away
2	Chorani (19,433 hectare)	Notified forest	Khuzdar	88 km away	92 km away

c) Demographic and Socio-economic Environment

23. The major portion of the population earns their livelihood from Agriculture and livestock husbandry owing to diverse agro-climate. Agriculture Crops are sown both in Rabi and Kharif seasons. Crops cultivated during Rabi season include: Wheat, Barley, Vegetables and Fodder whereas in Kharif Sorghum, Maize, onion, potato vegetables and Fodder are sown. Besides the field crops, farmers in the district also grow fruit crops. Major fruits grown in the district include Apple, Almond, Apricot, pomegranates and grapes.

24. Houses are mainly constructed of locally available impermanent materials, typically mud or sub-baked bricks fused with baked mud strengthened with chopped straw. These materials make poorer households susceptible to invasion of vermin and seasonally unstable, needing reconstruction after heavy rainy season. The houses made of impermanent materials, generally do not have border walls.

25. There is no group of people that could be termed as “Indigenous Community”, under the definition of ADB.

26. No resettlement is envisioned, however, land distribution among the tribe members at individual basis of ownership need to be done.

F. ENVIRONMENTAL IMPACTS & MITIGATIONS

27. The project is expected to cause few environmental and social impacts, both positive and negative. Positive impacts due to project interventions are:

- Employment opportunities to some locals for design phase surveys.
- An anticipated positive impact on socio-economic conditions during construction phase is the creation of limited-time employment opportunity for the local population. Since the project interventions will require substantial input from manual labor, even people with relatively lower levels of education or skills could get short term employment.
- A substantial land will be irrigated under the proposed scheme.
- Household income will increase substantially with irrigation improvement measures owing to availability of water for irrigation, crop yields, increase in the number of animals, and availability of other occupational opportunities.
- The Project will positively contribute in improving the carrying capacity of biological environment and overall improvement of the ecosystem.
- Availability of irrigation and agriculture would support livestock growth and in due course of time would enable farmers to diversify in areas of dairy production.
- Availability of water for cultivation of crops will support cropping during Rabi as well as Kharif season over the entire command area. During due course of time, availability of water will support agriculture and other production system and will help in converging into an integrated system wherein all the components of the ecosystem will be producing at their optimal level including the human element.

28. Phase wise negative impacts due to Project interventions are provided below:

Infiltration Gallery at Hatachi - Kharzan (*construction of new infiltrations galleries at Kharzan and Hatachi , Rehabilitation lining of irrigation channels at Kharzan and Hatachi , Rehabilitation of existing hydraulic structures, construction of social structures and time division structures*)

a) Design & Planning Phase

- **Assessment of Water Availability:** Improper assessment of water availability and failure of design. This impact would be of moderate significance.
  Mitigation: Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.
- **Design works construction of infiltration gallery as per proper engineering standards**
  Mitigation: Review of engineering design works will ensure the proper design of the system.
- **Social Issues**
  Mitigation: Acquire full information about traditional water rights and ensure that these are not disturbed.
  Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions.
- **Risk due to Natural Hazard i.e. flooding and earthquakes:** The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching weir, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.

Mitigation: Design engineer should ensure that seismic design of weir and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance.

Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.

b) Construction Phase

- **Changes in land use pattern, Cultural conflicts, Influx of external work force, Land degradation due to solid waste disposal of camp site, Workshop facilities will spread oils & chemicals, Soil erosion**

  Mitigation: Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.
- **Workshop facilities may spread oils & chemicals**

  Mitigation: Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.
- **Deterioration of air quality due to machinery & equipment**

  Mitigation: Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.
- **Noise pollution**

  Mitigation: Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed. Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured.

  Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.
- **Land degradation due to solid waste disposal of camp site**

  Mitigation: Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation. Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed
- **Water contamination**

Mitigation: Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits.

- **Loss of vegetation**

  Mitigation: The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.

  Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area.

- **Health and Safety issues**

  Mitigation: Protective fencing to be installed around the Camp to avoid any accidents. Firefighting equipment shall be made available at the camps. The camp staff shall be provided firefighting training. All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel. Health & safety plan should be prepared by contractor and get it approved by supervision consultant.

  Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. Project drivers shall be trained on defensive driving. Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.

  Demarcation tapes to be installed around the construction site to avoid any unauthorized entry. Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant

  Mitigation: community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites.

- **Soil erosion and contamination**

  Mitigation: Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.

  Material borrowing and disposal plan should be prepared. Cultivation fields should be avoided for borrowing material to the extent possible. Written consent of the land owner should be obtained for material (soil) borrowing. Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites

- **Air pollution**

  Mitigation: Vehicular traffic on unpaved roads shall be avoided as far as possible.

Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.

Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.

- **Noise pollution**

  Mitigation: Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.

  Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed. Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. Avoid night time activity.

- **Damage to infrastructure**

  Mitigation: All damaged infrastructure shall be restored to original or better condition.

- **Site overburden**

  Mitigation: Wind direction shall be considered while selecting sites for stock piles. Stockpiles of overburden shall be kept covered where possible. Ensure proper disposal of construction waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. Proper disposal of waste material. Demarcate the waste site and provide details of land use. Finally take approval from supervision consultant. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material Dismantled asphalt pavement shall be dumped to the waste site.

- **Borrow pit management**

  Mitigation: As far as possible wasteland or natural areas with a high elevation will be demarcated for borrowing earth material. Where the use of agriculture land is unavoidable, the top 300 mm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will initially fill with scrap material from construction and then leveled with the stockpiled topsoil. Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize the erosion and to avoid creating hazards for people and livestock. Land owners will be compensated according to the terms of lease agreement negotiated with the land owners, and restoration action agreed upon by the contractor will be duly carried out.

- **Sites of Historical, Cultural, Archeological or Religious Significance**

  Mitigation: Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for

construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites. Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.

- **Blocked of access due to earth works and stockpiling of excavated material**
  Mitigation: A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.

c) Operation & Maintenance Phase

- **Social issues and System sustainability**
  Mitigation: Agreements between different communities/tribes. Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. Ensure community participation in management and operation of the irrigation system. Training of community.
- **Health issues**
  Mitigation: Proper treatment system shall be provided. Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system. Turbidity and free residual chlorine tests shall be regularly performed. Arsenic will be tested as per WHO standards.
- **Solid waste generation**
  Mitigation: Ensure proper disposal of waste at designated landfill/disposal sites.
- **Loss of pastoral lands**
  Mitigation: Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals.
- **Conservation issues**
  Mitigation: Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.
- **Banned fertilizer & pesticides will cause health issues, Contamination of fresh water through surface runoff**
  Mitigation: Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as **Annexure 15** of this report
- **Risk due to Natural Hazard i.e. flooding and earthquakes (System sustainability)**
  Mitigation: Emergency Response Plan for Infiltration Gallery will be followed which is attached as **Annexure – 12** of this report.

Mula River Intervention: Flood Protection Bund

a) Design & Planning Phase

- **Design works construction of flood protection bund as per proper engineering standards (In case of design failure system will be collapsed)**
  Mitigation: Review of engineering design works will ensure the proper design of the system.

- **Social issues**
  Mitigation: Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions.

b) Construction Phase

- **Changes in land use pattern, Cultural conflicts, Influx of external work force, Land degradation due to solid waste disposal of camp site, Workshop facilities will spread oils & chemicals, Soil erosion**
  Mitigation: Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase. The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.
- **Workshop facilities may spread oils & chemicals**
  Mitigation: Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.
- **Deterioration of air quality due to machinery & equipment**
  Mitigation: Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.
- **Noise Pollution**
  Mitigation: Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed. Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. Avoid night time activity.
  Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.
  Equipment with high levels shall be fitted with noise reduction devices. Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed.
  Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. Avoid night time activity
- **Land degradation due to solid waste disposal of camp site**

Mitigation: Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation. Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed.

- **Water contamination**

  Mitigation: Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits.

- **Loss of vegetation**

  Mitigation: The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.

  Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area.

- **Health and Safety issues**

  Mitigation: Protective fencing to be installed around the Camp to avoid any accidents. Firefighting equipment shall be made available at the camps. The camp staff shall be provided firefighting training. All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. Project drivers shall be trained on defensive driving. Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.

  Demarcation tapes to be installed around the construction site to avoid any unauthorized entry. Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Health & safety plan should be prepared by contractor and get it approved by supervision consultant

- **Soil erosion and contamination**

  Mitigation: Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination.

  Material borrowing and disposal plan should be prepared. Cultivation fields should be avoided for borrowing material to the extent possible. Written consent of the land owner should be obtained for material (soil) borrowing. Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites.

- **Air pollution**

  Mitigation: Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order

to minimize the exhaust emissions.

Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.

- **Damage to infrastructure**

  Mitigation: All damaged infrastructure shall be restored to original or better condition
- **Sites of Historical, Cultural, Archeological or Religious Significance**

  Mitigation: Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites. Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction

c) Operation & Maintenance Phase

- **Breaching of Flood Protection Bund (System sustainability)**

  Mitigation: monitor the system on a regular basis. Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.
- **Risk due to Natural Hazard i.e. Flooding and Earthquakes (System sustainability)**

  Mitigation: Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 13** of this report.

G. ENVIRONMENTAL MANAGEMENT PLAN

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

30. EMP also provides its implementation mechanism during construction and operational phases

- **Implementation during Construction Phase**: The executing agency for this Project is Balochistan Irrigation Department (BID) having core implementation responsibility. The BIPD will overall monitor the environment related activities of Supervision Consultant and Construction Contractor and report to EPA-Balochistan regarding implementation status of EMP. Construction Contractor will be in direct coordination with Supervision Consultant through its HSE Department. Contractor's HSE Department is highly recommended to be on-board before mobilization.

- **Implementation during O&M**: The key players involved during operation of the proposed project are EA (BIPD), District Environmental Officers of Khuzdar, Water User Associations (WUA) & Farmer Organizations (FOs) Chairman and Vice Chairman. BIPD will get input from WUA and FOs, randomly check the project operation in context of EMP and report to District Environment Officers annually.

31. The EMP is prepared taking into account environmental consequences of the proposed action. Mitigation measures are suggested in Environmental Mitigation Plan at different stages of activities with performance indicators to mitigate the potential impacts. Environmental Monitoring Plan has also been prepared as a part of EMP which details about monitoring mechanism of a specific receptor /item, its frequency and parameters to be considered. The designer has carefully considered all recommendations related to the design. Though construction impacts are not severe, proper mitigation measures are needed. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational phase of the project. All required permits shall be obtained from the concerned departments before starting the related activity. Grievances should be addressed promptly, as suggested in the EMP.

H. EMP Budget

32. The EMP budget for construction and operations period of Project is as follows:

Table B: Cost for Contractor

Sr. #	Description	Unit Cost* PKR / Month
1	Laboratory Analysis Cost	100,000
2	Contractor Environmental Engineer (each contractor)	80,000
3	Health & safety measures to manage COVID-19	800,000 for whole project period

* based on unit parameter testing and sampling cost for air, water and noise.

Table C: Cost for Proponent

Sr. #	Description	Amount (PKR)*
A	**During Construction Period**	
1	Third Party Monitoring through EPA registered Environmental lab	500,000/Quarter
2	Training on EMP	100,000
B	**During Operation & Maintenance Period (for one year)**	
1	Laboratory Analysis Cost	61,000/Six Months
5	Training & Community Engagement Cost	200,000

* based on unit parameter testing and sampling cost for air, water and noise.

I. CONCLUSION

33. The report provides conclusion based on the impacts assessed and the mitigation measures suggested. It is recommended that EMP will be made a part of all bidding/tender document. Contractor will be bound to completely implement relevant mitigation measures set out in the EMP. Also, the cost related to these mitigation measures has to be borne by the Contractor. Contractor shall prepare detailed Burrow, Quarrying and Disposal Plan, site specific HSE Plan as mentioned in EMP.

34. No land acquisition and involuntary settlement are involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence.

35. 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.

36. Construction of subproject is going to bring positive changes in the area in terms of availability of water, cultivation of crops, establishment of new settlements and improvement in the standard of life of the inhabitants of the area. Land which is lying barren at present would change to lush green valley through provision of irrigation water. Availability of irrigation and agriculture would support livestock growth and in due course of time would enable farmers to diversify in areas of diary production.

37. Some activities under this project have been identified to cause low to moderate environmental negative impacts and their mitigation measures have been prescribed. Proper and timely execution of these measures will reverse most the negative impacts in the long term however there will be some residual impacts of the project. Overall the project causes moderate to high positive impacts on the physical and socio-economic environments and should therefore be approved for implementation.

1. INTRODUCTION

37. In the water starved, land rich Province of Balochistan, any and all initiatives for development of water resources certainly deserve top priority. Government of Balochistan (GoB) in collaboration with Asian Development Bank (ADB) has envisioned a Balochistan Water Resources Development Project (BWRDP) comprising rapid assessment of five river basins namely, Dasht, Hingol, Mula, Pishin and Zhob and selecting two river basins for further detailed study. Based on the pre-feasibility study and initial engineering design subprojects shall be proposed, and out of these two core subprojects will be selected for Feasibility and Engineering design. ADB selected the NESPAK-RHC-EGC JV to provide consultancy services for the Project Design, Construction Supervision and Implementation Support for BWRDP.

38. Initially, four river basins of Balochistan, namely, Dasht, Hingol, Kacchi, and Zhob were indicated. During the tripartite deliberations held on 7-8 March 2016; Quetta, it was decided to replace Kacchi by Mula River Basin; and add Pishin River Basin for a rapid assessment. Accordingly, the PPTA comprised of Dasht, Hingol, Mula, Pishin, and Zhob River Basins.

39. After the rapid assessment of above-mentioned four (04) river basins on the basis of following criteria, two river basins Zhob and Mula has been selected for detailed feasibility:

- Population;
- Cultivated Area;
- Non-Utilized Water Potential;
- Completed Projects in Basins;
- Proposed Projects in Basins;
- Social Acceptance;
- Security;
- Growth Pattern.

40. The Initial Environmental Examination of this project was prepared by PPTA consultants that is being updated by Project Design, Construction Supervision and Implementation Support Consultants.

1.1 Kharzan Hatachi Infiltration Gallery

41. The Kharzan Hatachi Infiltration Gallery is located in District Khuzdar in Mula River Basin on Mula River. The sub-project site is located at a distance of 115km from Khuzdar city. The first 80km are via Ratodero-Gwadar motorway (commonly known as M-8) upto Karkh valley from where a 45.0 km long black top Mula road in the mountainous area leads to the Kharzan Hatachi villages. The location of subproject is shown on the Location Map in **Figure 1 and 2.**

42. The scheme is proposed on river bents (small flat patches) and therefore, limited amount of land is available for irrigation. The proposed scheme will use surface flow as well as sub-surface flow for irrigation. The scheme will bring 681 hectares under cultivation out of which 576 (84.5%) hectares are already under cultivation, while an additional 105 hectares will be added to the existing command area. After construction of this scheme, lands belonging to two villages in Mula Tehsil, namely Kharzan and Hatachi will come under cultivation. Kharzan is located on the right bank while Hatachi is on the left bank of the Mula River.

43. In Kharzan Hatachi Irrigation sub-project, two infiltration galleries (one each on right and left banks) are designed in bed of Mula River about 1.9 km from each other. Details of each gallery are given in **Table 1**. Both of these are connected to collection chambers (off-take well) and irrigation channels, which bring water to command area. Necessary river protection bunds are provided on either side of river along channel and command area to save these from floodwater. At Kharzan, proposed gallery is 575 m long, while at Hatachi, gallery is 735 m long. Kharzan infiltration gallery is places diagonally at an inclination angle of 450 to river flow (towards upstream) at a depth of 4.67 m, whereas Hatachi infiltration gallery is placed perpendicular to river flow at a depth of 5.3 m below river bed.

Table 1. Details of infiltration galleries proposed at Kharzan and Hatachi

Parameter	Kharzan	Hatachi
Gallery Length (m)	575	735
Gallery Pipe Diameter (m)	1.0	1.0
Design Discharge (cumec)	0.566	0.707
Command Area (Ha)	235	446
Gallery Elevation (m)	623.72	607.22

Figure 1: Location Map of Kharzan Hatachi Irrigation Subproject

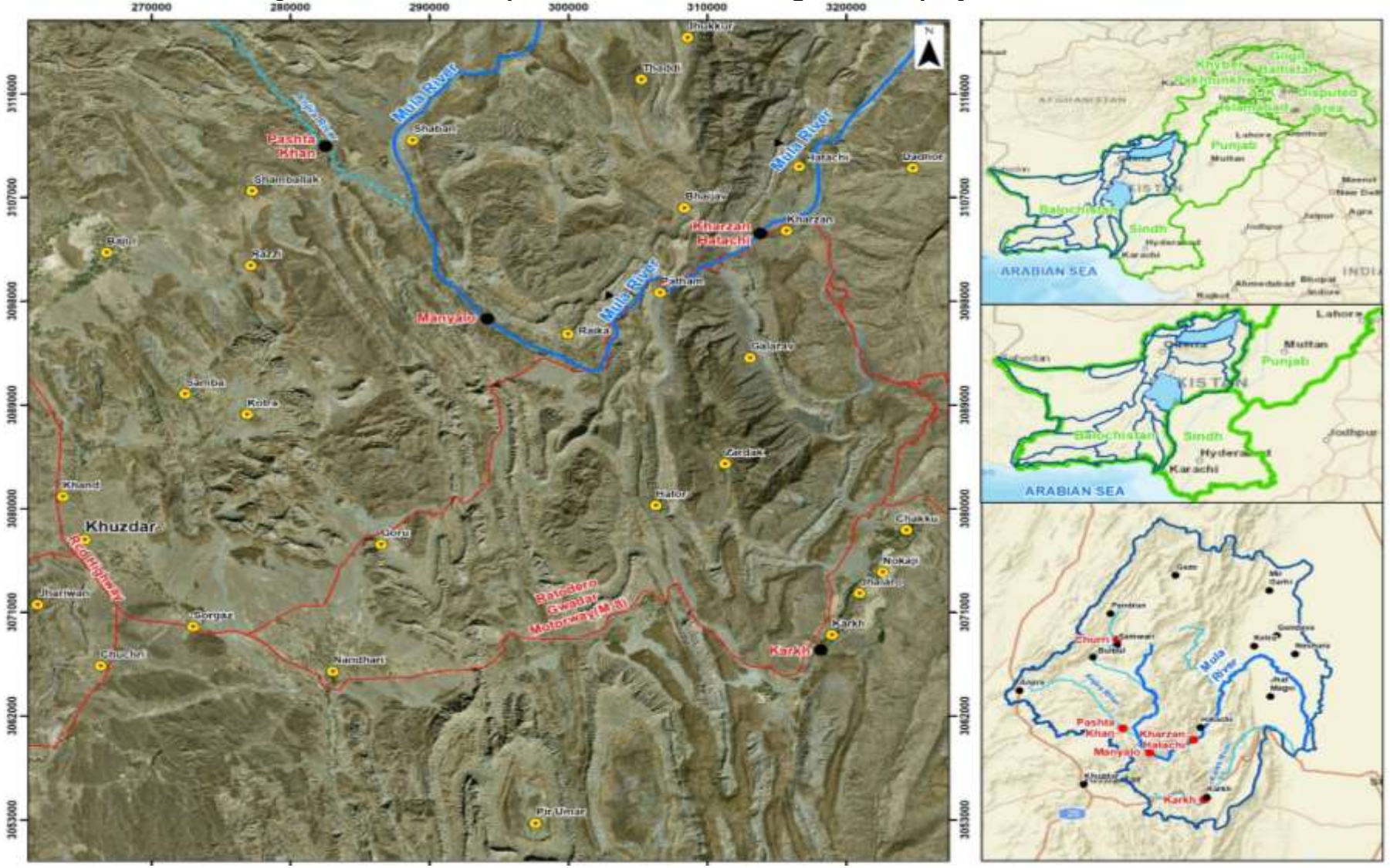
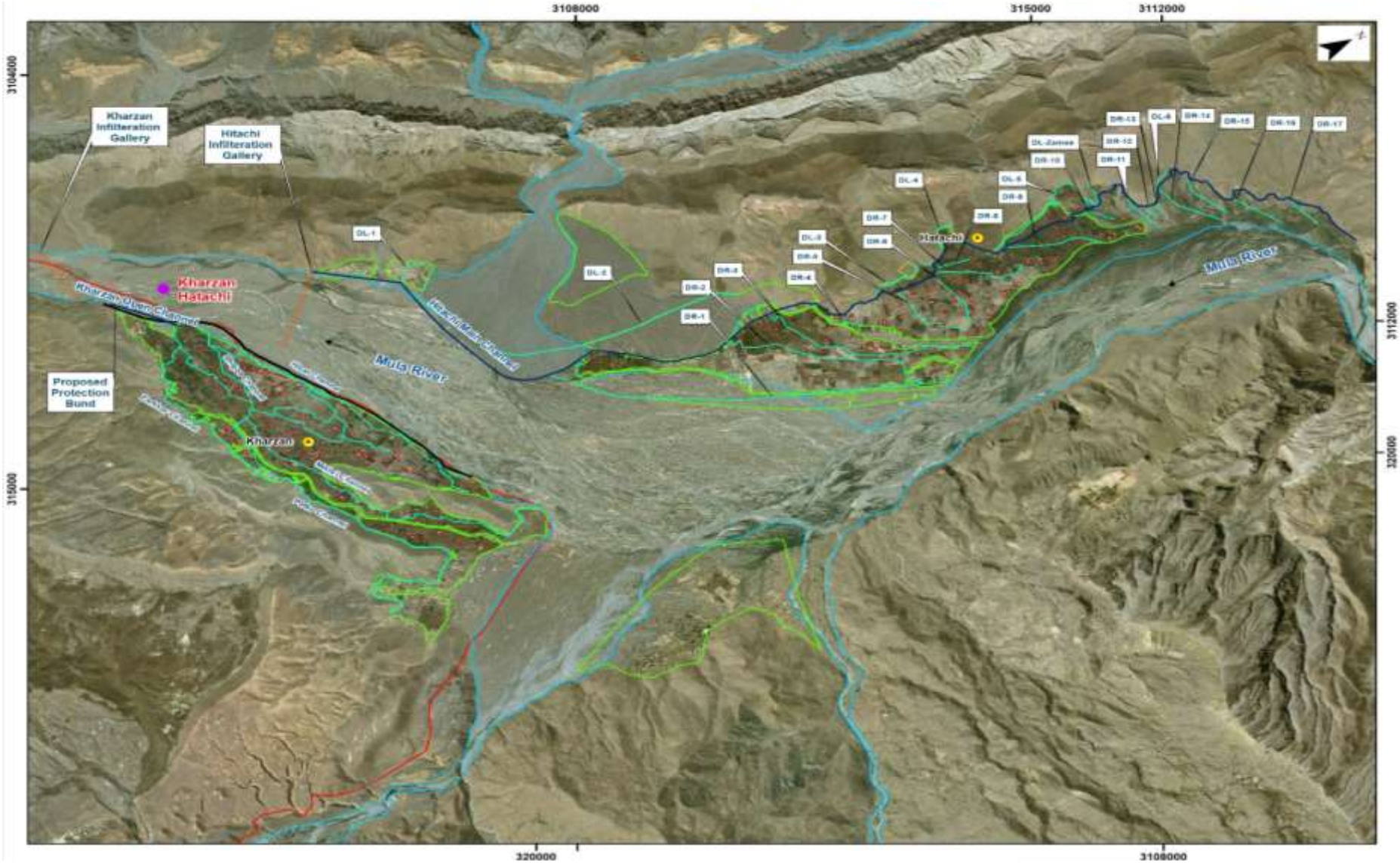


Figure 1:Layout Map of Kharzan Hatachi Irrigation Subproject



1.2 Proposed Interventions at Mullah River (Kharzan and Hatachi Infiltration Gallery)

44. The proposed interventions can be divided into three broad categories. **Figure 2** gives clear idea of the project interventions:

(a) Construction of two infiltration galleries,
(b) Construction and rehabilitation of water conveyance system and associated structures,
(c) flood protection works for irrigation canals and command area.

1.3 Environmental Assessment

45. The apex Pakistani law governing the subject of environment is the Pakistan Environmental Protection Act – 1997 (PEPA-97). Under Section 12 of the Act, it is mandatory for the proponents of the projects[2] to execute the IEE and / or EIA (where warranted), and get the approval from federal agency (i.e. Pak-EPA). This function has been delegated under Section 26 to provincial EPAs.

46. After the 18th amendment to the constitution of Pakistan, environment became a provincial subject, and the environmental law governing the construction of infiltration gallery in Hitachi – Kharzan area of Mula River at district Khuzdar. is the "Balochistan Environmental Protection Act 2012". This act also provides for

IEE or EIA (as the case maybe) for projects under its clause 15.

47. The EIA / IEE regulations of 2000 provide categories of projects for which IEE or EIA needs to be conducted. The proposed project falls under the category of "Water management, dams, irrigation & flood protection" and hence the environmental study is conducted and an IEE report is being prepared.

48. Accordingly, a proposed project is classified as 'Category B' if it is unlikely to cause significant adverse environmental and social impacts. A project is classified as 'Category B' if it's potential adverse environmental impacts on human populations or environmentally important areas, (e.g., wetlands, forests, grasslands, and other natural habitats) are less adverse, site-specific, and reversible with the exception of a few.

[2] The Act defines a Project as: *"Any activity, plan, scheme, proposal or understanding involving any change in the environment and includes:*
- *a. Construction or use of buildings or other works;*
- *b. Construction or use of roads or other transport systems;*
- *c. Construction or operation of factories or other installations;*
- *d. Mineral prospecting, mining, quarrying, stone-crushing, drilling, and the like;*
- *e. Any change of land use or water use; and*
- *f. Alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations."*

49. Accordingly, a proposed project is classified as 'Category B' if it is unlikely to cause significant adverse environmental and social impacts. A project is classified as 'Category B' if it's potential adverse environmental impacts on human populations or environmentally important areas, (e.g., wetlands, forests, grasslands, and other natural habitats) are less adverse, site-specific, and reversible with the exception of a few.

50. According to ADB, an IEE is required for 'Category B' projects to determine the likelihood of significant environmental impacts. In such a case, an EIA study of the project is warranted. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Public consultation is a mandatory task to be undertaken during the IEE process.

51. Based on the above requirements of national and provincial regulations, as well as the ADB policy, an Initial Environmental Examination of the proposed interventions is being carried out.

52. The overall objective of IEE study is to elucidate the anticipated aspects of the proposed project and their impacts on the surrounding environment in order to propose necessary mitigation measures to prevent/minimize adverse impacts. To achieve this objective, an assessment of the existing environmental status of the project site is a prerequisite and, therefore, included in this study by collecting and reviewing the baseline data of various environmental attributes.

53. The IEE report will be prepared to ensure adequate environmental and social management during the lifecycle of the project for the previously mentioned interventions of the Mula River Basin Project.

54. It intends to provide mechanisms for ensuring that potential environmental and social impacts of the current program are identified, assessed and mitigated as appropriate, through an environmental and social screening process.

55. The IEE report is also required to, comply with the Pakistan / Balochistan Environmental and social requirements, as outlined in the prevailing IEE / EIA Guidelines. The IEE will also comply with the ADB Safeguard Policies SPS – 2009 or 2012 for environmental management of projects.

1.4 More Specific Objectives of IEE Report

56. More specific objectives of this IEE report include following:

i. Meet the statutory requirements set forth by the Pakistan Environmental Protection Act (PEPA) 1997 and the Balochistan 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

57. The scope of the assignment will consist of the following sections:

- Description of the Project:

58. Complete description of the relevant parts of the project will be provided, using appropriate visual aids (maps, photographs, satellite imageries etc.) where necessary.

- Analysis of Project Alternatives:

59. Alternatives of the project will be examined including no-action option.

- Legislative and Regulatory Considerations:

60. A comparison of national and international standards (such as International Finance Corporation (IFC)'s Environment, Health & Safety (EHS) requirements) will be conducted in the IEEs to identify most stringent standards, applicable to this project and will be included in the IEE report. The appropriate authority jurisdictions that will specifically apply to the project will also be identified.

- Description of the Environment:

61. The baseline data on the relevant environmental characteristics of the Study Area will be assembled, evaluated and presented. This section includes the detailed description of the following environmental attributes within the project area. The 'Project Area' is defined as the area within which the impact of the project may be expected.

62. In Mula River, the proposed subproject of Kharzan-Hitachi Gallery is situated at UTM Zone 42R and coordinates of the subproject are 3103885.09 North and 313839.58 East at about 120 kms north-east of Khuzdar via Ratodero-Gawadar motorway. The mean altitude of the subproject command area is 600 m above mean sea level.

- Physical Environment:

63. Locations and surroundings, site plans and layout, geography, polar coordinates, soils and geology, topography and drainage system, seismic zone, water resources, air and water

quality, public water supplies, climate and ambient noise.

64. Most of this information is available through reliable secondary data sources. The IEE team has mostly used this data in the report after validation. All such data is properly referenced in this report at relevant locations. Monitoring and testing of major environmental parameters have been conducted in the field as described in the report.

- Biotic and Natural Environment:

65. Data pertaining to Flora and fauna of the terrestrial ecosystems, rare or endangered species and sensitive habitat will be collected and assessed from relevant department and local community. A list of fauna and flora has been given with conservation status and local information. This list has been prepared by ecologist through field observations and secondary data from the Forest & Wildlife Department of Government of Balochistan

- Socio-economic Environment:

66. Demographics, employment, land use, community structure, public health, communal facilities or services, sites affected by the project and community perceptions about the project.

67. Primary data from the project feasibility report prepared by the Social team has been used. Secondary data has also been added at relevant sections and properly referenced. Validation of available information will be done by characterizing the extent and quality of collected data. This will help in indicating the significant information deficiencies and any uncertainties associated with the prediction of impacts.

- Potential Impacts of the Project:

68. Impacts related to the project will be identified and distinction for significant impacts will be made between positive and negative, direct and indirect, short and long term, during different phases of the project implementation. Cumulative impacts will also be identified. Special attention will be paid to:

- Impacts of the project on the ecology;
- Impacts of the project on the existing socio-economic conditions;
- Impacts of the project on ambient noise levels;
- Impacts of the project on the ambient air quality;
- Impacts of the project on water quality;
- Impacts of the project on soil characteristics; and
- Impacts of the project on health and safety.

69. “Impact prediction" basically refers to the quantification, where possible (or, at least, the qualitative description) of the anticipated impacts of the proposed project on various environmental factors. It is desirable to quantify as many impacts as possible, because in so

doing, it has been frequently determined that the concerns related to anticipated changes are not as great as would be supposed, in the event of non-quantification.

70. The next stage of the IEE process is a detailed assessment to forecast the characteristics of the main potential impacts. Known as impact analysis. Impact identification and prediction are undertaken against an environmental baseline, often through indicators e.g. air/water, noise, ecological sensitivity, biodiversity. The aim is to take account of all of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are taken into consideration

71. Environmental impact studies represent a blend of technical information and analysis along with value judgments. To assess an environmental threat posed by an aspect, the principal factors to be considered are:

- the likelihood that the threat may be realized; and
- in the event of realization of the threat, the nature and extent of the consequences.

72. A qualitative risk assessment methodology has been adopted for this project, comprising the Likelihood and Consequence values detailed in **Table 2** and **Table 3**.

Table 2: Qualitative Likelihood Values

Likelihood Indicator	Likelihood Description	Explanation
A	Almost Certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May only occur in exceptional circumstances

Table 3: Qualitative Consequence Values

Consequence Indicator	Consequence Description	
1	Insignificant	Negligible, reversible, requires very minor or no remediation / minor injury with slight negative health impact
2	Minor	Reversible, requires minor remediation / major, non-fatal health impact to one or more individuals
3	Moderate	Reversible, short-term effect, requires moderate remediation / severe, non-fatal health impact to one or more individuals

4	Major	Serious impact, medium term effect, requires significant remediation / single fatality or severe irreversible disability or impairment
5	Catastrophic	Disastrous impact, long term effect, requires major remediation / multiple fatalities, major permanent health impacts on a large number of individuals

73. On the basis of a likelihood and consequence matrix (**Table 4**), each hazard may be categorized into broad 'risk categories' and the required management approach for each risk category can be defined.

Table 4: Risk Matrix – Risk Categories and Management Response

		Consequence				
		1	**2**	**3**	**4**	**5**
Likelihood	**A**	M	M	H	H	H
	B	L	M	H	H	H
	C	L	L	M	H	H
	D	L	L	L	M	H
	E	L	L	L	M	M

H = High Risk – Proposed works methods not acceptable and must be altered.
M = Moderate Risk – Detailed management action plan to be prepared, including monitoring program.
L = Low Risk – Routine management procedures to be defined and monitoring requirements

74. Residual impacts after implementation of mitigation measures have also been provided.

- Mitigation measures for Adverse Impacts:

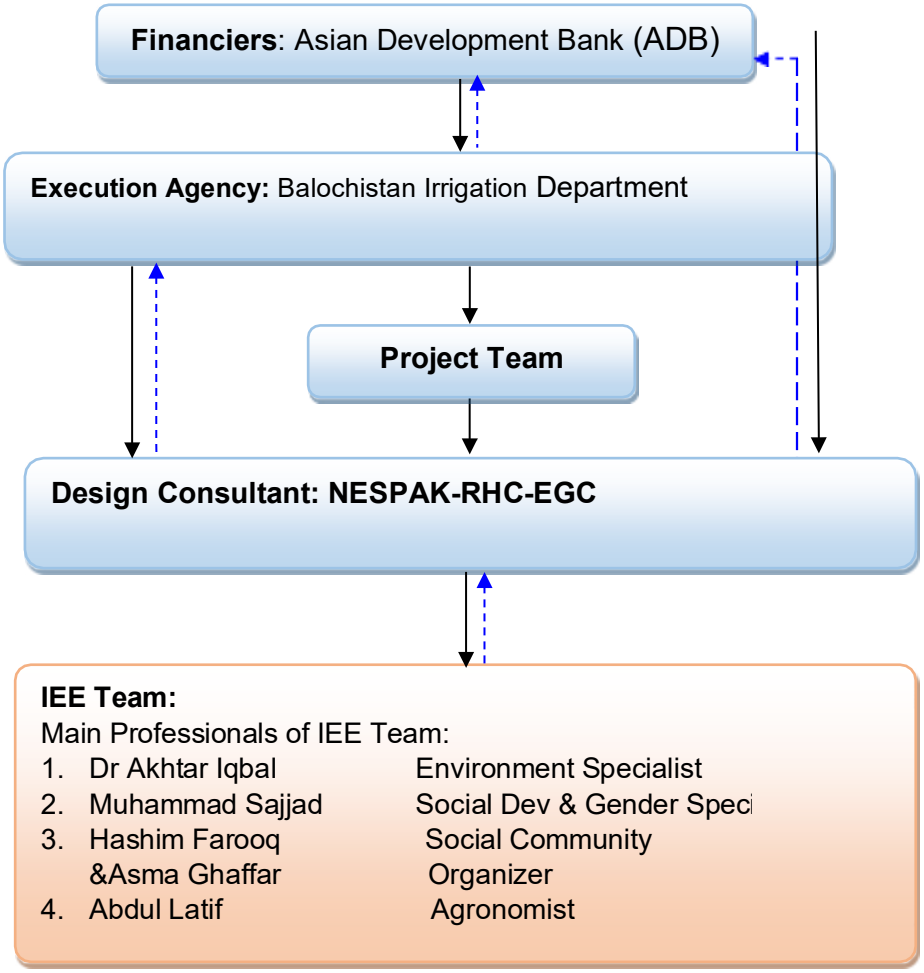
75. Possible measures to prevent or reduce significant negative impacts to acceptable levels will be identified. Recommendations to adopt feasible mitigation measures will be included in the report.

- Development of an Environmental Monitoring and Management Plan:

76. The critical issues requiring monitoring to ensure compliance to mitigation measures will be identified. Impact management and monitoring plan for operations will be presented.

77. Besides the above-mentioned professionals from NESPAK-RHC-EGC JV, its other staff members based in offices located in Lahpre will provide logistics and professional support to the IEE team as and when required.

1.6 IEE Team Arrangement



2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

2.1 General

78. 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 The IEE report also conforms with the guidelines as provided in ADB's Safeguard Policy Statement (SPS) 2009.

2.2 Background

79. The Government of Pakistan realized the importance of environmental preservation way back in the early 1980's. Until the 1980's development policies were formulated irrespective of environmental considerations. A variety of environment-related acts and ordinances existed, but the Pakistan Environmental Protection Ordinance 1983 (PEPO) was the first effort to deal with environmental concerns systematically. The ordinance created a legal basis for comprehensive environmental policy making, the establishment and enforcement of standards, environmental impact assessments and the inclusion of environmental considerations in development policies[3]. In 1984, the promulgation of this ordinance was followed by the establishment of the Pak-EPA, the primary government institution dealing with environmental issues. The PEPO 1983 was replaced with a new Act of Parliament in 1997 i.e. PEPA Act 1997.

80. The UN International Summit on Environment was held in 1992 in Rio de Janeiro, to highlight the importance of environment protection and to promote sustainable development. Pakistan also became a signatory of this summit, after which the Government of Pakistan developed a National Conservation Strategy (NCS), approved in March 1992. It was decided that all reports regarding strategies, policies and program for sustainable development will be drawn up on the basis of the NCS[4]. Another major environmental policy initiative formulated in 1999 was Environmental Planning and Resource Conservation Project (EPRCP)[5].

81. 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[5]. NEQS for municipal and liquid industrial effluent, industrial gaseous emissions and motor vehicle exhaust and noise,

[3] *"Industrial policy and the Environment in Pakistan":* United Nations industrial development organization*;*

[4] "*A model process to develop a National Agenda*": Pakistan National Conservation Strategy; pg1.

[5] *"Industrial policy and the Environment in Pakistan":* United Nations industrial development organization*;* 11 December, 2000; pg.9

were issued by Pakistan EPA in 1994.

82. Pakistan EPA review of IEE and EIA Regulations, 2000 and Pakistan Environmental Assessment Procedures were published, to provide necessary guidelines for preparation, submission and review of IEE and EIA.

2.3 National Environmental Policy

83. 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.

84. 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

85. The Integrated Water Resources Management (IWRM) Policy in Balochistan 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.

86. As per Draft Balochistan Comprehensive Development Strategy 2013 -2020 the water sector development will be as under:

87. "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 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 establishment of Drip Irrigation Manufacturing Plants in the province under PPP mode for providing either front- end or back- end subsidy to get a system introduced with full institutional support. There is emphasis that water supply and sanitation require a dedicated attention and given the massive gap, it is planned to undertake integrated water supply and sanitation system in partnership with the local communities especially

women through a community infrastructure program for a minimum of 5000 settlements.

2.5 Balochistan Acquisition of Land Act 1974 & (Amendment) Ordinance 1976

88. 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.

89. The Balochistan Acquisition of Land Act allows the government to acquire private land for housing or development schemes. Initially, the law specifically mentioned “in rural areas”, but this was deleted subsequently through the Ordinance in 1976. “Land Acquisition” literally means acquiring of land for some public purpose by government/government agency, as authorized by the law, from the individual landowner(s) after paying a government fixed compensation in lieu of losses incurred by land owner(s) due to surrendering of his/their land to the concerned government agency. The laws essentially are developments on the land acquisition act of 1894 which was created with the purpose of facilitating acquisition by the government of privately held land for public purposes. The word "public purpose", as defined in the act, refers to the acquisition of land for constructing educational institutions or schemes such as housing, health or slum clearance, as well as for projects concerned with rural planning or formation of sites. It is not necessary that all the acquisition has to be initiated by the government alone. Local authorities, societies registered under the societies registration act, 1860 and co-operative societies established under the co-operative societies act can also acquire the land for developmental activities through the government.

90. Land acquisition requires interaction between the Requiring Body (RB), which is normally a government agency that requires the land for certain national development project, and the Acquiring Body (AB), which is normally the Provincial Revenue Board, since land is a provincial subject according to the Constitution. The division of responsibility between the Requiring Body and the Acquiring Body in broad terms is that the Requiring Body provides the technical input and the Acquiring Body provides the legal input in the land acquisition process. It is the Requiring Body which must ensure that the project, for which the acquisition of land is required, is approved by the authorities and that funds are available. The Requiring Body must also justify the need for land and other property on the basis of field surveys including detailed engineering design and prepare all necessary documents required for decision making.

91. It is to be noted here that no acquisition of privately held land is envisaged for the said project.

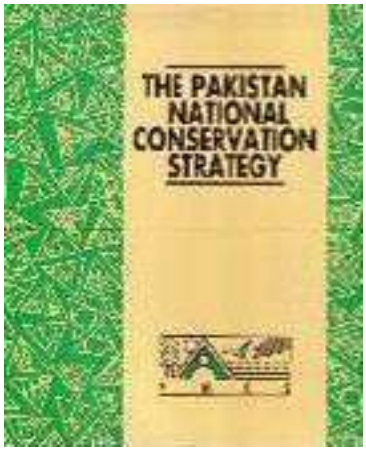
2.6 Environmental Legislations

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

2.6.1 National Regulations

93. The environmental policy framework, which will govern the project, is the NCS of Pakistan. The Pakistan 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



94. 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

95. 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[6].

2.6.2 Pakistan Environmental Protection Act, 1997

96. The PEPA 1997 is the apex environmental law of the country. Under section 12 of the Act, it is mandatory for the proponents of the projects[7] to execute the IEE and / or EIA (where warranted), and get the approval from provincial EPA. A copy of PEPA 1997 is attached as **Annexure – 2** of this report.

97. The following rules and regulations have been issued under the Pakistan

[6] Qadar S., and Dogar A. R., *Pakistan's Environmental Laws & Their Compliance*, Lahore Law Times Publications, 2002.

[7] The Act defines a Project as: *"Any activity, plan, scheme, proposal or understanding involving any change in the environment and includes:*

a. Construction or use of buildings or other works;
b. Construction or use of roads or other transport systems;
c. Construction or operation of factories or other installations;
d. Mineral prospecting, mining, quarrying, stone-crushing, drilling, and the like;
e. Any change of land use or water use; and
f. Alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations."

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.

2.6.3 Balochistan Environmental Protection Act, 2012

98. 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.

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

100. In terms of requirements of EIA / IEE, the provincial Act contains, in its section 15, similar provisions as given in the PEPA section 12. The PEPA has entrusted the authority of review and to approve environmental assessments to the provincial EPA. The proposed project falls under the jurisdiction of the Balochistan Environmental Protection Agency (BEPA). This IEE report will need to be submitted to EPA (B) for grant of environmental NOC.

101. An interesting provision of the provincial Act, which is relevant for the proposed project, is given in its section 20. 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.

2.6.4 Pakistan EPA Review of IEE and EIA Regulations, 2000

102. 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.

103. The Review of IEE and EIA Regulations 2000, prepared by Pak-EPA under the powers conferred upon it by PEPA-97, categorizes projects for IEE and EIA, respectively[8]. The proposed interventions under Mula River are likely to fall under the Category B as defined in Schedule – I of Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000, attached as **Annexure – 3**. According to these guidelines, the proposed project would require an IEE to be conducted.

104. According to the details provided in the regulations regarding preparation, submission, and review of IEE's and EIA's, following is a brief description of the approval process.

a. A project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations i.e. Schedule I and II attached as **(Annexure – 3)** at the end of this report.
b. An EIA or IEE is conducted as required and following the Pak-EPA guidelines.
c. The EIA or IEE is submitted to the concerned EPA: provincial EPAs if the project is located in the provinces or Pak-EPA if it is located in the Federal administered area.
d. 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.
e. The submittal is also accompanied by an application in the format prescribed in Schedule IV of the regulations.

[8] "PEPA Review of IEE and EIA Regulations, 2000", pg-2

f. The EPA 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.
g. The EPA 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.
h. When the EPA accord their approval subject to certain conditions:
i. Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
j. Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
k. An environmental management plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
l. The EPA is required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
m. 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.

2.6.5 Forest Act 1927

105. 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.

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

2.6.6 The Antiquities Act, 1975

107. 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.

2.6.7 Pakistan Penal Code 1860

108. 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.

2.6.8 The Balochistan Wildlife Protection (Amendment) Ordinance, 2001

109. 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.

2.6.9 Balochistan Goats (Restriction) Ordinance 1959

110. 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.

2.6.10 Balochistan Ground Water Rights Administration Ordinance 1978

111. This law was promulgated to ensure efficient and site-specific management of scarce water resources in Balochistan. The background to the law suggests admission that hydrological conditions in the entire Balochistan 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.

2.6.11 The Canal and Drainage Act, 1873

112. 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.

2.7 Institutional Setup for Environmental Management

113. 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.

2.7.1 Provincial Environmental Protection Council (Provincial EPC) and the Balochistan Environmental Protection Agency (BEPA)

114. After devolution of the subject environment to provincial level under 18th amendment, these two organizations are primarily responsible for administering the provisions of the Balochistan Environmental Protection Act 2012. The EPC oversees the functioning of the BEPA. Its members include the representatives of the government, industry, non- governmental 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. The NEQS for effluent discharge standards, gaseous emissions, vehicular emissions, drinking water and ambient air quality is attached as **Annexure 2** of this report.

115. Another function of the provincial EPA are the review and approval of environmental assessment reports.

2.8 Asian Development Bank Safeguard Policies

2.8.1 ADB Requirements for Preparation of Environmental Assessments of Projects

116. Asian Development Bank in its Safeguard Policy Statement (June 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 2020, promoting the “sustainability of project outcomes by protecting the environment and people from project’s potential adverse impacts”.

117. The Initial Environmental Examination in hand is fully committed to the requirements determined in the “ADB Safeguard Policy Statement”. The environmental works carried out by

NEC on behalf of project proponents have been essentially guided by these rules as enunciated in the "Outline of an Initial Environmental Examination Report".

118. 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.

119. Main reasons behind assigning category B is that the interventions are basically upgradation and rehabilitation of existing irrigation system and no resettlement is envisaged. However, an environmental assessment using ADB's Rapid Environmental Assessment (REA) checklist for urban development and water supply, (as given in **Annexure-1**), was conducted and 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.

120. 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.

2.8.2 ADB Safeguard Policy 2009

121. 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 safeguard policy (2009) framework consists of three Safeguard Policies on the 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

- AP are informed and consulted during project preparation and implementation.

122. The Project will need to comply with all the Safeguard Policies in the subproject or 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 5.**

Table 5: ADB Safeguard Policy 2009 Relevant to 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	As of now, no involuntary resettlement is envisaged for the proposed project. However, the situation may change at the detailed design level. Therefore, this policy is assumed to be applicable due to the serious nature of possible impacts.
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	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.

S. No.	Safeguard Policies	Key Requirements	Remarks
		and economic benefits that are culturally appropriate and gender and intergenerationally inclusive.	

2.8.3 ADB's Accountability Mechanism Policy 2012

123. 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.

124. In case PAPs' grievances/complaints are unaddressed by multi-tiered Grievance Redressal Committee, ADB provides an independent forum to all the affected personnels 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.

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

125. 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.

126. 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.

2.8.5 Relevant International Treaties

- Convention on Biological Diversity

127. 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.

78. 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

79. 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.

- ***Government of Pakistan Guidance on Managing COVID-19 Risks***

80. Government of Pakistan issued Guidelines "Health & Safety of Building and Construction Workers during COVID-19 outbreak" to Managing COVID-19 Risks while Commencing Work in Construction Project, on 11 April 2020. Taking into account these guidelines, the contractor will prepare The contractor will prepare Site-specific EMP (SSEMP) , , Site Specific Health and Safety Management Plan (SSHSMP) and a Standard Operational Procedure (SOP) to manage COVID-19 risks. These plans will be approved by Supervision consultant

2.9 Comparison of International and Local Environmental Legislations

128. 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.

81. In order to select the most stringent standards applicable, a comparison of local (PEQS) 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 6 below. For air quality, comparison was only possible for pollutants having same averaging periods in PEQS, IFC and WHO. PEQS for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards, in the case of most pollutants. The applicable and most stringent parameters for each respective pollutant are highlighted in yellow.

82. Similar to the standards for air quality, the comparison of noise standards provided in Table 7 clearly shows that PEQS 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 PEQS (75 dB (A)) and so for this particular parameter, the WHO/IFC standard will be used.

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

84. Similar to the standards for air and Noise quality, the comparison of Water quality standards provided in Table 8 clearly shows that PEQS for biological and physical parameters of drinking water quality are same as for WHO standards except for Total hardness as CaCO3. PEQS 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 6: Comparison of International and Local Air Quality Standards

Pollutants	USEPA		WHO/IFC		NEQS	
	Avg.Time	Standard	Avg.Time	Standard	Avg.Time	Standard
SO_2	3 hrs	0.5 ppm	24 hr	125 µg/m^3 (IT-1*)	Annual Mean	80 µg/m^3
	1 hr	75 ppb	10 min	500 µg/m^3	24 hr	120 µg/m^3
CO	8 hrs	9 ppm (11 mg/m^3)	-	-	8 hrs	5 mg/m^3
	1 hr	35 ppm (43 mg/m^3)			1 hr	10 mg/m^3
NO_2	Annual Mean	100 µg/m^3 (53 ppb)	1 yr	40 µg/m^3	Annual Mean	40 µg/m^3
	1 hr	(100 ppb)	1 hr	200 µg/m^3	24 hrs	80 µg/m^3
O_3	8 hrs	0.07 ppm (148 40 µg/m^3)	8 hrs	100 µg/m^3	1 hr	130 µg/m^3
PM_{10}	24 hrs	150 µg/m^3	1 yr	70 µg/m^3 (IT-1*)	Annual Mean	120 µg/m^3
			24 hr	150 µg/m^3 (IT-1*)	24 hrs	150 µg/m^3
PM_{25}	Annual Mean	15 µg/m^3	1 yr	35 µg/m^3	Annual Average (IT-1*)	15 µg/m^3
	24 hrs	35 µg/m^3	24 hr	75 µg/m^3	24 hrs (IT-1*)	35 µg/m3
					1 hr	15 µg/m^3

*IT- 1 as specified by WHO=AQG, 2005

Table 7: Comparison of International and Local Noise Standards

Category of Area/Zone	Limit in dB(A) Leq	
	NEQS	WHO/IFC

	Day Time	Night Time	Day Time	Night Time
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

85. 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 8: Comparison of National and WHO Environmental Quality Standards for Drinking Water

Properties/Parameters	Standard values	WHO standards	Remarks
Biological			
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Most Asian countries also follow WHO standards
Physical			
Colour	≤15TCU	≤15TCU	
Taste	Non objectionable/ Acceptable	Non objectionable/ Acceptable	
Odour	Non objectionable/ Acceptable	Non objectionable/ Acceptable	
Turbidity	<5NTU	<5NTU	
Total hardness as CaCO3	<500mg/l	---	
TDS	<1000	<1000	
pH	6.5 – 8.5	6.5 – 8.5	
Chemical			
Essential Inorganic	mg/Litre	mg/Litre	
Aluminum (Al) mg/l	≤0.2	0.2	
Antimony (Sb)	≤0.005 (P)	0.02	
Arsenic (As)	≤0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	

Properties/Parameters	Standard values	WHO standards	Remarks
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl-)	<250	250	
Chromium (Cr)	≤0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	mg/l	mg/l	
Cyanide (CN)	≤0.05	0.07	Standard for Pakistan similar to most Asian developing countries
Fluoride (F)*	≤1.5	1.5	
Lead (Pb)	≤0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤0.5	0.5	
Mercury (Hg)	≤0.001	0.001	
Nickel (Ni)	≤0.02	0.02	
Nitrate (NO3)*	≤50	50	
Nitrite (NO2)*	≤3 (P)	3	
Selenium (Se)	0.01 (P)	0.01	
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source		
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries
Organic			
Pesticides mg/l			PSQCA No. 4639-2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted. **
Phenolic compounds (as Phenols) mg/l		0.002	
Poly-nuclear aromatic hydrocarbons (as PAHs) g/l		0.01 (By GC/MS methods)	
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

86. National Environmental Quality Standards for vehicular emissions and wastewater are given in Table 9 and 10 respectively.

Table 9: National Environmental Quality Standards for Motor Vehicle Exhaust And Noise

#	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 10: National Environmental Quality Standards for Municipal and Liquid Industrial Effluents (Mg/L, Unless Otherwise Defined)

S. 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 (asCN^{-})	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. DESCRIPTION OF SUBPROJECTS

78. The subprojects are located in Union Council Abad, Tehsil Mula, District Khuzdar in the Balochistan province of Pakistan. Its capital is the city of Khuzdar. Khuzdar district was establishment as a district in 1974. The city of Khuzdar is situated on National Highway linking Pakistan, Iran and Turkey. It is about 400 km from Karachi and 300 km from Quetta.

79. This chapter intends to present the present conditions at the proposed intervention locations along Mullah River.

3.1 Interventions at Mullah River (Infiltration Gallery)

3.1.1 Current Status

80. Perennial surface flow is diverted to irrigate the existing command area in the Hatachi and Kharzan villages. Due to the presence of considerable surface water, it is also used for livestock, drinking and other domestic purposes. Although perennial flow is used for irrigation, flood water is also available during high flow season.

81. An intake structure (See Figure 3) and water channel (See Figure 4) has been constructed under BMIAD project about 20 years ago with some protection wall of gabion (See Figure 5). Over the years, some part of gabion wall has been damaged due to flood flows in the Mula River. The intake structure is reported to be damaged and not supplying water to the supply channel. The irrigation channel is generally in good condition for the carrying water to Kharzan and Hatachi. The farmers of subproject contribute for making a channel from river on self-help basis and connect it into supply system of channel for the two villages. In recent years, the irrigation department has provided gabion protection wall to this river channel to avoid flood damages.

82. There is considerable perennial flow in the river that can be used for irrigation through proper means and can bring additional land under cultivation. The flood water in the river causes damages to the existing intake system which requires engineering solution. Absence of proper flow diversion structure restricts the villagers to use the perennial flow.

Figure 3: Existing intake structure

Figure 4: Existing channel and bifurcation

Figure 5: Existing gabion wall

3.1.2 Proposed Projects

83. The proposed interventions can be divided into three broad categories:

(a) Construction of two infiltration galleries,
(b) Construction and rehabilitation of water conveyance system and associated structures,
(c) flood protection works for irrigation canals and command area.

- **Type of Structure**

84. It is need of the day that new structures like extension of infiltration gallery tunnel, lining of infiltration gallery wells, infiltration gallery tunnel cleaning; lining of covered channel, open channel lining, social structures and time division structures be constructed for an efficient use of water for enhancement of cropping intensity in command area of the infiltration gallery. The provision of permanent infrastructure will improve system efficiency by reducing losses and conveyance times between the source and outlets. These savings will lead to expansion of the existing command area, diversification of the existing cropping pattern and an increase in cropping intensities. Additional advice regarding crop production will lead to improved practices and subsequently, increased yields.

85. The objective of the project is to provide more irrigation water to the existing and available command area in Kharzan and Hatachi Villages. The subproject will also provide with the protection bund along some reaches of command area to preserve it from flood water. Availability of water round the year will increase productivity of the area and enhance income generation activities in the area.

86. Two options were considered at feasibility stage. The first being a water intake structure, as head works, with proper flood protection works for canal system and lining the entire water channel to the command area including drainage structures. The other option being the infiltration gallery along with lined irrigation channel up to the command areas.

- **Typical features of infrastructure**

87. In Kharzan Hatachi Irrigation sub-project, two infiltration galleries (one each on right and left banks) are designed in bed of Mula River about 1.9 km from each other. Both of these are connected to collection chambers (off-take well) and irrigation channels, which bring water to command area. Necessary river protection bunds are provided on either side of river along channel and command area to save these from floodwater. At Kharzan, proposed gallery is 575 m long, while at Hatachi, gallery is 735 m long. Kharzan infiltration gallery is places diagonally at an inclination angle of 450 to river flow (towards upstream) at a depth of 4.67 m, whereas Hatachi infiltration gallery is placed perpendicular to river flow at a depth of 5.3 m below river bed.The layout plan and different cross sections of canal and infiltration gallery of the proposed subproject are shown in Annexure 4. Moreover, flood protection bunds at various locations of the subproject have been proposed for both the existing and proposed command areas.A number of structures are proposed on each canal including aqueduct, road crossings, supper passages and off-take structures.

88. The salient features and the cost estimates of the proposed interventions are shown in Table 11 and Table 12 respectively. A typical drawing and cross-section of Hatachi- Kharzan Infiltration gallery on Mula river is given as Annexure - 4.

Table 11: Salient Features - Kharzan Hatachi Infiltration Gallery, Irrigation System and Flood Protection Bund Subproject

No.	Description of Design Parameters	Kharzan	Hatachi
1.0	**Infiltration Galleries**	01	01
1.1	Design Discharge (m^3/s)	0.566	0.707
1.2	Gallery Length (m)	575	735
1.3	Gallery Perforated Pipe Diameter (m)	1.0	1.0
1.4	Command Area (Ha)	235	446
1.5	Gallery Elevation (m)	623.72	607.22
1.6	Offtake Well (No.)	01	01
1.7	Offtake Well Diameter (m)	2.0	2.0
1.8	Outlet Size / Diameter (m)	1.0	1.0
2.0	**Flood Protection Bund**		
2.1	Design Flood (m3/s)	2,170	2,575
2.2	Length of Protection Bund No. 1 (m)	373	-
2.3	Length of Protection Bund No. 2 (m)	-	968
2.4	Length of Protection Bund No. 3 (m)	-	1620
2.5	Length of Protection Bund No. 4 (m)	-	516
3.0	**Irrigation System**		
3.1	Canal Length (m)	17+449	24+782
3.2	Conduit Length (m)	0+283	2+700
4.0	**Canal Appurtenant Structure**		
4.1	Aqueduct	2	2
4.2	Super Passage	-	-
4.3	Drainage Culvert	-	-
4.4	Off-take Structures	5	13
4.5	Fall Structures	4	16
4.6	Manhole	1	1
4.7	Transition Chambers	1	1
4.8	Cattle Drinking Structure	-	-
4.9	Washing Structure	12	-
4.10	Water Storage Tank	-	-
4.11	Road Culvert	5	-
4.12	Foot Bridge	2	2
4.13	Time Division Structure	55	95
4.14	Tail Structure	8	21

Source: Design Report

Table 12: Cost of Kharzan Hatachi Infiltration Gallery, Irrigation System and Flood Protection Bund SubProject

Sr. No.	Description	Amount (Pak Rs.)
A	**Civil and Mechanical Works**	
1	Kharzan Irrigation System	388,626,339
2	Hatachi Irrigation System	457,725,207
3	General Items	28,320,000
	Sub Total-(A)	**874,671,546**
B	**Provisional Items**	
	Day Work	3,449,615
	Specified Provisional Sums	7,000,000
	Physical Contingencies @ 4% of Sub Total - (A)	26,240,146
	Price Contingencies	87,467,154
	Grand Total	**998,828,463**

Source: Design Report

89. The proposed Construction schedule and Estimated labor force and resource usage by contractor is shown in Table 13 below:

Table 13: Estimated Labor Force and Resource Usage by Contractor

#	Description	Unit	Quantity
Construction Works at Kharzan Hatachi Infiltration Gallery			
1	Labor force deployed for 18 months	No.	50
2	Water requirement for construction works	m^3	2,000
3	Water requirement for labor force	m^3	2,700
4	Wastewater generated from campsite	m^3	2,160
5	Following machine will be utilized at site: 1. Concrete Batching Plant 2. Concrete Pump Mobile 3. Concrete Static Pump 4. Transit Mixture 5. Loader 6. Excavator (Type) 7. Excavator (Chain) 8. Dumper 9. Mobile Crain 10. Truck Crain 11. Tractor 12. Tractor Trolley 13. Electric Vibrator (Petrol) 14. Steel Cutting Machine 15. Steel Bending Machine 16. Water Bowser 17. Fuel Pump 18. Power Generator 19. Welding Plant (Diesel) 20. Dewatering Pump (Diesel)	No.	Various depending upon contractor progress
6	Cement	tons	3,100

7	Sand	tons	4,650
8	Crush	tons	9,300

Source: Design Report

90. For construction of proposed Infiltration galleries and Rehabilitation irrigation channels, river protection works and flood protection works construction materials such as fine and coarse filters and stone for stone masonry are available in close vicinity of the project area. The period of construction is estimated as 2-years as per implementation plan.

3.1.3 Design revision and impacts

Fesaibility stage technical design of Kharzan-Hitachi Irrigation subproject was revised at detail design as follows;

- **Design Discharge (m^3/s)**

91. Design discharge of Kharzan has been increased from 0.3 to 0.566 (m3/s) and of Hitachi from 0.5 toTV 0.707 (m3/s) as per established water rights of local communities. At feasibility stage, 20-22 cusecs water was allocated for these schemes as per available command area, but at Design stage, after review of secondary data of Balochistan irrigation department and public consultation, water allocation was increased to 40 cusecs as per already existing water rights of local communities.

92. This will have positive impact in terms of incorporating local people concerns in project design and avoiding any social issues that may arise in future.

- **Canal Length (m)**

93. After detailed field investigations at detail design phase, lined Canal length of Kharzan increased from 12,689m (feasibility) to 17449 m (Design). This will positively impact in terms of water conservation and water availability.

- **Gallery Length (m)**

94. Length of Kharzan gallery increased from 475m (feasibility stage) to 575 m (Design stage) after detailed field investigations and engineering studies.

95. As at feasibility stage, gallery pipe was uptill 475 m and some 100 m space was left without pipe. As water flow 90 degree to gallery pipe, so there was chance that water may change its direction and may flow from open space without pipe and it may fail gallery operation. So at detail design, gallery length was increased by 100 meter and now all of the water will pass tover gallery pipe and maximum water will be trapped and in filtered in gallery. It will have positive impacts as Water from an infiltration gallery has the advantage of bank filtration to reduce the water treatment requirements for a surface withdrawal. Feasibility and detail design stage layout plans of Irrigation system are given in **Figure 6 and 7** respectively.

Figure 6: Layout Plan of Kharzan-Hitachi Irrigation System (Detail Design Stage)

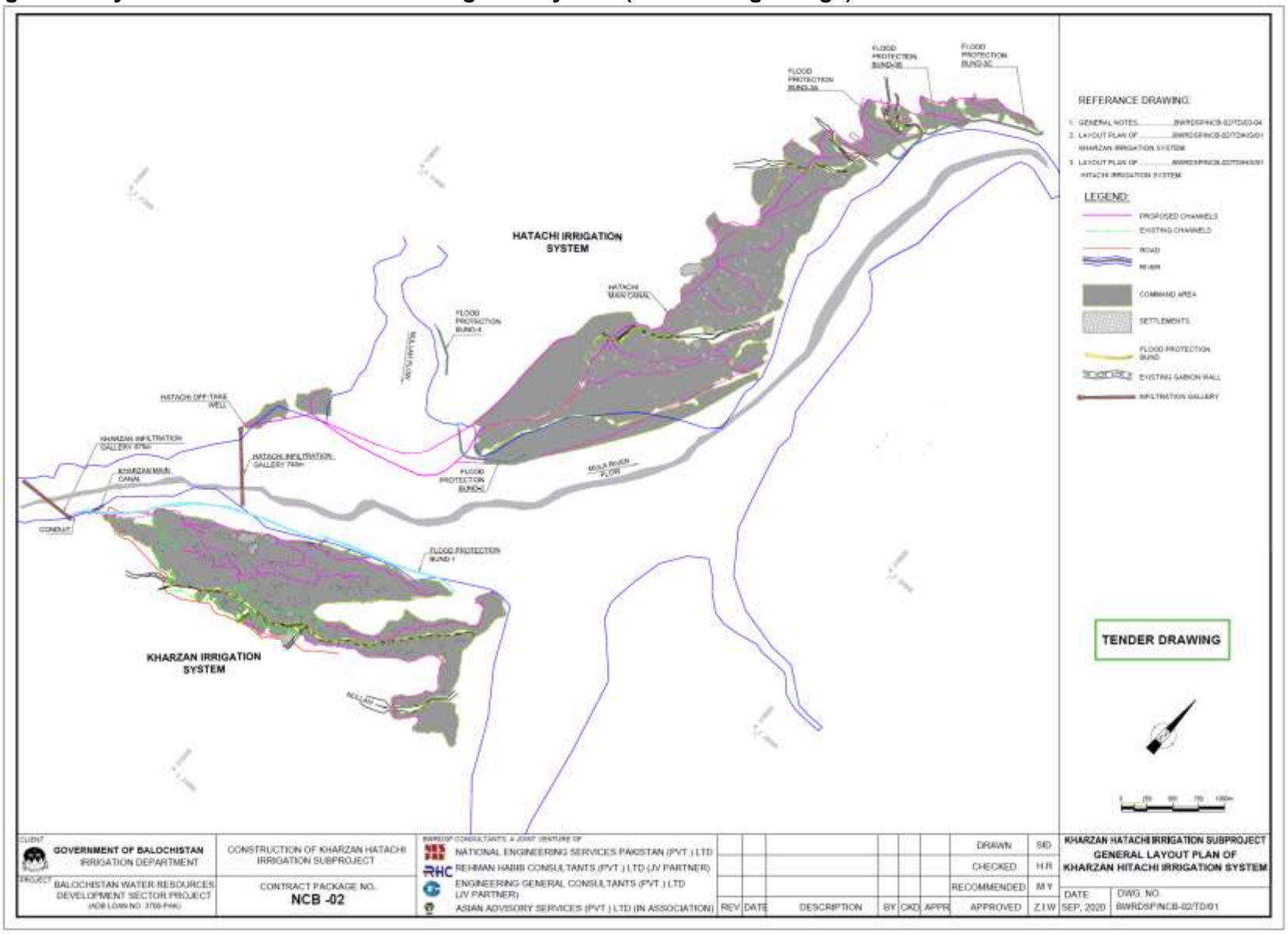
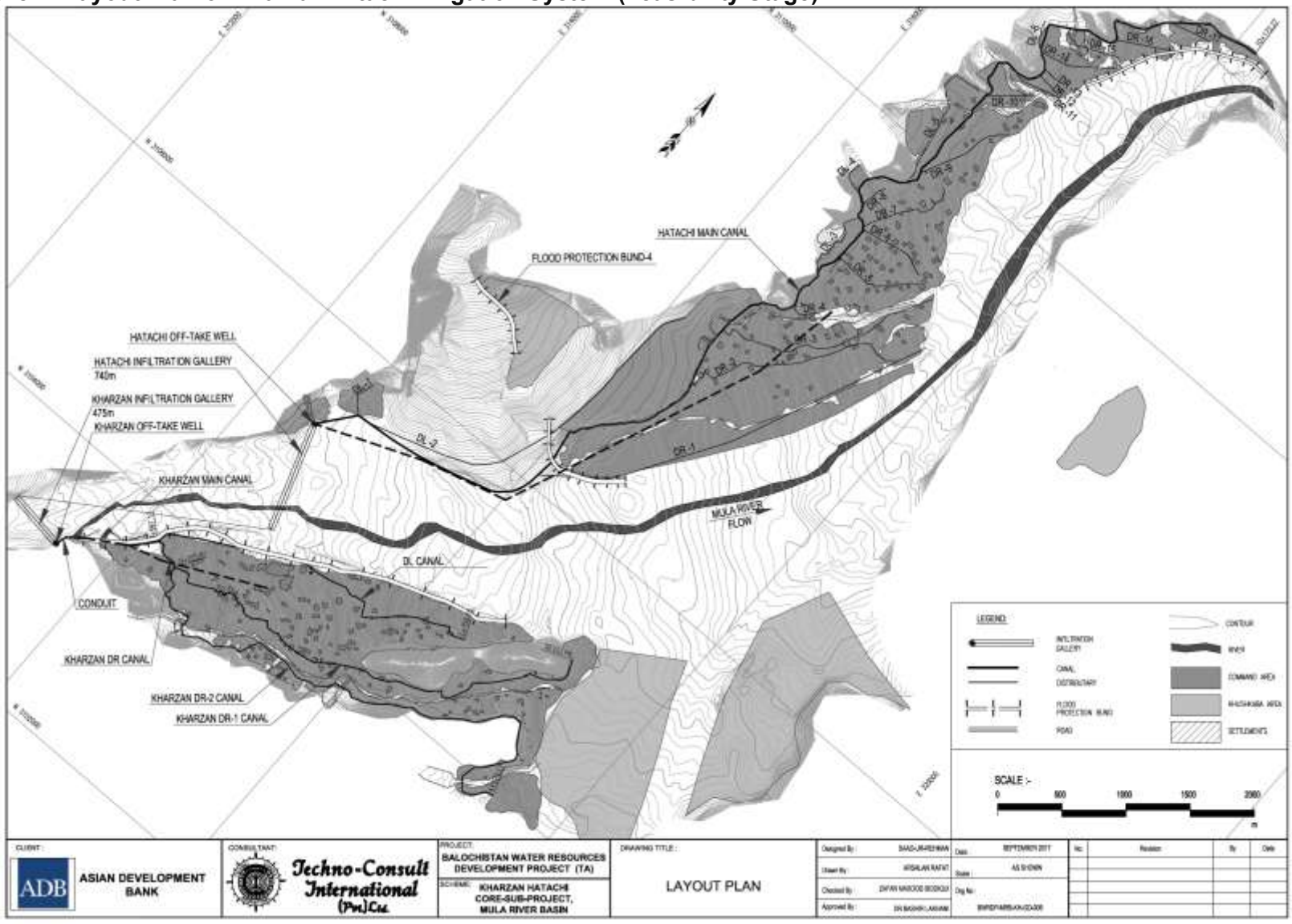


Figure 7: Layout Plan of Kharzan-Hitachi Irrigation System (Feasibility Stage)



4. ALTERNATE ANALYSIS

4.1 Project Need and Justification

4.1.1 Kharzan-Hatachi Infiltration Gallery

96. Perennial surface flow is diverted to irrigate existing command area in Hatachi and Kharzan villages. Due to presence of considerable surface water, it is also used for stock water and domestic uses. Although, perennial flow is used for irrigation, floodwater is also available during high flows. An intake structure and water channel was constructed for both Kharzan and Hatachi Villages under BCIAP project in late 2000s (**Figure 8**). It was designed to carry 1.13 cumecs (40 cfs) water for both villages Kharzan and Hatachi. Flood protection bounds with gabion stone stud was also included in core sub- project to protect both villages (6).

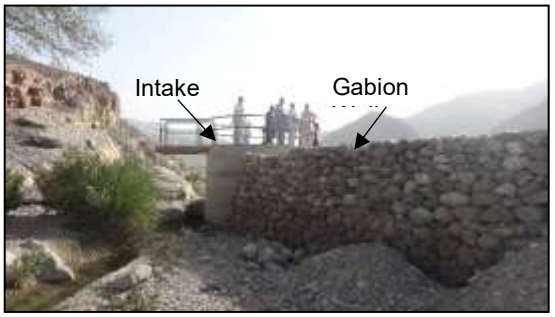


Figure 8- Existing intake structure and flood protection gabion wall

97. The intake structure was choked due to floods and is not supplying water. The irrigation channel is in working condition for carrying water to Kharzan and Hatachi. The farmers divert flow into channel from Mula River on self-help basis and connect it into supply system of channel for two villages (**Figure9**). Flood protection bund for Kharzan village was damaged due to floods in Mula River. In recent years, Irrigation Department has provided gabion protection wall to this river channel to avoid flood damages.

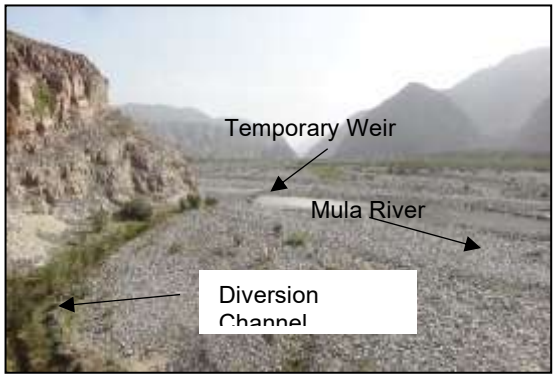


Figure9 - Temporary stone weir for river diversion to unlined channel

98. The farmers cannot divert the total perennial flow in the Mula River at temporary diversion structure. The farmers of Hatachi village divert the remaining surface flow to their existing lined channel through the sump intake which was constructed under the BCIAP project.

99. There is considerable perennial flow in the river that can be used for irrigation through effective diversion and can bring additional land under cultivation. The floodwater in river causes damage to existing intake system which requires engineering solution. Absence of proper flow diversion structure restricts villagers to use perennial flow.

100. This project will assure water supplies to 575ha existing commands, and also adding 106 ha new command area in Hatachi, Flood protection for Kharzan and Hatachi villages with proper distribution of readily available water with little investment and optimum productivity.

101. Owing to the above argument, conceptual plans were developed for determining the feasibility of the subprojects. During the pre-feasibility stage phase in the project cycle several alternatives were evaluated. Following alternatives were discussed to finalize the conceptual design of the subprojects:

4.2 No Project Alternative

4.2.1 Hatachi – Kharzan Infiltration Gallery

102. An intake structure and water channel has been constructed about 20 years ago with protection wall of gabion. Over the years, some part of gabion wall has been damaged due to flood flows in the Mula River. The intake structure is damaged and not supplying water to the supply channel. Absence of proper flow diversion structure restricts the villagers to use the perennial flow and is adversely affecting the irrigation capability of the command area.

4.3 Interventions at Mulla River (Hatachi – Kharzan Infiltration Gallery)

4.3.1 Alternatives

103. The following two options were considered at Hatachi-Kharzan:

- A water intake structure, as head works, with proper flood protection works for canal system and lining the entire water channel to the command area including drainage structures.
- An infiltration gallery connected to collection chambers (off-take well) and irrigation channels, which bring water to command area.

104. It was duly noted during field investigations that the surface water would not be available during the entire year however the subsurface water (river back flow) is available all year round hence the selection of an Infiltration gallery across the entire river bed has been proposed.

105. The objective of the project is to provide more irrigation water to the existing and available command area in Kharzan and Hatachi Villages.

106. The subproject will also provide with the protection bund along some reaches of command area to preserve it from flood water. The provision of permanent infrastructure will improve system efficiency by reducing losses and conveyance times between the source and outlets. Availability of water round the year will increase productivity of the area and enhance income generation activities in the area.

107. **Table 14** below provides comparison of alternatives with respect to cost, design and environment:

Table 14: Comparison of Alternatives

Parameters	Weir	Infiltration Gallery
Cost	Costly	Cheaper
Design	Weir can only be operateable during surface flow of river.	Infiltration gallery can provide water to agricultural field around the year
Perceived Environmental Impacts	Soil erosion, loss of natural vegetation, deployment of external labor force.	Soil erosion, loss of natural vegetation, deployment of external labor force.

108. Comparison of alternative as mentioned in **Table 14** shows that the infiltration gallery is the best alternative with respect to cost and availability of water for whole year.

5. ENVIRONMENTAL & SOCIAL BASELINE CONDITIONS

109. 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. The area of influence around the proposed subproject interventions are attached Annexure - 5. 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. This chapter describes the environmental setting of the proposed interventions.

110. The data presented in the following sections has been collected from both secondary and primary sources. For secondary data acquisition, the project team contacted the relevant departments and gathered the required information. Primary data was collected during reconnaissance surveys and detailed visits during May 2017. The secondary data was also verified, and visual observations were made during these visits.

5.1 Physical Resources

5.1.1 Geography

111. Balochistan is situated in the southwest of Pakistan and covers an area of 347,190 square kilometers (134,050 sq. mi). It is Pakistan's largest province by area, constituting 44% of Pakistan's total land mass. The province is bordered by Afghanistan to the north and north- west, Iran to the south-west, Punjab and Sindh, and Khyber Pakhtunkhwa and the Federally Administered Tribal Areas to the north-east. To the south lies the Arabian Sea. Balochistan is located on the south-eastern part of the Iranian plateau. It borders the geopolitical regions of the Middle East and Southwest Asia, Central Asia and South Asia. Balochistan lies at the mouth of the Strait of Hormuz and provides the shortest route from seaports to Central Asia. Its geographical location has placed the otherwise desolate region in the scope of competing global interests for all of recorded history[9].

112. Balochistan is rich in exhaustible and renewable resources; it is the second major supplier of natural gas in Pakistan. The province's renewable and human resource potential has not been systematically measured or exploited due to pressures from within and without Pakistan. Local inhabitants have chosen to live in towns and have relied on sustainable water sources for thousands of years.[10]

[9] https://en.wikipedia.org/wiki/Balochistan,_Pakistan#Geography
[10] https://en.wikipedia.org/wiki/Balochistan,_Pakistan#Geography

113. The capital city Quetta is located in a densely populated portion of the Sulaiman Mountains in the north-east of the province. It is situated in a river valley near the Bolan Pass, which has been used as the route of choice from the coast to Central Asia, entering through Afghanistan's Kandahar region. The British and other historic empires have crossed the region to invade Afghanistan by this route.[11]

5.1.2 Geology

114. The geological features of Kharzan-Hatachi subproject area comprise of Paleocene sedimentary rocks. Area adjacent to the subproject location, and also some part of the command area has underlying Eocene sedimentary rocks.[12]

5.1.3 Seismicity

115. The entire province of Balochistan lies in a seismically active region. The province has experienced devastating earthquakes in the past. A powerful earthquake with a magnitude of 7.0 on the Richter scale was recorded on May 31, 1935 and devastated Quetta town and resulting in 35,000 fatalities.

116. Again, on the Nov 28th, 1945, an earthquake measuring 8.6 on the Richter scale hit Balochistan killing almost 4,000 people.

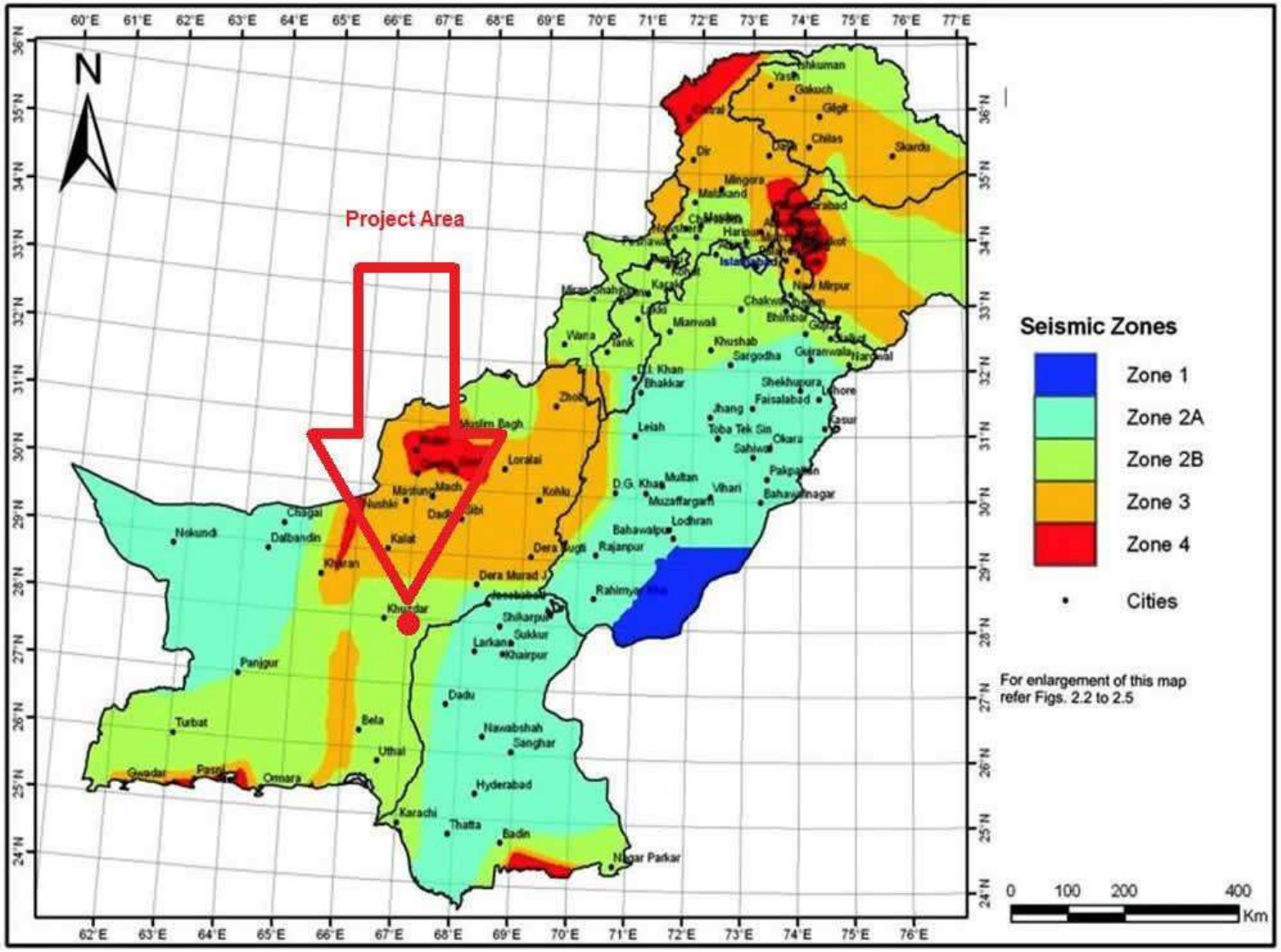
117. A history of recorded earthquakes is attached as Annexure - 6.

118. The seismic zoning map of Pakistan, indicates that the project area lies in the zone 2B. This zone is liable to MSK VI or less and is classified as the Low Damage Risk Zone. The Medvedev–Sponheuer–Karnik scale, also known as the MSK or MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. An explanation of MSK intensity is given as Annexure-6. The updated Seismic Zoning Map of Pakistan is shown below as Figure 10.

[11] Bolan Pass – Encyclopædia Britannica Eleventh Edition

[12] Standard interpretation of Geological map of Pakistan by Geological Survey of Pakistan

Figure 10: Seismic Zoning Map of Pakistan



Source: Geological Survey of Pakistan

5.1.4 Topography

- **Kharzan-Hatachi subproject area**

119. The subproject is located in the middle reach of Mula River. The subproject is proposed on relatively wide gorge where the river is bounded by high mountains on both sides. The river has a width of 530 m and an elevation of 638 m above mean sea level at the subproject location. Moreover, the river is very steep in this reach having a longitudinal slope of 1:70.[13]

120. Kharzan and Hatachi are the largest bents on the river. Both bents are bounded by high hills on one side and Mula River on the other side. The terrain is generally flat in the subproject area and is suitable for command area development. The new command area is on a degraded rangeland.

5.1.5 Climate

121. The climate of Balochistan is generally arid (Rasul et al., 2012; Burke et al., 2005). The province can be divided into three broad climatic zones:

- Hyper-arid (<100 mm/year) - Chaghai, Makran coastal areas and south-east of Lasbela
- Arid (100-250 mm/year) - Northeast of Zhob, Loralai, Sibi, Kachhi, Lasbela plains, and Pab-Mor ranges
- Semi-arid (250 – 400 mm/year) - Sulaiman ranges covering Toba Kakari area, Marri Bugti areas, and Pab Khirthar mountain ranges and Brahui ranges.

122. The temperature regime in Balochistan is extremely variable and is directly related with the altitude.

123. High altitude areas with cooler temperatures usually experience a mean annual temperature between 10°C to 18°C. Frost and snow prevail during winters. Low altitude temperate climate region has mean annual temperature between 18°C and 24°C. Tropical temperature dominates in the low mountain belt and low land facing the Arabian Sea with a mean annual temperature between 29°C and 37°C (Rees et al., 1990; Burke et al., 2005).

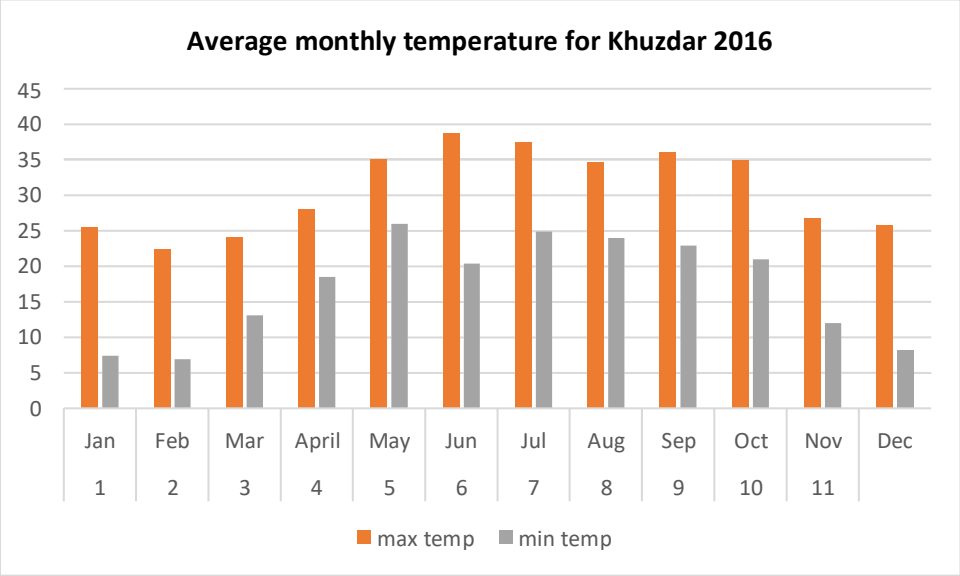
124. The province experiences frequent spells of droughts and occasional but torrential floods. Perennial rivers are rare in the region and life is mostly dependent on runoff farming (‘Khushkaba’) or Spate irrigation (flood water harvesting or ‘Sailaba’). Approximately 40% of irrigation water in Balochistan comes from the Indus River which irrigates only 5% of the province. This is because of rugged terrain and poor infrastructure.

[13] Sub - Project Feasibility Report

Table 15: Average Monthly Temperature for Khuzdar 2016

S.No.	Month 2016	UoM	Max temp	Min temp
1	January	°C	25.5	7.4
2	February	°C	22.4	6.9
3	March	°C	24.2	13.1
4	April	°C	28.1	18.5
5	May	°C	35.1	26
6	June	°C	38.8	20.4
7	July	°C	37.5	24.9
8	August	°C	34.6	24
9	September	°C	36.1	22.9
10	October	°C	35	21
11	November	°C	26.8	12
12	December	°C	25.8	8.2
Source: Pakistan Meteorological Department				

125. The **Table 15** provides minimum and maximum temperatures of Khuzdar district of 2016. The hottest months are June and July while the coldest months are January and February.



5.1.6 Rainfall

126. Approximately 40% of average rainfall in eastern and southern Balochistan occurs in the months of July and August (monsoon dominated environments). However, less than 10% of average rainfall occurs in monsoon in western parts of the province (temperate climate regions). This makes rainfall dependability throughout upland Balochistan generally low (Rees et al., 1990).

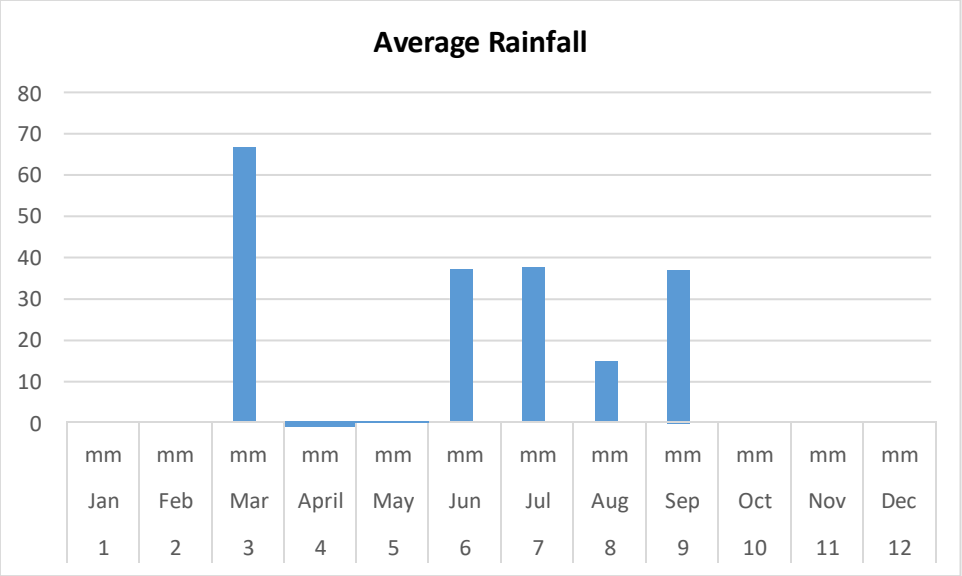
127. In a report published by Pakistan' National Disaster Management Authority, Monsoon Season 2016 unfolded with five rain spells at regular intervals starting from 28 June to 16 September 2016. As per Pakistan Meteorological Department (PMD), Monsoon 2016 remained 25% Above Normal against predicted rainfall of 10 - 20% Above Normal. During the month of August, rainfall was largely in excess across much of the Country while in July, the Country experienced slightly less rainfall[14].

Table 16: Average rainfall data for Khuzdar 2016

S.No.	Month 2016	UoM	Average Rainfall
1	January	mm	0
2	February	mm	0
3	March	mm	66.7
4	April	mm	1.0
5	May	mm	2.1
6	June	mm	37.1
7	July	mm	37.6
8	August	mm	14.9
9	September	mm	37.0
10	October	mm	0
11	November	mm	0
12	December	mm	0
Source: Pakistan Meteorological Department			

[14] Pakistan' National Disaster Management Authority, "POST DISASTER REPORT MONSOON 2016", http://www.ndma.gov.pk/publications/Post%20Monsoon%202016%20Report%202%20March%20201 7.pdf

128. The **Table 16** shows that March received the maximum rainfall in 2016, while June, July and September received approximately same amount of rainfall (around 37mm).



5.1.7 Hydrology and Floods

- ***Kharzan-Hatachi subproject area***

129. The overall water balance at basin level is carried out through hydrological modeling of the whole river basin. Stream flow and base flow is predicted for each subproject by specifying location on the particular river reach in a GIS interface supported hydrological model ArcSWAT. ArcSwat model is used to simulate groundwater and surface water based on the available meteorological, land use and soil data records. The calibration of the model was carried out for observed stream flow data for 9 years. The results of the water balance study represent the proportion of each component of the hydrological cycle

130. The site is located in the middle part of the basin on main Mula River. There are number of existing subproject diversion upstream of this location. However, there is substantial potential for a new subproject having a catchment area of 5,219 sq.km. The annual average availability of water is nearly 125.8 Million Cubic Meter (MCM). There is perennial surface flow at the site.

131. The results from the model were compared with measured flows during the site visit. During the site visit in November (2016), 5.09 cumec flow was observed in the river. The ArcSWAT model for November estimates that the river will have 3.39 cumec flow. This shows that the order of magnitude estimated by the model is in close conformity with the actual flows.

5.1.8 Water Quality

- ***Kharzan-Hatachi subproject area***

132. The soil type is very deep clay. The soil was moderately calcareous. No salinity and sodacity was encountered in soils.[15]

133. River water samples were tested and presented in the Table 17 and Location Map of sampling points are attached as Annexure – 8 of this report.

Table 17: River Water Analysis at Kharzan-Hatachi Project Area

#	Parameter	UoM	Kharzan-Hatachi Infiltration Gallery Surface Water UTM Coordinates 313763.63 E 3104294.59 N	PEQS	WHO/IFC
1	Turbidity	NTU	BDL	<5	<5
2	Total Suspended solids	mg/L	BDL	<1000	<1000
3	Total Dissolved Solids	mg/L	357	<1000	<1000
4	pH		7.99	6.5-8.5	6.5-8.5
5	Aluminum	mg/L	BDL	≤ 0.2	0.2
6	Antimony	mg/L	BDL	≤0.005	0.02
7	Arsenic	mg/L	BDL	≤0.005	0.01
8	Barium	mg/L	BDL	0.7	0.7
9	Boron	mg/L	BDL	0.3	0.3
10	Cadmium	mg/L	BDL	0.01	0.003
11	Chromium	mg/L	BDL	≤ 0.05	0.05
12	Copper	mg/L	BDL	2	2
13	Lead	mg/L	BDL	≤ 0.05	0.01
14	Manganese	mg/L	BDL	≤ 0.5	0.5
15	Nickel	mg/L	BDL	≤ 0.02	0.02
16	Mercury	mg/L	BDL	≤ 0.001	0.001
17	Selenium	mg/L	BDL	0.01	0.01
18	Zinc	mg/L	BDL	5.0	3

BDL: Below Detection Limit

134. The river water is fresh in this reach having TDS value less than 500 ppm.

5.1.9 Ambient Air Quality

135. Ambient air in the Project Area, in general, is apparently clean, because no major

[15] Feasibility Report Paragraph 70

industrial activity exists in the immediate surroundings of the Project Area and vehicular traffic.

136. Ambient air quality parameter as per site conditions only includes Suspended Particulate Matters was spot monitored for on Kharzan interventions. Table 18 below shows average 2 hours results. The equipment used for air monitoring is Hazdust EPAM 5000 and test method is USEPA PM10, 2.5 method 201a. The results range from 0 to 15 µg/m3 details are presented in Annexure – 7 of this report.

Table 18: Ambient Air Quality Results (Suspended Particulate Matters)

S. No.	Location	Test Results (µg/Nm^3)	PEQS/WHO (avg. 24 hrs. µg/m^3)
7	Haatachi Khizran Infiltration Gallery	BDL	500

5.1.10 Ambient Noise

137. Under this assignment, ambient noise level was measured at Kharzan subproject, which range between 32-41 dB(A). This range corresponds to a low-level noise atmosphere of the rural areas, associated with some of vehicular traffic. The details of the analysis are presented in Annexure – 7 of this report.

138. Ambient noise levels were measured and the average 2 hours monitoring results are given as following in Table 19. Noise monitoring was done with a type 1 noise meter.

Table 19: Summarized Results of Noise Monitoring

S. No.	Location	Noise Level dB(A)	NEQS / WHO Day Time	NEQS / WHO Night Time
1	Haatachi Khizran Infiltration Gallery	32	55	45

Source: Monitored in the Project Area by Laboratory Team.

139. Sensitive receptors are people or other organisms that may have a significantly increased sensitivity or exposure to contaminants by virtue of their age and health (e.g. schools, day care centers, hospitals, nursing homes), status (e.g. sensitive or endangered species), proximity to the contamination, dwelling construction (e.g. basement), or the facilities they use (e.g. water supply well). The location of sensitive receptors must be identified in order to evaluate the potential impact[16]. There are no sensitive receptors within the area. The nearest villages around the both Core SubProjects are about 3-5 kms away.

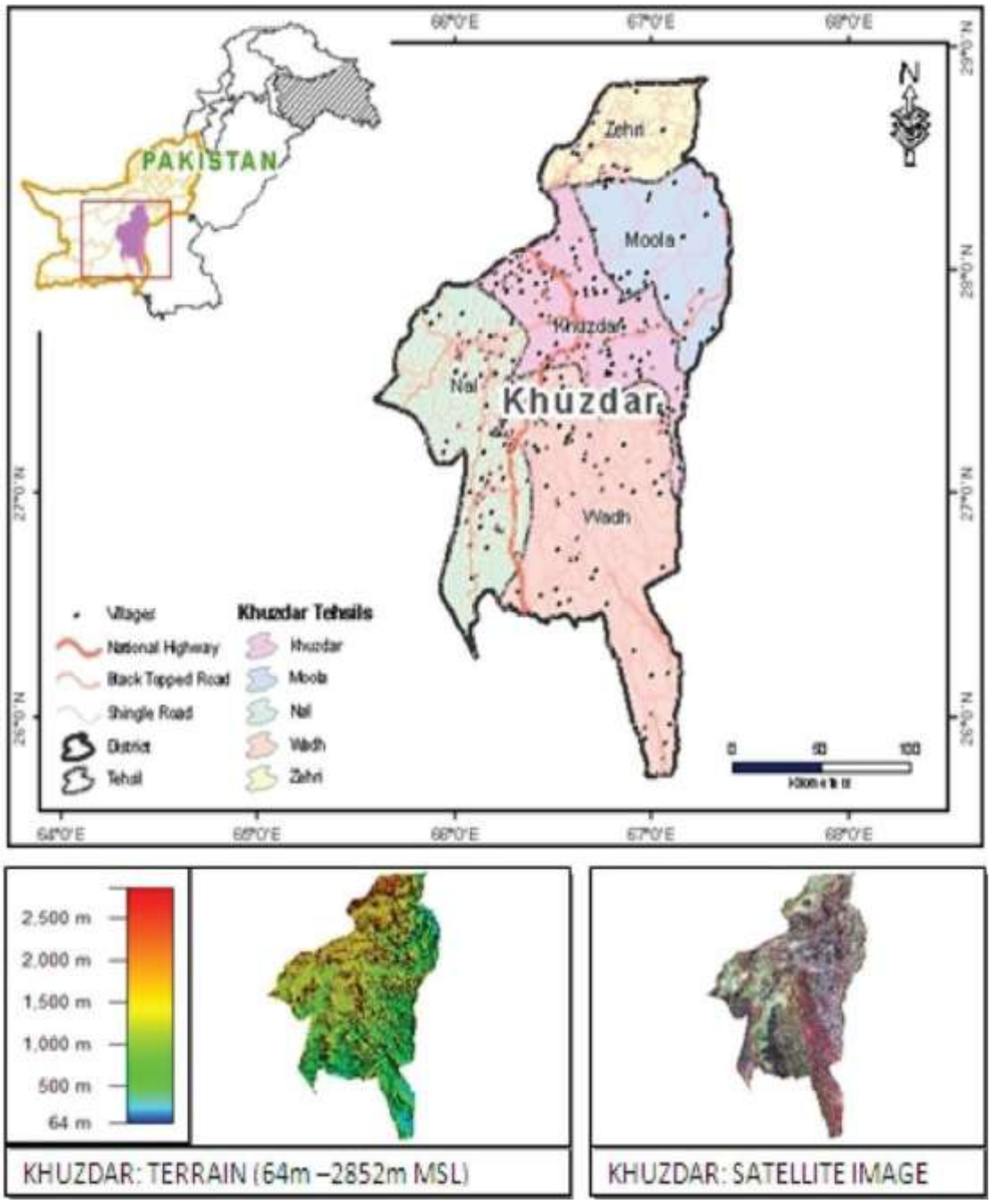
[16] http://www.smchealth.org/sites/main/files/file-attachments/651311584receptor_survey.pdf

5.2 Ecological Resources[17,18,19,20]

5.2.1 Ecology

140. Khuzdar is recognized as “Dry sub-tropical and temperate semi-evergreen scrub” zone of the province. The region from 7,430 feet above sea level and lower, accommodates a variety of scrub vegetation.

Figure 11: Administrative Profile of Khuzdar District

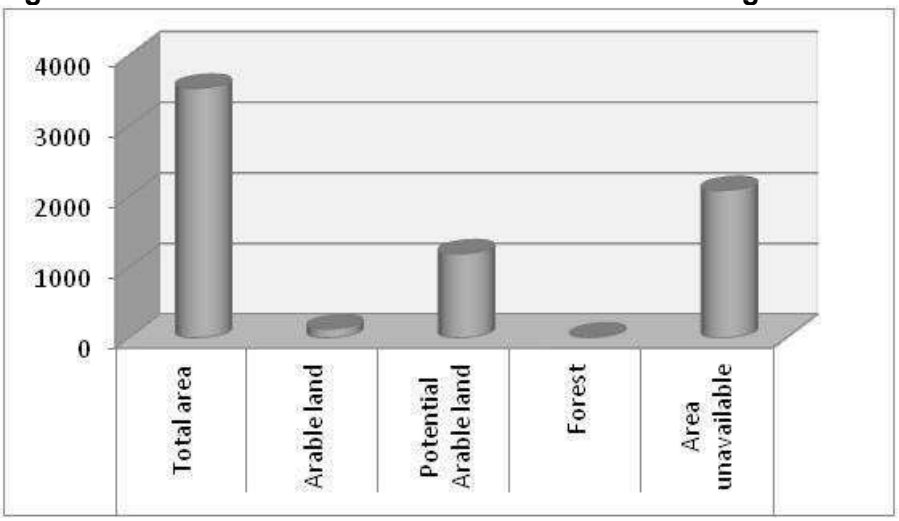


[17] UNESCO- 2011- Developmental Profile of Khuzdar,
[18] IUCN- 2005- Balochistan Conservation Strategy,
[19] GEF- 2006- Protected areas of Pakistan.
[20] Balochistan Forest and Wildlife Department- Government of Balochistan.

- **Topographic and administrative divide in Khuzdar** (Development profile of Khuzdar-2011)

141. Edaphically they are uphill steep slopes and Foot hills, Piedmont plains and stream beds, represented by a range of floristics and faunal composition. The uphill steep slopes represent a less diverse composition due to limited availability of associated factors supporting to establish an ecosystem; whereas the Piedmont plains and stream beds were seen with more diverse representation.

Figure 12: Land use of District Khuzdar in Terms of Agriculture[21]



- **Landuse pattern in Khuzdar district** (Development profile of Khuzdar-2011)

142. The Kharzan-Hitachi area is slightly different in topographic dynamics, as it lays in the main river bed of Mula River, though the area and population are very limited, but the extent of agriculture is quite well established.

- **Kharzan at a glance**

143. The conditions in Hitachi- Kharzan area were relatively different, the flow is relatively more and consistent, and the team witnessed presence of water in channels even in dry month. The ecology of riverbed reveled a different story, by representing Narium sp. and Tamarix sp., which are perennials and indicates a relatively stable ecological behavior.

[21] UNESCO- 2011- Developmental Profile of Khuzdar,

- **Narium oliender growing the river bed of Mulla River**

144. It has moderately dense forests and a negligible area has been conserved as state forest, overall natural vegetation, including shrubs, bushes and grasses can be aptly termed as rangelands. These rangelands are substantially contributing to the ecological stability of important ecosystems and economic uplift of people in the district.

Table 20: Floristic List of Hitachi Area

#	Taxon	Family	Life form	Vernacular name
01	Acacia nilotica	Fabaceae	Tree	Babbur
02	Acacia sengal	Fabaceae	Shrub	Babbur
03	Prosopis cineraria	Fabaceae	Tree	Kandi
04	Prosopis glandulosa	Fabaceae	Shrub	Kandi
05	Prosopis juliflora	Fabaceae	Shrub	Devi
06	Tamarix sultanii	Tamaricaceae	Shrub	Kirri
07	Zizyphus nummularia	Rhamnaceae	Shrub	Ber
08	Aerva javanica	Amarantheaceae	Shrub	Gujo
09	Periploca aphylla	Ascalpidaceae	Shrub	
10	Capparis decidua	Capparidiaceae	Shrub	
11	Haloxylon recurvum	Amarantheaceae	Shrub	
12	Suaeda fruiticosa	Amarantheaceae	Shrub	
13	Suaeda ferinosa	Amarantheaceae	Shrub	
14	Grewia domaine	Malvaceae	Shrub	
15	Alhaji marorum	Fabaceae	Shrub	
16	Salvadora oleoides	Salvadoraceae	Shrub	
17	Salvadora persica	Salvadoraceae	Shrub	
18	Heliotropium sp	Boragenaceae	Shrub	Merin
19	Calligonum polygonoides	Polygonaceae	Shrub	
20	Rhazya stricta,	Apocynaceae	Shrub	
21	Euphorbia caducifolia	Euphorbiaceae	Shrub	
22	Commiphora mukal	Burseraceae	Shrub	Gugul
23	Inula montaine	Asteraceae	Herb	Kulumurak
24	Inula grantoides	Asteraceae	Herb	Kulumurak
25	Grewia tenex	Malvaceae	Shrub	Chill
26	Phoenix dyctylefera	Palmea	Tree	Khajoor
27	Cymbopogon sp	Poaceae	Grass	
28	Cenchrus sp	Poaceae	Grass	
29	Aristida sp	Poaceae	Grass	Nadak
30	Chrysopogon sp	Poaceae	Grass	
31	Sericostoma	Boraginaceae	herb	

145. The majority of area does offer much of the conducive condition to grow, except for the river beds and its surroundings, one can have the extent of such habitat by looking at the following images;

Hitachi- Khizran

Table 21: Faunal list of Hitachi area

#	Taxon	Common name	Life form	Conservation status
01	Gazella bennettii	Chinkara	Mammals	Rare
02	Capra aegagrus	Sindh Wild Goat	Mammals	Occasional
03	Ovis orientalis blanfordi	Urial (Gut)	Mammals	Occasional
04	Vulpes grifithii	Hill fox	Mammals	Occasional
05	Hysrix indica	Porcupine	Mammals	Common
06	Felis libyca	Desert Cat	Mammals	Occasional
07	Hyaena	Striped Hyaena	Mammals	Occasional
08	Vulpes	Desert Fox	Mammals	Occasional
09	Canis aureus	Asiatic Jackal	Mammals	Occasional
10	Canis lupus	Wolf	Mammals	Occasional
11	Hemiechinus auritus megalotis	Hedgehog	Mammals	Common
12	Goluda ellioti	Bush rat	Mammals	Common
13	Lepus capensis	Cape hare	Mammals	Common
14	Chlamydotis undulata	Houbara Bustard	Bird	Migratory
15	Ammoperdix griseogularis	See-see Partridge	Bird	Reported

#	Taxon	Common name	Life form	Conservation status
16	Dupetor flavicollis	Black Bittern	Bird	Reported
17	Aquila heliaca	Imperial Eagle	Bird	Reported
18	Falco peregrinus	Peregrine Falcon	Bird	Reported
19	Pterocles coronatus	Crowned Sandgrouse	Bird	Migratory
20	Falco naumanii	Lesser Kestrel	Bird	Reported
21	Falco concolor	Sooty Falcon	Bird	Reported
22	Pterocles lichtensteini	Close-barred/ Lichtenstein Sandgrouse	Bird	Reported
23	Francolinus pondicerianus	Grey Partridge	Bird	
24	Pseudibis papillosa	Black Ibis	Bird	Reported
25	Corvus ruficollis	Brown-necked Raven	Bird	
26	Varanus griseus knoiecznyi	Indian desert monitor	Reptile	
27	Naja	Indian Cobra	Reptile	Common
28	Ablepharus pannonicus	Easter dwarf skink	Reptile	
29	Eristicophis macmahonii	Leaf nose viper	Reptile	

5.2.2 Protected areas / National Sanctuaries

146. There were some five areas initially documented in Khuzdar district, however after administrative adjustments, they were left over as follows:

Table 22: Protected Areas in Khuzdar

#	Area	Status	Tehsil	Distance from Haatachi Khizran Infiltration Gallery
1	Kera Dhori 8,094 hectares	Wildlife Sanctuary	Khuzdar	55 km away
2	Chorani (19,433 hectare)	Notified forest	Khuzdar	92 km away

147. Mula tehsil of Khuzdar district, does not have any of the listed protected sites, neither has any wetlands of national and international importance. Therefore, its ecological sensitivity has been found at lower risk or the proposed project activities do not have any significant impact on the existing natural ecosystem.

148. A combined map showing protected area and project area is given as Annexure 9.

5.3 Economic Development

5.3.1 Land Use and Economic Activities

149. Khuzdar district falls in the dry temperate ecological zone with a total potential agriculture area of 1,195,494 ha (Agriculture Statistics, 2008 – 09) which is about 33.8% of the total area of the district. Land use of district Khuzdar in terms of agriculture is as follows[22]:

Table 23: Land use of District Khuzdar in Terms of Agriculture

S. No:	Category	Area (Hectares)
1.	Current fallow	55,838
2.	Net sown	76, 211
3.	Arable land	132,049
4.	Culturable waste	1,063,445
5.	Potential area	1,195,494
Source: (Agriculture Statistics 2008-09)		

150. During 2005 to 2009, the current fallow land increased from 35% to 42%, this indicates that more area was made available for cultivation and new sown area decreased from 65% to 58%. In the district major Rabi season crops are wheat followed by fodder. It has been observed that wheat is grown on 81% of the area, while fodder crops occupy 8% of the total area. During Kharif season, mostly vegetables are grown in the district. However, cotton and melon are considered as major crops. Cottons is grown over 23.6% of the area, while melon is own on 15.7% of the total land sown during Kharif season. Among fruit crops pomegranate occupies the top position with a production of 14,505 kg per ha. Other major fruits produced in the district include: almond, apples, apricot, grapes, peach, plum, pistachio dates, citrus, banana, and guava[23].

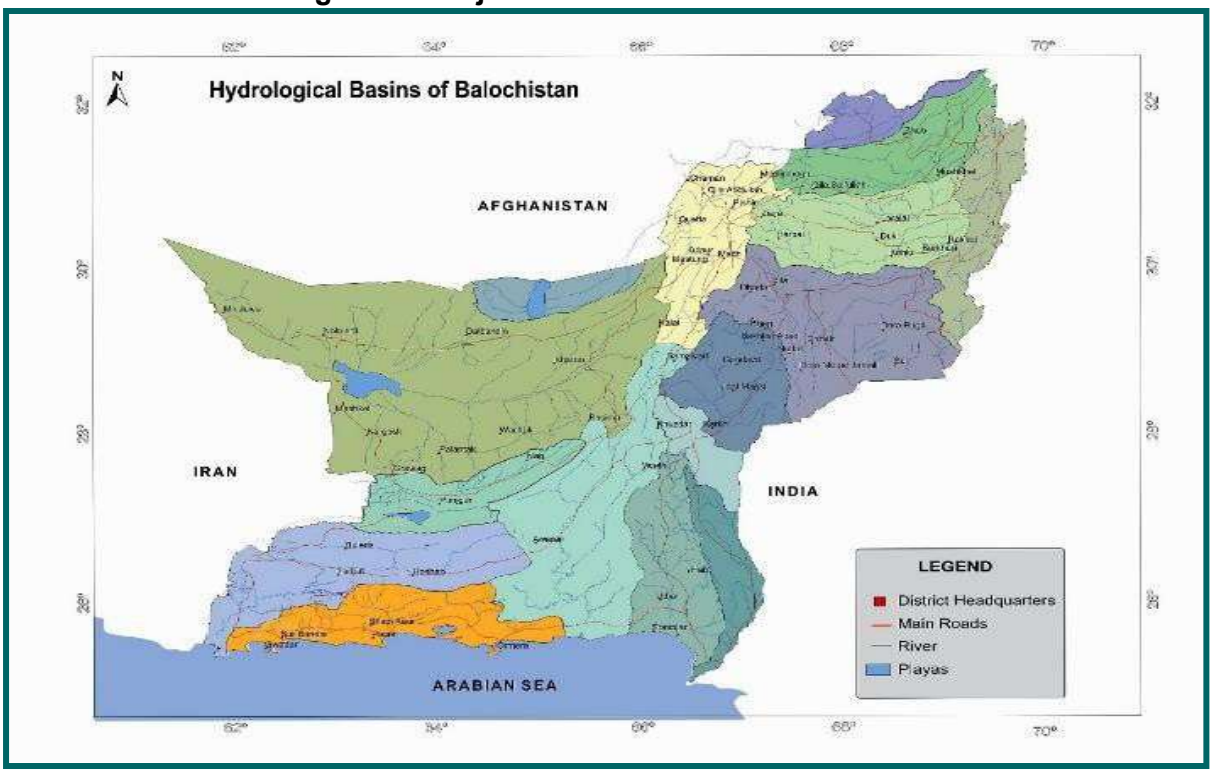
5.3.2 Settlement Patterns

151. The current population of Balochistan province, of around 10.5 million in 2016, lives in the 18 river basins (See Figure 13) and is largely rural.

[22] Planning & Development Department, Government of Balochistan – UNICEF, “District Development Profile 2011”, Khuzdar,

[23] Ibid, et el.

Figure 13: Major River Basins of Balochistan



5.3.3 Agriculture and Irrigation

- **Kharzan-Hatachi subproject area**

152. Kharzan – Hitachi, are two villages that are located in the north-east at a distance of 120 km from the district headquarters Khuzdar town. Both of the villages are located on the opposite banks of the main Mula River. Just like Karkh area, ecologically the Kharzan and Haatachi fall in the Hot Arid Lowland Plain. In Kharzan and Hitachi, an infiltration gallery has been constructed under Perennial Irrigation Schemes (PIS). A water channel emanating from this infiltration gallery irrigates the crop in both the villages through a traditional system of water distribution.

153. In Kharzan and Hitachi crops are cultivated both during Rabi season as well as in Kharif season. During Rabi, the crops grown include: wheat, Mash bean, onion, tomatoes, while during Kharif following crops are sown: Onion, tomatoes, cucumber, water melon, melon, rice, cotton. In Kharzan and Hitachi a very good variety of rice known as Subdasi is cultivated. It is mainly used for household consumption, while in lesser quantities it is also sent to Khuzdar for sale. In addition to the field crops, the farmers in the communities also have grown horticulture/fruit crops. Fruit crops grown in the area included: mangoes, date palm, lemon. The ratio between field and horticulture crops like that in Karkh was low. The major reason for the low horticulture crop production is the lack of knowledge/information and technical knowhow on the horticulture crop production as well as non-availability of proper commercial market. In Kharzan and Hitachi, proper farm to market road is not available. Now a black top road is being constructed, which would serve as farm to market road for the community. Due to non-availability of proper marketing mechanism, the agriculture produces

in Khazran and Hitachi is mainly disposed of through barter system wherein the community member exchanges the agriculture produce in lieu of another commodity or any other article/object of value.

- **Resource Base for Agriculture in Kharzan area:**

a. Land:

154. At present only about 3,450 acres of land is available in both the village for cultivation. Out of these 2,500 acres are present in Kharzan, while remaining 950 acres are located in Hitachi village. In Khazran village an area of 500 acres has been brought under cultivation through the water made available by the PIS. While in Hitachi village the area brought under cultivation is 350 acres. In Khazran village an area of 2000 acre is present a culturable waste, whereas in Hitachi land that can be brought under cultivation is 600 acres. Present scheme which relates to the extension of infiltration gallery can help in bringing extra land under cultivation in both the villages. Although due to non-availability of farm to market road very little agriculture produce is marketed to Khuzdar, still agriculture has played a very vital role in bringing an upward change in the lives of both communities. Almost all the population living in these villages is dependent upon agriculture for their livelihoods. Bringing another 105 ha (260 acres) would further help in increasing the agriculture crop production in the area and providing extra income earning opportunities to the population of the area.

b. Water:

155. The major water resource in the Khazran and Hitachi is the infiltration gallery through constructed the PIS in 2000. This infiltration is providing about 15 cusecs of water through a channel which is distributed by both the villages through a traditional system. Unlike Karkh area, the river span is very wide here and does not allow for construction of diversion weir. Therefore, infiltration gallery has been construction to secure and divert the sub- surface flow in the river for crop production.

156. The infiltration gallery has been constructed close to the Hitachi village. A water channel takes water to the croplands, where it is distributed through an established traditional system. A total of 576 ha has been brought under cultivation through construction of infiltration gallery. Here it is important to mention that the water secured and diverted through the infiltration gallery from the Mula River is available 24 hours for crop irrigation. During monsoon season i.e. from July to August/September, water level in the river rises, making extra water available for crop production during this season. This allows farmers of the community for brining extra land under cultivation that helps in increasing the agriculture crop production in the area. However, from March to June/July, the water level decreases in the river, which affects irrigation of crops and therefore production is low. Water distribution is managed by the Farmers Organization. The communities have a traditional system of water distribution in place, which is managed by the members of Farmer Organization. The disputes/conflicts that may arise on water distribution or related matters are also resolved by the Farmer Organization through traditional norms.

c. Land Tenure System:

157. The villages of Khazran and Hitachi are mostly inhabited by the Mosiyani, sub-tribe of the Zehri tribe. Brahvi language is mostly spoken by the resident community members of Khazran and Hitachi. Besides Brahvi, Sindhi is also spoken and understood in these villages. Agriculture land is mostly cultivated by the owners; however, the tenancy is also prevalent in both the villages.

158. Rest of the variable/parameters related to the agriculture sector in the Khazran and Hitachi are same as discussed in section for Karkh except for marketing. In Khazran and Hitachi due to long distances and non-availability of farm to market road, agriculture produce is mostly consumed at the household level, whereas some quantities are exchanged in a barter system, while very little is transported to the Khuzdar town for marketing. In institutional support for the future, marketing should be given top priority for Khazran and Hitachi so that community may earn hard cash for their agriculture produce.

- **Existing and projected agriculture**

159. At present the agricultural productivity is fair in the subproject but due to inadequate irrigation system in the subproject area, the landowner cannot bring the whole command area under cultivation. The existing cropped area is 572 ha with 84% cropping intensity followed by annual cropping pattern wheat – Rabi and Kharif vegetables – fodder – rice - melon – pulse etc. The yield and production are not good enough to support the landowner to enhance agricultural productivity.

160. The projection agriculture for the subproject has been made keeping in view the current irrigated cropped area, cropping intensity, yield and production in the subprojects through findings the agronomic field survey in and around the subproject area. The landowners are much interested to propose the profitable crops and fruits in the future as by the subproject development. The existing cropped area will be enriched from 572 ha to 817 ha and the cropping intensity will be enhanced from 84% to 120%.

- **Irrigation water rights**

161. The available water is being diverted to cultivated land / field as per land capacity / farm size according to the time division rule and they ensured that they will follow this current rule water distribution / right in the future as well.

5.3.4 Proposed agricultural development

162. It is expected that the design cropping intensity 120 percent would be completed within three years after commencement the project. The cropping pattern will be change with high yield and profitable crops such as cotton.

5.3.5 Livestock[24]

163. Livestock census of 2006 has data for 26 districts as districts like Washuk. Nushki, Harnai and Sherani were part of other districts. General categories of livestock for which data was collected comprised cattle, buffalo, sheep, goat, camel, horses, mules, asses and poultry. Situation of Khuzdar is ranked (based on sorting order largest to the smallest) below among the then 26 districts. In total livestock population ranking, Khuzdar district has the largest population.

Table 24: Livestock Population

Livestock Category	Cattle	Buffalo	Sheep	Goats	Camel	Horse	Mule	Asses	Poultry
Khuzdar District Ran	10	7	4	1	6	14	8	3	4

164. The above ranking shows that in case of small ruminants, Khuzdar large population as compared to other districts while in case of large ruminants too population is substantial. Area wise Khuzdar is second largest district and human population wise it ranks third largest (among 30 districts) while population density per square kilometer in only 15 (on project population, 2010).

165. District Khuzdar has enormous potential in livestock sector which provides livelihood to many poor families. The areas of Nal, Zehri, Wadh and Moola are suitable for livestock development, especially for raising cattle, as fodder grows in large quantity in these areas. The nomadic population depends on livestock. Livestock farming is a traditional activity in the district and comprises mostly Goats, Sheep, Cows, Buffaloes, Cattle, Camels and Asses. Goat constitutes the major portion of the livestock population in District Khuzdar.

166. Livestock Department, headed by the Deputy Director along with its staff, manages and controls all the activities pertaining to livestock including animal health coverage and husbandry. Vaccination is being carried out free of cost whereas the treatment is provided at 50% subsidized rates.

5.3.6 Power

167. Electricity at subproject areas is supplied by Quetta Electric Supply Company (QESCO). Quetta Electric Supply Company (QESCO) is a Public Limited Utility Company, established in 1998 under Companies Ordinance 1984 and is responsible for distribution of Electric Power to the entire province of Baluchistan excluding Lasbela district under a Distribution Electric Power within its territorial jurisdiction and presently serving approximately over 0.5 Million Customers (Domestic, Commercial, Agricultural,

[24] Planning & Development Department, Government of Balochistan – UNICEF, “District Development Profile 2011”, Khuzdar,

Industrial and others) in the thirty districts of Balochistan province.

168. Recently QESCO has undertaken the ADB's power distribution enhancement investment project PDEIP Tranche III to enhance the capacity of its power distribution system. This project covers construction work of two 2 Nos. of new double circuit 132KV Transmission line in jurisdiction of Quetta Electric Supply Company (QESCO) across 08 Districts of Balochistan i.e. Quetta, Mastung Khuzdar, Kalat, Loralai, Qila saifullah, Muslim Bagh, and Pashin districts.[25]

5.3.7 Water Supply Service

169. The task of water supply and sanitation at the subproject area lies with the Public Health Engineering (PHE) department for domestic uses. The residents of Khuzdar city have protested against the shortage of water supply by the PHE department[26]. Alternately the residents of subproject area use the canal water supply for their daily chores. No incidents of gestro-intestinal diseases have been reported during discussions with the community.

5.3.8 Transport

170. The subproject areas are well connected to surrounding cities of Balochistan and Sindh. The RCD highway connects Khuzdar to Karkh area and Hatachi-Khazran area with a travel time of 1.5 and 4 hours respectively. The Khuzdar – Shahdadkot Road (M-8, 58 Km long Project) is also widely used by traders and agriculturist of Karkh area to transport their produce to market at Shahdadkot.

5.4 Social and Cultural Resources

5.4.1 Population and Erhnicity

171. About 821 households were reported in core sub-project including 411 households in Kharzan village and 410 households in Hatachi village. The details pertinent to demography are given in Table 25.

Table 25 - Demography of Kharzan-Hitachi sub-project

No.	Sub-project Name	Name of Village	Total Land/Water Shareholding Household	Total Population	Male	Female
1	Kharzan Hatachi	Hatachi	410	2469	1203	1266
		Kharzan	411	2570	1380	1190

172. Based on findings of integrated surveys, average household size was 6.6 persons per household in target villages. The male and female ratio is 3.4 and 3.2, respectively.

[25] http://www.qesco.com.pk/PDF/EMReport%20T-3.pdf

[26] https://www.dawn.com/news/1298685

Majority of population in core sub-project are Muslims. The land and water rights belongs to different clans of Zehri tribe mainly Musiani, Jam, Changlani, Naqeeb, Battar and also some other tribes including Jattak, etc. The living patterns of locals are similar irrespective of ethnic background. Major language spoken in core sub-project is Brahvi.

5.4.2 Houses Construction Type

173. The core sub-project consists of rural population living in comparative isolation. Majority of population live in small settlements of five to twenty houses scattered in core subproject. Around 80.2% of houses are muddy and built without layout or plan and without any regard to blocks and 19.8% are composed of brick masonry. All earthen houses usually have a boundary wall enclosing enough space for cattle and storage. The roof of earthen house consists of 69.3% soil mulch and 30.7% of tiles. In some cases, owner of land is settled within farm away from other population.

5.4.3 Religious and Cultural Values

174. Majority of population in core sub-project are Muslims. Muslims are divided into Suni and Shia sects. The majority of Suni sect is Brailvi or followers of saints (Sofis). Their religious leader has many codes of honor like Imams and Pirs. Imam performs Nikah (marriage), leads Eid and Juma (Friday) congregations and at time of a burial leads funeral prayers (Janaza) besides leading five times a day congregational prayers. Persons belonging to Syed family are also respected and are called Sain. Important religious events are Edi-ul-Fitur, Eid-ul-Zuha, Eid-Miladun Nabi and Mohram.

5.5 Socio Economic Status

5.5.1 Sources of income

175. The integrated survey conducted in core sub-project reveals following key findings with respect to earning their livelihood:

- In Hatachi village; agriculture is a primary source of income for 100% landholding households while government employment is secondary source of income 30 households out of 410 households. Livestock rearing is tertiary source of income in core sub-project.
- In Kharzan village, agriculture is primary source of income for 92.7% landholding households and government employment is another primary source of income for 7.29% households. Livestock rearing is secondary source of income for 100% households in core sub-project.

5.5.2 Livestock in core sub-project

176. Livestock is one of allied fields of agriculture. The core sub-project has following types of livestock as portrayed in graphs with its average ownership per household.

Table 26 - Livestock ownership (average)

Goats	Sheep	Cow	Buffaloes	Donkey
15.47	9.72	2.71	1.55	1.05

177. The above table revealed that highest reported population is goats followed by sheep which are owned per household is around 16 and 10, respectively. This shows goats are preferred farm animals that people like to rear as compared to other livestock species probably due to suitable weather conditions and ease of keeping it. The other livestock comprise of cows, camels and buffaloes in core sub-project. The donkey is a domestic animal of core sub-project and used for fetching water and agriculture products.

178. The livestock meat production is illustrated in following graph which indicates that average weight of goat is 13.5 kg, meat production of cow 60 kg and average weight of sheep is 16.5 kg.

5.5.3 Potential income diversification options

179. The survey data reveals that potential income diversion options are identified as follows:

- Command area development works under core sub-project;
- Development of Khushkaba farming; and;
- Livestock production – small ruminants.

5.5.4 Education

180. The education perception level is very low, there are no students of professional studies (engineering & medical), total strength of sixteen year education is only 0.05%, matric level education is 0.1% and primary level education is 1.6%. Hatachi is largely populated areas and have primary as well as secondary schools. There are degree colleges separate for boys (2Nos) and girls (1Nos.) at Khuzdar that are affiliated with the Balochistan Board of Intermediate & Secondary Education (BBISE).

5.5.5 Archaeological and Historical Sites

181. There is no site of archaeological and historical importance in core sub-project corridor

5.5.6 Land Use and Availability

182. The land rights are equitable and all residents have share in land. The lands of both villages are reported in cadastral record. The cultivated land reported and observed in core sub-project was altogether about 575 ha including 250 ha of Kharzan and 325 ha of Hatachi village. While expandable land in core sub-project is about 106 ha.

183. There is also considerable Khushkaba land in both villages. In Kharzan, a tributary to Mula River called Ghurr can irrigate about 258 ha which is currently uncultivated. While in Hatachi Khushkaba land is located in mountains called Gorani and Ghatti having more

than 120 ha of land, which is currently also irrigated from localized runoff. However, there is no proper motorable access to core sub-project through vehicle. But farmers are trying to develop an unpaved earthen road for core sub-project. Flood irrigation is practiced to improve soil fertility as sediments deposited with floodwater are enriched with nutrients.

5.5.7 Water Rights

184. There are well-established water rights since centuries. The water right is a time bound water share. The allocation of water share is based on size of land owned by an individual farmer. The water distribution is time based and from head to tail. As mentioned, 821 households are entitled to water rights in Hitachi Kharzan perennial irrigation subproject.The flow is distributed on time division basis.

185. There is a water cycle in days which varies from season to season due to fluctuation in discharge in channel. It was reported by community that individual water rights are registered in cadastral record. A list of water shares holders was prepared and is part of Poverty, Social and Gender Assessment Report.

5.5.8 Irrigation Sources and Distribution

186. The source of water is Mula River, water is diverted through kacha traditional diversion bund. Both communities share single diversion structure and distribute water equally among two villages. The designed water will be diverted to design command area. Water allocations are based on size of farm in terms of time per unit ha. The survey data revealed that currently average land ownership and irrigated land of an individual farmer is 0.80.

5.5.9 Issues and Options on Water Rights

187. In 2002, irrigation sub-project was constructed under BCIAP funded by World Bank. The sub-project consists of intake head works, distribution structure and syphon to cross river and convey water for Hatachi command area. However, in flood of 2007, intake structure became non-functional and farmers again started diverting water through temporary diversion bund. This situation also created tension among both communities on distribution of water. Which was resolved by civil administration by monitoring equitable distribution of water. The Kharzan residents also registered a court case on Hatachi farmers for distribution of water. However, matter has been settled between communities but court case is still under progress.

5.5.10 Tenancy Arrangements

188. Tenancy is not very common; however, it is practiced. The land is cultivated where water is permanently available. Presently, land is cultivated by land owner and about 5% of land owners hire tenants.

5.5.11 Conflict Resolution

189. There are two main arrangements of conflict resolution in the district; one is official

and other is traditional. The official system involves Law Department of GoB and unofficial system is based on traditional Jirga/Mairh system. The government system functions through civil, criminal, session and Qazi courts and Majlis-e-Shora. The people file suit in courts to resolve their disputes. Criminal cases are registered in session court at Khuzdar. People prefer Mairh/Jirga system, where they take their issues to a senior and influential head of clan (Sardar/Motabar) of community and after a lengthy discussion their disputes are settled.

5.5.12 Community Priority Needs

190. During public consultation and baseline surveys in core sub-project, needs of communities were assessed. The baseline reveals following demands priority wise following demands:

- Construction of headwork's separately for Hatachi and Kharzan villages;
- Channel lining;
- Provision of flood protection bunds.

5.5.13 Public Consultation and Mitigation Measures

191. Meaningful consultation was carried out with farmers of Hatachi Kharzan perennial irrigation sub-project. Findings of consultation are illustrated as follows:

- Involuntary resettlement (IR) and issues related to indigenous people (IP) were assessed for core sub-project in line with ADB-SPS and standard checklists.
- During field visits, it was confirmed that core sub-project proposed for rehabilitation will be implemented on existing alignment of irrigation channels as well as other structures. The proposed rehabilitation works will be confined in existing ROWs. The construction of new canals/irrigation structures or change of alignment will not be involved. Following this approach, rehabilitation and core sub-project is not expecting to have any physical or economic displacement, therefore, there is no possibility of land acquisition and consequently no involuntary resettlement impacts are anticipated thus core sub-project is classified as Category "C" for IR.
- The core sub-project is located in district Khuzdar, where no indigenous or ethnic minorities, as described in line with ADB-SPS, was found living in or around core sub-project. All persons are Muslim and they do not recognize themselves as IPs. The ADB's policy on IPs is therefore not triggered. Therefore these sub-projects have been categorized as "C" for IPs and no indigenous peoples plan will be needed.

192. The mitigation measures suggested are:

- Minimize resettlement and other social adverse impacts through rehabilitation works carried out along existing available RoW and all works shall be restricted inside existing ROWs.

5.5.14 Involuntary Resettlement and Indigenous People

193. No involuntary resettlement and indigenous people issue is anticipated on the

subproject.

5.5.15 Health[27]

194. The highly subsidized public healthcare system is the major provider of curative and preventive care services to the local population. The health facility infrastructure includes:

1 Hospital, 6 Rural Health Centers (RHCs), 34 Basic Health Units (BHUs), 31 Civil Dispensaries (CDs), 1 Maternal & Child Health Center (MCHC) and 1 TB Clinic. There are 190 beds, out of which 100 are situated in RHCs. Apart from these health facilities, there are two leprosy clinics and two private hospitals with 30 beds.

195. Special Health Programs and Initiatives currently being carried out in the Khuzdar district are:

- Expanded Program on Immunization (EPI)
- TB Control Program
- Malaria Control Program
- Hepatitis Prevention Control Program
- AIDS Control Program

5.5.16 Gender Issues

196. Women's freedom for movement is limited and their main exposure to outside world is through media; thus this is particularly true for women with high social status where purdah customs are more strictly observed. The women interviewed in core sub-project have right to express her views in family matters but are not involved in business affairs nor do they own property. The women are responsible for collection of fuelwood.

197. Gender consultations were conducted in the two villages of the command area 53 women participated

Table 27: Consultations with the Participants (Kharzan Hatachi)

Sr. No.	Name	Age (Years)	Occupation	Education
Village: Kharzan				
1	Noor bibi	60	House wife	Illiterate
2	Faiz bibi	40	House wife	Illiterate
3	Ruqia	20	House wife	Illiterate
4	Yasmeen	20	House wife	Illiterate
5	Sahib khtoon	60	House wife	Illiterate
6	Sabira	35	House wife	Illiterate
7	Naseema	30	House wife	Illiterate
8	Razia	35	House wife	Illiterate
9	Sefat khtoon	44	House wife	Illiterate
10	Fazila	28	House wife	Illiterate
11	Parveen	18	House wife	Illiterate
12	Naima	28	House wife	Illiterate
13	Samina	18	House wife	Illiterate

[27] Planning & Development Department, Government of Balochistan – UNICEF, "District Development Profile 2011", Khuzdar,

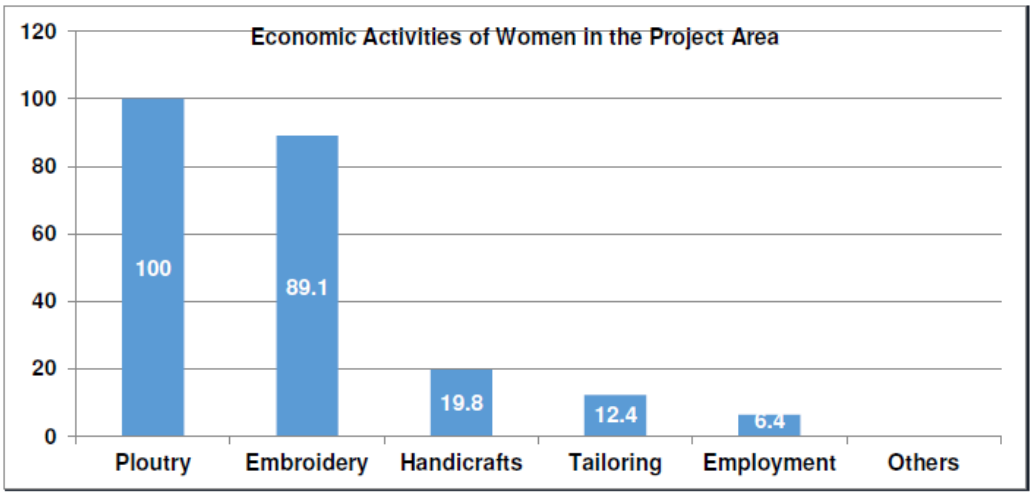
14	Saira	18	House wife	Illiterate
15	Sadia	18	House wife	Illiterate
16	Lal bibi	44	House wife	Illiterate
17	Sajida	30	House wife	Illiterate
18	Hameeda	40	House wife	Illiterate
19	Fareeda	40	House wife	Illiterate
20	Mairum	35	House wife	Illiterate
21	Mehwish	20	House wife	Illiterate
22	Jan bibi	35	House wife	Illiterate
Village: Hittachi				
1	Afroz	30	Health worker	Educated from madras
2	Shaker bibi	25	House wife	Illiterate
3	Hoor bibi	25	House wife	Illiterate
4	Shumaila	18	House wife	Illiterate
5	Hameeda	33	House wife	Illiterate
6	Khan bibi	40	House wife	Illiterate
7	Fozia	30	House wife	Illiterate
8	Saeeda	33	House wife	Illiterate
9	Afroz bibi	19	House wife	Illiterate
10	Zamrud	18	House wife	Illiterate
11	Bibi naz	30	House wife	Illiterate
12	Balqeesa	40	House wife	Illiterate
13	Rubina	18	House wife	Illiterate
14	Allah raki	60	House wife	Illiterate
15	Jamila	40	House wife	Illiterate
16	Shaheena	18	House wife	Illiterate
17	Rubina	18	House wife	Illiterate
18	Sifat khtoon	50	House wife	Illiterate
19	Sajida	20	House wife	Illiterate
20	Haseena	35	House wife	Illiterate
21	Shaker bibi	30	House wife	Illiterate
22	Zulaikha	35	House wife	Illiterate
23	Sumaira	18	House wife	Illiterate
24	Nadia	20	House wife	Illiterate
25	Zainab	30	House wife	Illiterate
26	Ruqiya	21	House wife	Illiterate
27	Sadia	18	House wife	Illiterate
28	Sumaira	19	House wife	Illiterate
29	Saima	19	House wife	Illiterate
30	Sabira	35	House wife	Illiterate
31	Zulaikha	33	House wife	Illiterate

Photographs of Women Consultation in the Project area

- ***Livelihood source and economic activities of women***

198. The ownership of sewing machine is a source of income for women in core subproject. The averaged percentage of ownership of sewing machines is 0.8%. Chicken rearing is another economic activity for women. The survey data reveals that 100% of women have ownership of poultry and average ownership of chickens is 7.5 per households. The women do not sell out chicken in market but it is only used for domestic consumption. The major economic activities of women undertaken in the core sub-project illustrated in following graph which reveals that:

- Poultry rearing is common;
- Embroidery as source of income for 89.1% of women;
- Handicraft as a source of income for 19.8 of women;
- Tailoring is as a source of income for 12.4% of women;
- Government employment is as a source of income for 6.4% of women.



199. Women in core sub-project do not play role in agriculture and watershed management activities. The contribution from different economic activities are given in Table 28.

Table 28 - Contribution in livelihood and income by source (average Rs./annum)

Poultry	0.0
Embroidery	19000
Handicrafts	10000
Tailoring	22500
Employment	215000

- ***Women role in livestock rearing***

200. Both men and women are engaged in livestock production; men are responsible for animal's health as this entail outside activity; and' women are involved in activities such as watering, feeding and milking. Most women are also engaged in processing dairy products including whey, butter for home consumption. None of women interviewed own

neither livestock nor are they authorized to sell animals. Women have no rights in land ownership and there is no female headed household in core sub-project. As per contradictory to Islamic law, women are not given their due share from paternal side and share in case husband is deceased.

- ***Potable water***

201. As per findings of integrated survey, 69% of women fetch water from hand pumps located inside compounds and 23% of fetch water from channels or springs located outside of compounds. Water from these sources is also used for washing dishes and clothes. Women and girls are responsible for fetching water for domestic use. Most sources of water are situated within one hour walking distance from settlements. Women further stated that they make four or five trips in a day to fetch water. Respondents considered fetching water is a most difficult and time consuming activity. Most of women have some notion of need for clean drinking water. But water is neither filtered nor boiled in any of the respondent's household. The women store water in plastic and clay containers. They do not boil water before drinking. There is no sewerage system in core sub-project.

- ***Health and hygiene***

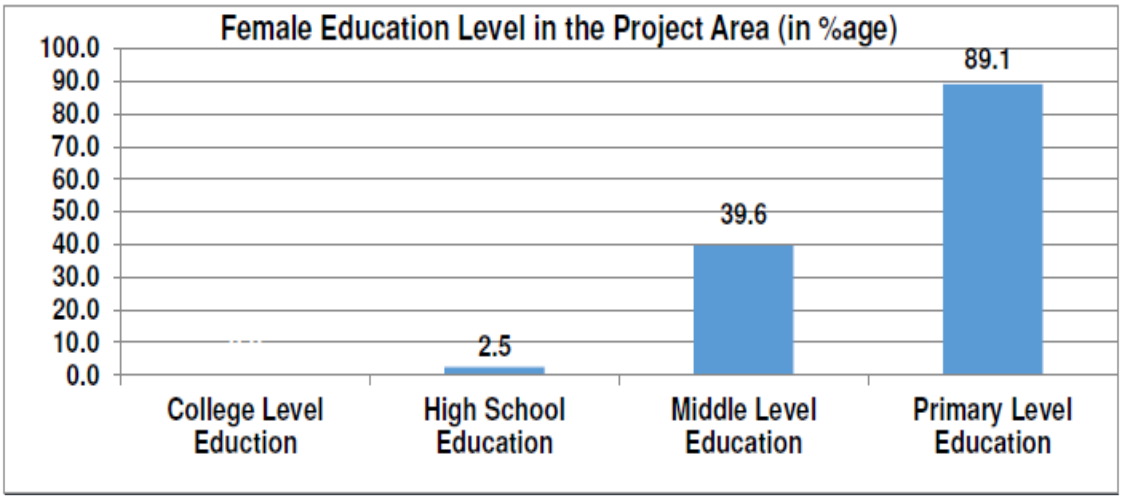
202. Sanitary facilities are not available in core sub-project. There is traditional lady birth attendant who is attending women delivery cases. Knowledge of nutritional value of food and importance of balanced diet is limited. Respondent women reported prevalence of various health problems including diarrhea, abdominal pain, malaria and skin diseases; most children are said to suffer from skin diseases.

- ***Women role in agriculture***

203. Two third of women interviewed were involved in agriculture activities with their husbands or relatives, participating in weeding and harvesting. All women respondents were reportedly involved in post-harvest activities such as storage of food grains, cleaning of seeds as well as sun drying and cleaning of grains in case of infestation of insects. Women do not grow vegetables for home consumption inside their compound.

- ***Female education***

204. Like other districts of the province, gender disparity in education is high almost at all levels of education. The female education level in core sub-project is illustrated in following graph.



- ***Women priority needs***

205. During integrated surveys, sub-consultant women team assessed following needs of women in core sub-project:

- Training in health and hygiene;
- Provision of female education facilities;
- Employment;
- Kitchen gardening; and;
- Development of water collection and Washing Pads under core sub-project.

- ***Suggested Income Generation Activities and Training***

206. Information was collected regarding "potential area for increasing women's participation in economic activities". Participants mentioned that fruits and vegetable are often wasted if they are given a comprehensive training to process the fruits to add value and with proper marketing a small scale women led business can be introduced for the women.

207. During the group discussion with female respondents identified following potential areas for increasing women's participation in the small scale- women- led agribusiness business for fruits and vegetables:

- Tomato ketchup.
- Maraba Making
- Pickle Making.
- Mini feed mills for livestock feeds.
- Plastic Tunnel for Fruit drying.

208. Trainings recommended by the female participants which are:

- Livestock Sector (Rearing goat, sheep and cattle)
- Poultry Farming: (Selling poultry products)
- Dairy sector, process and packing milk
- Training in embroidery, sewing, and marketing
- Agriculture Sector: Crop Sowing, harvesting and picking
- Kitchen gardening (producing vegetables at small scale)

209. Women of the area can run these small businesses for themselves with minimal effort, training and credit facility that will allow them to supplement their earnings. The females were interested to take part in the above mentioned area.

5.5.17 Cultural Heritage[28]

210. The central position of Khuzdar, at the point of convergence of roads from Multan (via the Mula pass), Makran and Kandhar (province of Afghanistan), made it a very important place for the Arabs invading India; also, its moderate climate made the locality attractive and acceptable for the Arabs. In the Arab Tenure, Khuzdar was protected by a small fortress, which was probably on the peak overlooking the valley; is now known as Biradari (Shahi Bagh).

211. Therefore, the Arabs made frequent attacks upon Khuzdar and in 664 AD, in the caliphate of Muawiya, Al-Manzar, son of Al-Jarud-al-Abdi, was appointed to the frontiers of India after conquering Nukan and Kikan, captured Khuzdar. Al-Manzar is said to have died here. During the caliphate of Al-Mutasimbillah (833-41 AD), Umar, who was nominated as the governor of Sindh, transferred the inhabitants of Kandabel (Gandava) to Khuzdar.

212. In 976 AD, Khuzdar was governed by an Arab named Muin bin Ahmed. A year after, Amir Nasir-ud-din Subuktegin commenced series of invasion on India and conquered Khuzdar but its possession was restored to the previous rulers through a treaty. The treaty stipulated that immediately a sum of money must be paid and that the ruler would thereafter send a tribute every year. Subuktegin again attacked the wayward ruler. During the days of Mahmud Ghaznivi, the rulers of Khuzdar again became disaffected and withheld the tribute. Mahmud Ghaznavi marched to Khuzdar and it was indeed owing to Mahmud's possession of Khuzdar that his subsequent conquests in Sindh were largely effective. Khuzdar was included in Mahmud's territory in 1031 AD.

213. With the downfall of the Ghaznivids, Khuzdar passed to the Ghorids and then to Nasir- ud-din Kabacha. In 1225 AD, Khuzdar was given to Shamsuddin Altamash. Afterwards, the country appears to have passed sovereignty to the Mughals. In 1590 AD, Abdul Fazal speaks of the Zehri section of the Baloch tribe. Decline of Mughal power was followed by the rise of the Brahvis to a position of greater or lesser independence. During the reign of Mir Mahmud Khan, Pottinger visited Jhalawan in 1810 AD, travelled to Kalat via Bela and Khuzdar. He described Khuzdar as a small town not having more than 500 houses.

214. The influence of Hindus from Multan and Shikarpur appeared immense that the keys of the town gate were entrusted to the then senior Brahmin every night. During 18th century, the people of Khuzdar were very religious. The rulers of that period had implemented the Islamic Laws very effectively. Since the death of Gauhar Khan, chief of Jhalawan, the area has enjoyed a long period of repose.

215. Khuzdar region was full of karezes and lush green cultivation, at the time it was a province of Khurasan. Khuzdar was situated on the route for caravans taking merchandise on camel backs to Makran Port for export, to the middle-eastern countries. The forces of Muhammad bin Qasim passed through this area gaining access to Sind through Mula pass. The mud-fort in Khuzdar was built by Khan Khuda Dad Khan in 1870,

[28] Planning & Development Department, Government of Balochistan – UNICEF, “District Development Profile 2011”, Khuzdar,

during a war with Jams of Lasbela.

216. In 1903, British Government appointed a political agent at Khuzdar to carry out administrative affairs of the government. This administrative system continued till partition of India. Before March 1974, Khuzdar was a sub-division of Kalat District.

217. A number of mounds of archaeological interest have also been found in Khuzdar. The most important one is Meri Bhar or Palace Mound. It is believed to be the seat of last Mongol governor of Khuzdar, Malik Chap, who was killed by Kurd inhabitants of Khuzdar. The “Shahi Bagh” at Khuzdar gives an indication of its importance and condition in ancient times. Many old dams and tombs are scattered throughout the district. A beautiful mosque, symbol of modern Islamic architecture on the RCD highway in Khuzdar, attracts many people.

218. Any site of cultural or historical importance were not seen in the project areas.

5.6 Stakeholder Consultation

219. In the consultation process for IEE, following key stakeholders were consulted:

- Irrigation Dept.
- Local communities, Men and village elders attended meetings.
- IUCN
- landlord and their representatives
- BRSP

220. Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in-depth interviews and discussions with landlords and their representatives. The location of the meetings, the process followed, and the outcomes are discussed in this section. The list of the villages where public consultation was carried out is given in Annexure – 10 while the photographs of consultations are included as Annexure -11.

221. The summary of the various stakeholder consultations is given below.

222. The consultations were considered a good gesture and appreciated, especially by the landowners and locals of the project Mullah river interventions. The Consultants probed about the anticipated irrigation problems from the local community and presented the proposed project interventions as a solution to their problems. The local community perceived that the proposed project would improve their financial well-being to a great extent because 80% people job associated with Agriculture work. They emphasized that local villagers should be given priority when employing people for various project-related works and activities according to their skills because non-Local work force coming in the project area that will not be aware of the local customs and norms, may result in conflicts with the local community, keeping in mind the sensitive law and order situation and culture of the area. Local also expressed some fear that vehicles would disturb their cattle and

that their livestock might get hurt or run away or die accidental death due to vehicular (heavy machines) movement. No reservations for proposed project interventions shown by the community during focused group discussions.

223. During a meeting with Syed Perveiz Bukhari, Chief Engineer of the Irrigation and Power Department, Government of Balochistan presented the project background information. The consultants probed the justification of the project and conditions on the ground. The Chief Engineer was very positive that the project would have a positive impact on the community of the subproject areas. The consultants asked if the BIPD held discussions with the community regarding their issues and how the BIPD can facilitate to resolve their issues. The Chief Engineer informed that he and his department were constantly in contact with the community and the proposed design is based on informal meetings and discussions with the local community.

224. The consultations with Balochistan Rural Support Program (BRSP) were considered a good gesture and appreciated. They informed the consultants of successful work done by BRSP. The consultants briefed the BRSP team of the project interventions. BRSP expressed views on the positive impact the project may have on the local people and BRSP's role on agriculture extension in the project area. BRSP advocated synergistic approach as implementing partner for the sustainability of proposed interventions and wellbeing for the villagers. The consultants probed the functions of BRSP in the region and its past progress. This was done to find possible solutions of getting BRSP involved in the project at a later stage in the form of educating agriculturists of the area. Suggestions of CEO were duly noted and are presented in the conclusion and recommendations chapter.

225. A meeting was held with Mr. Naseeb ullah Khan at IUCN- Pakistan, Balochistan Program office Quetta. The Project was briefed by the team with the help of maps. IUCN shared its input and endorsed the need of the projects in Balochistan while focusing on improving water efficiency. IUCN shared its sensitivities about the protected areas and threaten species. During the consultation it was revealed that no protected areas and no threaten species are reported in the Project area.

226. A meeting was held with Mr. Iqbal Zehri, Conservator, Balochistan Forest and Wildlife Department, Khuzdar, at his residence at Khuzdar. The consultants shared project details with him and benefited with the organizational knowledge of the Conservator. Mr. Zehri discussed the formations present in and around the project areas. He also confirmed about no protected sites of ecological importance in and around the project areas, Mr. Zehri was of the opinion that the project will contribute to the wellbeing of the community as well as ecology. The team further asked Mr. Iqbal Zehri how the proposed project can help conserve the forest and wildlife. He proposed that if any tree is fallen, some additional trees should be planted to compensate its effect. The type and number would be finalized by Balochistan Environmental Protection Agency in consultation with Balochistan Forest and Wildlife Department at the time of IEE approval.

227. Engr. Imtiaz Ahmad – DPD Mula River Basin and Mr. Muhammad Khan Zehri – Agriculture Officer also accompanied the team during the second consultation visit conducted in March 2020. The team visited sub-project along with the representatives of Farmers Organisation (FO). Information of FO representatives consulted and the extent of proposed works identified at each weir (irrigation scheme) was documented. Consultation pictures and contact details are in **Annexure 11.**

228. Community Consultation was done at detail design phase from 8-14 March 2020. Main concerns and response were following

- 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. **Response:** Local norms and customs will be respected.

- 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. **Response**. To enhance safety of local people the contractor should use protective devices, including wire mesh containment, displaying warning signs along the work site, blowing sirens, etc.

- Whether jobs will be provided to the locals? **Response:** Unskilled labors will be hired from the local.

- Project activities may produce dust or gaseous emissions and noise/vibration during construction phase. **Response:** Proper mitigation measures will be taken by contractor.

- It is anticipated that a large quantity of excavated material will need to be disposed of (will be used in side lining of canal). If this waste material is not properly disposed of, it will contaminate the soil and water resources, especially during the rainy season. **Response:** Excavated material will be managed properly, and if dumping required than dumped it in proper place.

- Contractor should establish construction camps on waste land and should not disturb productive agriculture land. The participants requested that labour should be hired from villages of the project area. **Response.** Although it is the responsibility of the contractor, however IEE would recommend it.

- Which type of the channels haveki been proposed? **Response:** Lined channels has been proposed. It will reduce seepage, losses of irrigation water and make irrigation system more efficient.

6. ASSESSMENT OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

6.1 General

229. 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 the Project Area is presented in the following sections.

6.2 Impact Assessment Methodology

230. For the purpose of evaluating the environmental impact of this proposed project, the following steps have been executed:

- Scoping of impacts
- Environmental screening
- Qualitative impact evaluation
- Describing mitigation measures
- Residual impact significance
- Determining cumulative impacts

231. Each of these steps undertaken for the evaluation of environmental impacts and to describe mitigation measures, is described in the following section.

6.3 Scoping of Impacts

232. Potential environmental impacts of the Project on various environmental features in the Project Area are identified through the following studies:

- Environmental quality baseline monitoring of air, noise and water;
- Detailed review and analysis of primary and secondary data available for all environmental parameters in Project Area such as physical, ecological and social resources;
- Desktop study of engineering investigations, studies and designs;
- Consultations with implementing agencies, local government, affected community, traditional and religious leaders of community;
- Stakeholder consultations with relevant government agencies and national NGOs;
- Knowledge assimilation of international best practices on environmental assessment of irrigation projects.

6.4 Notion of Significance

233. The term ***"Environmental Impact"*** or simply *"**Impact**"* covers the negative, adverse or harmful as well as positive, desirable or beneficial impacts of the project on environmental settings. Prediction of impacts of the proposed activity is based on factual data; however, the significance of these impacts involves subjective judgment. The nature of the impacts may be categorised in terms of:

- **Direction** - Positive or Negative
- **Duration** - Long or Short Term
- **Effect** - Direct or Indirect
- **Extent** - Wide or Local

234. Impact significance depends on both the nature of the impact and on the sensitivity of the receptor. The more sensitive the receptor the greater will be the significance of impact of that change. For this IEE Report, nature of change is combined with the sensitivity of the receptor to evaluate the significance of the impact. The significance of impact is characterized as very low, low, moderate, high and very high. Environmental issues having "moderate", "high" and "very high" significance would be provided with mitigation measures. Residual impacts after implementation of mitigation measures have also been provided.

6.5 Environmental Screening

235. For identification of potential impacts of the project, screening of activities causing impacts had been carried out in different phases of the project life. In the impact assessment exercise, major project activities with their associated environmental issues were identified and then their impacts on the relevant physical, ecological, and socio-economic elements of the area were evaluated.

236. In broader spectrum, the project activities could be categorized in the following three phases:

- Planning & Design Phase;
- Implementation & Construction Phase; and
- Operations & Maintenance Phase.

237. During the first phase, the focus will be not only on the engineering design, but also on laying the foundation for integrated planning for water resources management. Extensive inter-departmental coordination will be necessary at this stage for improvement in institutional arrangements and capacity in the areas of environmental and social management and monitoring. Development of decision support systems and training to

develop local expertise is expected to substantially improve the management and monitoring of social and environmental impacts.

238. The planning, information management, and capacity-building activities are all intended to facilitate increased awareness-raising to foster ownership, understanding and mainstreaming of environmental and social considerations. Such activities to be planned and partly to be implemented.

239. The construction phase mainly entails rehabilitation of weirs, construction of infiltration gallery, new canal and other irrigation structures. Rehabilitation of weirs, construction of the infiltration gallery, new canal and other irrigation structures are expected to introduce direct significant benefits to the local population. This phase will be very sensitive in terms of environmental and social implications, because of a wide range of issues including the very extent of construction activities etc. The interventions planned under this component will become less damage to environment, if the EMP is implemented in letter and spirit.

240. Operations & Maintenance will be another stage where major impacts, both positive and negative, can surface, and the earlier predictions could be validated. This phase will comprise commissioning the newly rehabilitated weirs, constructed infiltration gallery, new canal and other irrigation structures. While the operation phase mostly consists of engineering activities, it has an equally important requirement of continued inter- departmental coordination, for harvesting the full potential of positive impacts of the project.

241. **Table 29** below presents the screening of activities for proposed infiltration gallery, new canal and irrigation system during design, construction and O&M phases.

Table 29: Screening of Project activities

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low s	Moderate Risk	High Risk	Low	Moderate	High	
Infiltration Gallery at Hatachi - Kharzan (construction of new infiltrations galleries at Kharzan and Hatachi , Rehabilitation lining of irrigation channels at Kharzan and Hatachi , Rehabilitation of existing hydraulic structures, construction of social structures and time division structures)							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential impact
Assessment of water availability		✓			✓		• Failure of design
Location, land use and land acquisition of the selected subproject area	✓			✓			• No potential impacts
Design works construction of infiltration gallery as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Traditional water rights considerations	✓			✓			• No impacts as water rights have been distributed and settled between both villages (Kharzan and Hatachi)
Public consultation and sharing of proposed design considerations		✓			✓		• Social issues
Disruption to public life	✓			✓			• No potential Impact
Disruption to wildlife	✓			✓			• No potential Impact
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
B. Implementation & Construction Phase							
Construction contractor mobilization and		✓			✓		• Changes in land use pattern

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low s	Moderate Risk	High Risk	Low	Moderate	High	
Establishment of campsite and machinery/ equipment Yard							• Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues
Security and Safety Risks		✓			✓		• Delay in project execution
Transportation of construction material		✓			✓		• Soil erosion and contamination • Air pollution • Noise pollution • Health and Safety issuesespecially COVID-19 related • Damage to infrastructure
Earthen works		✓			✓		• Soil erosion • Site overburden • Borrow pit • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low s	Moderate Risk	High Risk	Low	Moderate	High	
							• Blocked of access due to earth works and stockpiling of excavated material
Concrete and Form works		✓			✓		• Noise pollution • Air pollution • Health and safety issues especially COVID-19 related • Blocked of access due to construction works
C. Operation & Maintenance Phase							
Conflicts caused by unavailability or improper distribution of water in the area		✓			✓		• Social issue
Use of water for drinking purposes		✓			✓		• Health issues • Social issues
Periodic cleaning and maintenance of the system		✓			✓		• Solid waste generation
Increase of agricultural lands		✓			✓		• Loss of pastoral lands
Community Participation for management and operation of the irrigation system		✓			✓		• Social issues • System sustainability
Use of fertilizers & pesticides		✓			✓		• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff
Disruption to wildlife		✓			✓		• Conservation issues

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low s	Moderate Risk	High Risk	Low	Moderate	High	
Risk due to Natural Hazard i.e. flooding and earthquakes		✓			✓		• System sustainability
Mula River Intervention: Flood Protection Bund							
A. Design & Planning Phase							
Field surveys	✓			✓			• No potential Impact
Design works construction of flood protection bund as per proper engineering standards		✓			✓		• In case of design failure system will be collapsed and Social issues
Public disclosure of final design		✓			✓		• Social issues
B. Implementation & Construction Phase							
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard		✓			✓		• Changes in land use pattern • Influx of external work force • Social conflicts • Workshop facilities may spread oils & chemicals • Deterioration of air quality due to machinery & equipment • Noise • Land degradation due to solid waste disposal of camp site • Water contamination • Loss of vegetation • Health and Safety issues especially COVID-19 related
Transportation of construction material		✓			✓		• Soil erosion and contamination

Proposed Sub-activities	Screening Results			Significance Prior to Mitigation			Potential Impacts
	Very Low s	Moderate Risk	High Risk	Low	Moderate	High	
							• Air pollution • Noise pollution • Health and Safety issues • Damage to infrastructure
Earthen Bund with Stone Pitching: Hatachi Village = 3,104 m Long Kharzan Village = 3,737 m Long		✓			✓		• Soil erosion • Site overburden • Loss of natural vegetation • Damage to infrastructure • Sites of Historical, Cultural, Archeological or Religious Significance • Noise pollution • Air pollution • Health and safety issues especially COVID-19 related • Blocked of access due to earth works and stockpiling of excavated material
C. Operation & Maintenance Phase							
Breaching of flood protection bund		✓			✓		• System sustainability
Risk due to Natural Hazard i.e. Flooding and Earthquakes		✓			✓		• System sustainability

6.6 Assessment of Risk – Environmental Aspects

242. The next stage of the IEE process is a detailed assessment to forecast the characteristics of the main potential impacts. Known as impact analysis. Impact identification and prediction are undertaken against an environmental baseline, often through indicators e.g. air/water, noise, ecological sensitivity, biodiversity. The aim is to take account of all of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are taken into consideration.

243. The anticipated environmental impacts due to project is based on the methodology provided in chapter 1 of this report presented below in Table 30.

244. Residual impacts after implementation of mitigation measures have also been provided.

245. The project and its activities may have a potential to impact the environment and this section intends to evaluate the significant impacts. It is imperative that the project is considered into its different aspects. The following environmental impacts have been evaluated:

- Impacts owing to Design Phase
- Impacts owing to Construction Phase
- Impacts owing to Operations Phase

246. The impacts of Design and Operational Phases are similar for all intervention. However, impacts for construction phase is specific with respect to sites.

Table 30: Anticipated Environmental Impacts Assessment

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Infiltration Gallery at Hatachi - Kharzan (construction of new infiltrations galleries at Kharzan and Hatachi , Rehabilitation lining of irrigation channels at Kharzan and Hatachi , Rehabilitation of existing hydraulic structures, construction of social structures and time division structures)				
A. Design & Planning Phase				
Field Surveys	No potential impact	-	-	-
Assessment of water availability	Failure of design	C-3	Design works will ensure the assessment of water. Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	C-1
Location, land use and land acquisition of the selected subproject area	No potential impact	-		
Design works construction of infiltration gallery as per proper engineering standards	In case of design failure system will be collapsed	D-4	Review of engineering design works will ensure the proper design of the system	D-1
Traditional water rights considerations	Social issues	D-4	Acquire full information about traditional water rights and ensure that these are not disturbed	D-1
Public consultation and sharing of proposed design considerations	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Disruption to public life	No potential impact	-	-	-
Disruption to wildlife	No potential impact	-	-	-

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Risk due to Natural Hazard i.e. flooding and earthquakes	The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching infiltration gallery, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	D-4	Design engineer should ensure that seismic design of infiltration gallery and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	D-2
B. Implementation and Construction Phase				
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Cultural conflicts Influx of external work force Land degradation due to solid waste disposal of camp site Workshop facilities will spread oils & chemicals Soil erosion	B-2	Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Workshop facilities may spread oils & chemicals	B-2	Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.	B-1
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1
	Noise Pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Land degradation due to solid waste disposal of camp site	B-2	Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation. Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed	B-1
	Water contamination	B-2	Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp to avoid any accidents Firefighting equipment shall be made available at the camps The camp staff shall be provided firefighting training. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant	B-1
Security and Safety Risks	Delay in project execution	C-3	Frequent consultation with local community leaders should be carried out to ensure that any social frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	
Transportation of construction material	Soil erosion and contamination	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust	B-1
	Air pollution	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Noise pollution	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	B-1
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic Project drivers shall be trained on defensive driving. Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared. Cultivation fields should be avoided for borrowing material to the extent possible. Written consent of the land owner should be obtained for material (soil) borrowing.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites.	
	Loss of natural vegetation	B-2	Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	B-1
	Site overburden	B-2	Wind direction shall be considered while selecting sites for stock piles. Stockpiles of overburden shall be kept covered where possible. Ensure proper disposal of construction waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. Proper disposal of waste material. Demarcate the waste site and provide details of land use. Finally take approval from supervision consultant. An impervious liner shall be laid to waste sites before the dumping of	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material Dismantled asphalt pavement shall be dumped to the waste site.	
	Borrow pit management	B-2	As far as possible wasteland or natural areas with a high elevation will be demarcated for borrowing earth material. Where the use of agriculture land is unavoidable, the top 300 mm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will initially fill with scrap material from construction and then leveled with the stockpiled topsoil. Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize the erosion and to avoid creating hazards for people and livestock.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Land owners will be compensated according to the terms of lease agreement negotiated with the land owners, and restoration action agreed upon by the contractor will be duly carried out.	
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			of the construction activities at such sites.**34** Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.	
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1
	Air pollution	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Blocked of access due to earth works and stockpiling of excavated material	B-2	A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant	B-1
C. Operation and Maintenance Phase				
Conflicts caused by unavailability or improper distribution of water in the area	Social issues	C-3	Agreements between different communities/tribes Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows.	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured. Farmers in downstream areas should be compensated in case they lose their water rights. All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.	
Use of water for drinking purposes	Health issues	C-3	Proper treatment system shall be provided Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system.	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Turbidity and free residual chlorine tests shall be regularly performed. Arsenic will be tested as per WHO standards.	
Periodic cleaning and maintenance of the system	Solid waste generation	C-3	Ensure proper disposal of waste at designated landfill/disposal sites.	C-1
Increase of agricultural lands	Loss of pastoral lands	C-3	Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals.	C-1
Community Participation for management and operation of the irrigation system	Social issues and System sustainability	C-3	Ensure community participation in management and operation of the irrigation system Training of community	C-1
Disruption to wildlife	Conservation issues	C-3	Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally of low significance.	C-1
Use of fertilizers & pesticides	Banned fertilizer & pesticides will cause health issues Contamination of fresh water through surface runoff	C-3	Concerted efforts by thedepartment of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level;	C-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as **Annexure 15** of this report	
Risk due to Natural Hazard i.e. flooding and earthquakes	System sustainability	C-3	Emergency Response Plan for Infiltration Gallery will be followed which is attached as **Annexure – 12** of this report.	C-1
Activity / Issue	**Potential Impact**	**Assessment of Risk**	**Mitigation Measures**	**Residual Impacts**
Mula River Intervention: Flood Protection Bund				
A. Design & Planning Phase				
Field surveys	No potential impact	-	-	-
Design works construction of flood protection bund as per proper engineering standards	In case of design failure system will be collapsed	D-4	Review of engineering design works will ensure the proper design of the system	D-1
Public disclosure of final design	Social issues	D-4	Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	D-1
Implementation & Construction Phase				

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	Changes in land use pattern Cultural conflicts Influx of external work force Land degradation due to solid waste disposal of camp site Workshop facilities will spread oils & chemicals Soil erosion	B-2	Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents. Local residents shall be given priority in the employment opportunities generated during construction and operations phase The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose.	B-1
	Workshop facilities may spread oils & chemicals	B-2	Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. Efficient Use of Chemicals shall be ensured. Good housekeeping practices shall be ensured at workshop areas. Mixing of waste into fresh water sources shall not be allowed.	B-1
	Deterioration of air quality due to machinery & equipment	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Noise Pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	B-1
	Land degradation due to solid waste disposal of camp site	B-2	Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material. Good housekeeping practices within the camp site shall be adopted to minimize waste generation.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed	
	Water contamination	B-2	Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	B-1
	Loss of vegetation	B-2	The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	B-1
	Health and Safety issues	B-2	Protective fencing to be installed around the Camp to avoid any accidents Firefighting equipment shall be made available at the camps The camp staff shall be provided firefighting training. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant	B-1
Transportation of construction material	Soil erosion and contamination	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			to avoid soil and water contamination.	
	Air pollution	B-2	Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	B-1
	Noise pollution	B-2	Vehicles shall have exhaust mufflers (silencers) to minimize noise generation Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	B-1
	Health and Safety issues	B-2	Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic Project drivers shall be trained on defensive driving Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
Construction Works: Earthen Bund with Stone Pitching: 1. Hatachi Village = 3,104 m Long 2. Kharzan Village = 3,737 m Long	Soil erosion and contamination	B-2	Material borrowing and disposal plan should be prepared Cultivation fields should be avoided for borrowing material to the extent possible Written consent of the land owner should be obtained for material (soil) borrowing Photographic record (before, during, after) should be kept for the borrow and disposal areas. Leveling of borrow sites.	B-1
	Loss of natural vegetation	B-2	Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	B-1
	Damage to infrastructure	B-2	All damaged infrastructure shall be restored to original or better condition.	B-1
	Sites of Historical, Cultural, Archeological or Religious Significance	B-2	Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites.35 Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.	
	Noise pollution	B-2	Equipment with high levels shall be fitted with noise reduction devices Regular inspection, maintenance and lubrication of the construction	B-1

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			vehicle and equipment shall be performed Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured Avoid night time activity	
	Air pollution	B-2	Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	B-1
	Health and Safety issues	B-2	Demarcation tapes to be installed around the construction site to avoid any unauthorized entry Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant	B-1
C. Operation and Maintenance Phase				
Breaching of Flood Protection Bund	System sustainability	D-4	The Irrigation Department should monitor the system on a regular basis.	D-2

Activity / Issue	Potential Impact	Assessment of Risk	Mitigation Measures	Residual Impacts
			Capacity building of the communities should be carried out in the O&M activities. Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	
Risk due to Natural Hazard i.e. Flooding and Earthquakes	System sustainability	C-3	Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 13** of this report.	C-1

7. ENVIRONMENTAL MANAGEMENT PLAN

7.1 Environmental Management Plan (EMP)

7.1.1 General

247. 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.

248. 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.

249. 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, in this case BEPA, if any issue has been overlooked or if any need would arise as the project continues.

7.1.2 Structure of EMP

250. 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
    a. Role and Responsibilities of the Functionaries involved in EMP Implementation
    b. Reporting Mechanism
    c. Non-Compliance of the EMP
- ❑ Institutional Arrangements for Implementation of EMP during Operation Phase
    a. Role and Responsibilities of the Functionaries involved in EMP Implementation
    b. Reporting Mechanism
- Environmental Mitigation Plan
- Environmental Monitoring Plan
- Implementation of EMP
- ❑ NOC and other Approvals
- ❑ Stakeholder Coordination
- ❑ Trainings
- ❑ Communication & Documentation
- Environmental Management Cos
- Change Management

7.1.3 Regulatory Requirements

251. This EMP refers to the applicable National and International legal framework for the proposed project for the protection of the environment.

7.1.4 Purpose & Need of the EMP

252. 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. 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[29].

7.1.5 Objectives of the EMP

253. 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 EIA and recommend improvement if any need would arise.

7.1.6 Scope of the EMP

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

- Implementation and Construction Phase; and
- Operation Phase.

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

7.1.7 Institutional Arrangement for Implementation of EMP

256. 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 PMO of ADB's Kharzan Hitachi Irrigation Project. The final organizational structure, working and monitoring of Institutional setup would be proposed by the BID and would be finalized in consultation with ADB's Resident Mission in Pakistan.

[29] Guidelines for Preparation and Review of Environmental Reports, 1997

a) Institutional Arrangements for Implementation of EMP during Construction Phase

257. The Project Director (PMO, BWRDSP) will formulate an Environmental & Social Management and Monitoring Cell (ESMMC) which will comprise senior professionals, and should preferably have representative of various stakeholders.

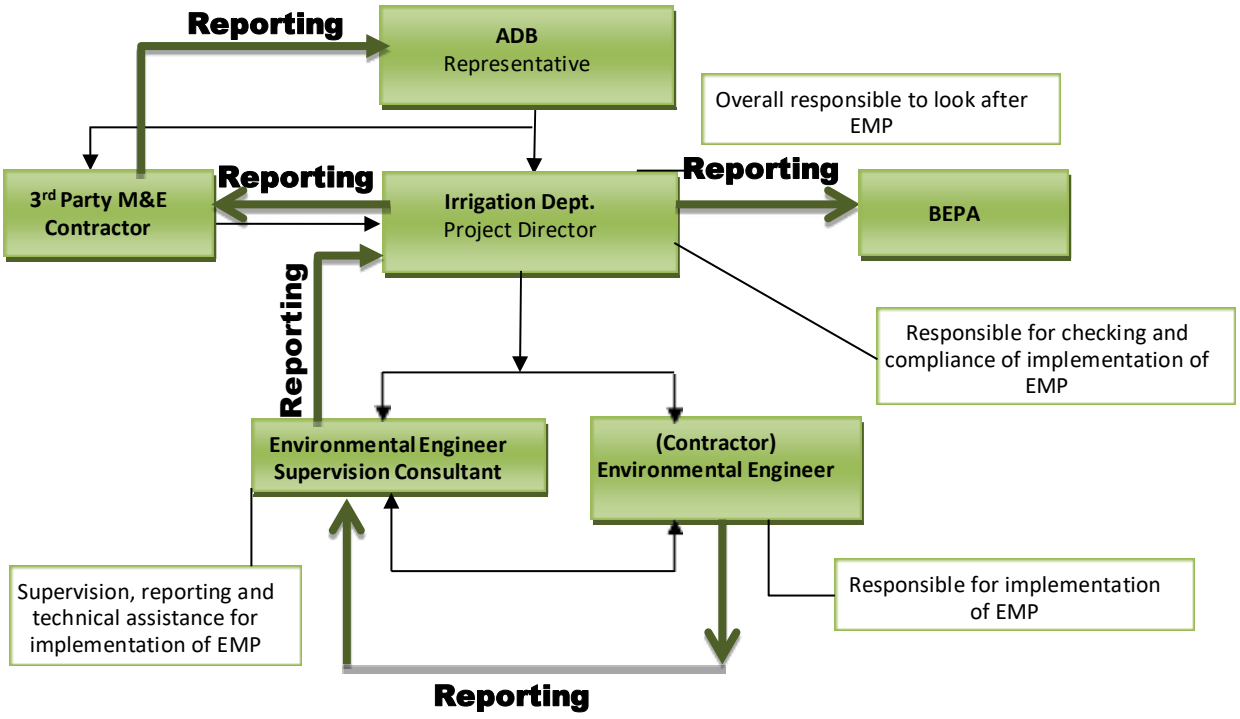
258. The key players involved during construction stage of the proposed project are the ESMMC, 3rd Party M&E Contractor, Balochistan Environmental Protection Department/ Agency, the Contractor and the Supervisory Consultants (SCs). The roles, remits and responsibilities of these organizations are outlined below.

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

- ESMMC Representative;
- 3rd Party M&E Contractor;
- SC's Environmental Specialist/Engineer; and
- Contractor's Environmental Engineer/Scientist.

260. 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 14: Organizational Setup for Implementation of EMP (Construction Phase)



❑ Roles and Responsibilities

a) BEPA

261. BEPA is the regulatory authority for issuance of NOC for this proposed project. 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) 3rd Party M&E Contractor (if required)[30]

262. 3rd Party M&E shall be responsible for:

- To make sure that all the contractual obligations related to the environmental and social compliance are met;
- To monitor the progress regarding implementation of environmental safeguard as provided in EMP;
- Oversee the Compliance of all the monitoring programs as given in EMP;
- Check randomly whether monitoring of the environmental aspects of the project during construction phase is being properly carried out;
- Document and disclose monitoring results and identify necessary corrective and preventive actions in the periodic monitoring reports, and make follow-up on these actions to ensure progress toward the desired outcomes;
- Make sure that the Contractor is implementing the additional measures suggested by the M&E Contractor; and
- Reporting the status of EMP compliance to BID and ADB

c) Project Director, PMO-BWRDSP:

263. Project Director through ESMMC will have responsibility for assuring implementation of EMP. This includes the following:

- Ensuring that the required environmental training is provided to the concerned staff;
- The Project Director will be responsible for carrying out random site visits to the construction sites to review the environmental performance of the Construction Contractors;
- Review monitoring reports for the progress of environment 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 approvals from the concerned departments.
- Maintaining interface with the other lined departments / stakeholders; and
- Reporting to the BEPA on status of EMP implementation.
- Reporting to ADB on status of EMP implementation.

d) Supervision Consultant: Resident Engineer

264. Resident Engineer’ s (RE) roles and responsibilities will be:

- 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;

[30] Normally on some of the ADB’s Projects 3rd Party M&E contractor performed the monitoring of EMP as well.

- 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.

e) Supervision Consultant: Environmental Inspector

265. SC's Environmental Inspector will perform following roles and responsibilities:

- Directly reporting to the RE;
- Ensure the implementation of the mitigation measures suggested in EMP;
- To supervise and monitor environmental activities being performed at site;
- To organize periodic environmental training programs and workshops for the consultant's and contractor's staff with the help of Environmental Specialist.
- Suggest any additional mitigation measures if required.

f) Construction Contractor: Environmental Supervisor/Inspector

266. Contractor will be bond to appoint a Site Environmental Supervisor/Inspector with relevant educational experience and background. Contractor's Environmental Engineer/Scientist will carry out following activities:

- Implementation of the mitigation measures at construction site;
- Contractor will be bond through contract to take actions against all the special and general provisions of the contract document;
- Contractor will make sure the compliance of EMP recommendations and will also be responsible for effective liaison with local heads of villages;
- Provision of proper Personal Protective Equipment (PPEs) to the workers and train them for their proper use;
- To conduct the environmental and health & safety trainings to the workers/labor; and
- Coordinate with RE / Environmental Specialist of SC.

❑ **Reporting Mechanism**

267. 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-PMO. A bi-annual report of environmental activities shall be submitted to ADB by BID.

268. 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.

❑ **Non-Compliance of the EMP**

269. The implementation of the proposed EMP involves inputs from various functionaries. Construction Contractor will be primarily responsible for ensuring implementation and reporting of the mitigation measures proposed in the EMP, which will be part of the contract documents. In addition, the Contractor will also need to prepare Site Specific Environmental Management Plan (SSEMP) and get it approved from SC / BID before start of any construction phase. The SSEMP will provide the risk rating for each construction activity and will provide mitigation measures to reduce activities with higher degree of risk. Various

plans, and layout maps (construction camp layout plan) will also form part of SSEMP. The provision of the environmental mitigation cost will be made in the total cost of project, for which Construction Contractor will be paid on the basis of monthly compliance reports. However, if the Construction Contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, deductions will be made from the payments to the Construction Contractor claimed under the heads of environmental components.

- **Institutional Arrangement for Implementation of EMP during Operation Phase**

270. The key players involved during operation phase of the proposed project are BID, BEPA, Water User Associations (WUA) and Farmer Organizations (FOs) or Jirga. The roles, remits and responsibilities of these organizations are outlined below. The following staff will be involved in the implementation of EMP. Organizational setup for implementation of EMP is also given below.

- WUA and FOs, or Jirga; and
- BID, Environmental Engineer/Scientist.

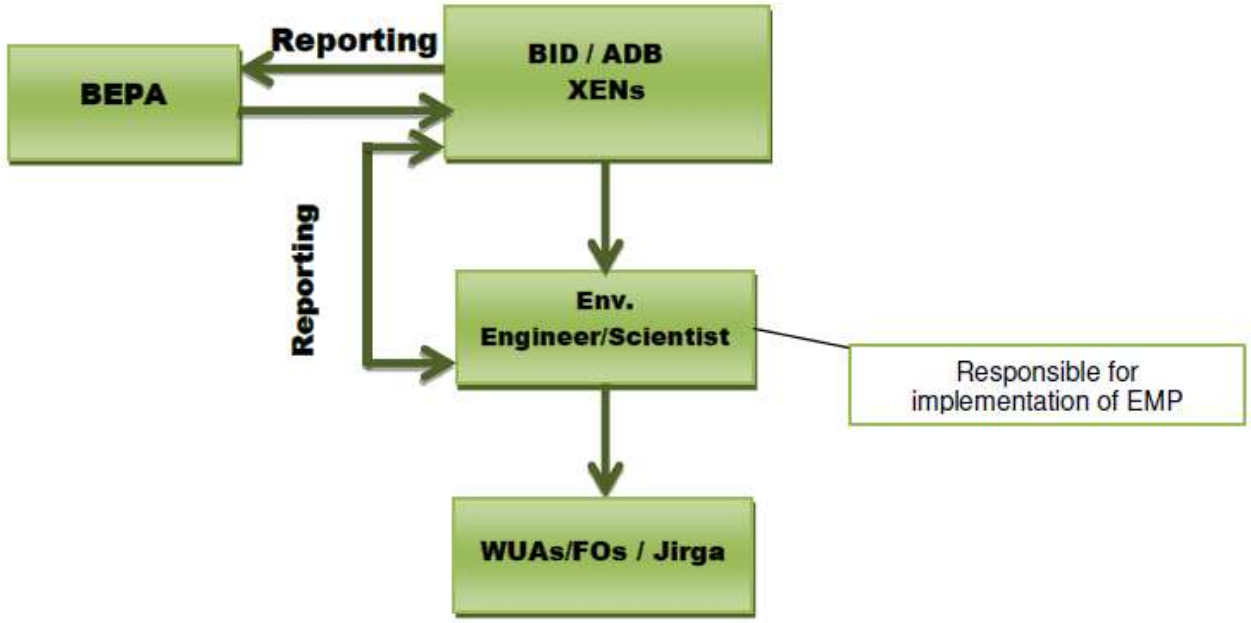


Figure 15: Organizational Setup for Implementation of EMP (Operation Phase)

- **Roles and Responsibilities**

a) Environmental Engineer/Scientist

271. Environmental Engineer/Scientist will have responsibility for assuring implementation of EMP. This includes the following:

- Coordinating and planning the overall activities, as per EMP;
- Environmental Engineer/Scientist will randomly check the operation of project and make sure system is in compliance with EMP;
- Make sure that the WUA & FOs are implementing the measures suggested in the EMP and to report in environmental monitoring reports; and
- Bi-annual reporting to BEPA on environmental compliance of the project during operation stage.

b) Water User Association (WUA) and Farmer Organizations (FOs), Chairman & Vice Chairman / Jirga

272. WUA and FOs will ensure the implementation of the mitigation measures at operation site and will report to BID.

7.1.8 Environmental Management Plan

273. 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 31. 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 31: Environmental Management and Monitoring Plan

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Activity	**Potential Impact**	**Mitigation Measures**	**Monitoring Indicators**	**Monitoring and Reporting Frequency**	**Party(ies) Responsible for Implementation & Monitoring**
Infiltration Gallery at Hatachi - Kharzan (construction of new infiltrations galleries at Kharzan and Hatachi , Rehabilitation lining of irrigation channels at Kharzan and Hatachi , Rehabilitation of existing hydraulic structures, construction of social structures and time division structures)					
A. Design & Planning Phase					
Assessment of water availability	• Failure of design	• Design works will ensure the assessment of water. • Hydrological and flood & drought management analysis shall ensure the feasibility of project success.	• Feasibility and Design report before project execution	• Once before start of construction works	• Design Engineer
Design works construction of infiltration gallery as per proper engineering standards	• In case of design failure system will be collapsed	• Review of engineering design works will ensure the proper design of the system	• Design Report	• Once before start of construction works	• Design Engineer
Traditional water rights considerations	• Social issues	• Acquire full information about traditional water rights and ensure that these are not disturbed	• Water Rights Consideration Included in the Design Report	• Once before start of construction works	• Design Engineer • Project Director
Public consultation and sharing of proposed design considerations	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		perceptions			
Risk due to Natural Hazard i.e. flooding and earthquakes	• The Project area lies in zone 2B as per seismic map of Pakistan which clearly shows that the area is in moderate risk zone. So due to earthquake the breaching infiltration gallery, canal and other irrigation structures can be possible. This impact would be of moderate significance. The other natural hazard which affect the area is flood which would also be of moderate significance.	• Design engineer should ensure that seismic design of weir and other allied and irrigation structures should be carried out on international engineering standards. By adopting the above measure, the impact would be of low significance. • Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance.	• Design Report	• Once before start of construction works	• Design Engineer
B. Implementation and Construction Phase					
Construction contractor mobilization and Establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Cultural conflicts • Influx of external work force	• Site for camp site shall be selected keeping in view the cultural norms of the area to avoid undue interference of the Construction contractor's staff with the local residents.	• Monthly rent receipts. • Development & implementation of policy on local employments • Employment record	• Strict compliance monitoring on fortnightly basis • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Land degradation due to solid waste disposal of camp site • Workshop facilities will spread oils & chemicals • Soil erosion	• Local residents shall be given priority in the employment opportunities generated during construction and operations phase • The land shall be rented for the camp site and equipment yard. No resettlement is envisaged for this purpose. • Residents of village shall be employed for the construction phase (mostly for unskilled jobs).			
	• Workshop facilities may spread oils & chemicals	• Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. • Efficient Use of Chemicals shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Mixing of waste into fresh water sources shall not be allowed.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment to meet National	• Monitoring shall be done on stack of machinery and	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		Environmental Quality Standards of Pakistan limits. • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		• Monitoring by Supervision Consultant PM
	• Noise Pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Avoid night time activity	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Ensure proper disposal of camp site waste at designated landfill/disposal sites. If the project area does not have any disposal site the construction contractor shall use any depression for waste dumping. Prior to dumping	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		the contractor should get the NOC from local authorities for disposal of solid waste. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste, the depression should be covered by scarified material. • Good housekeeping practices within the camp site shall be adopted to minimize waste generation. • Disposal of campsite waste near residential colonies or in agricultural fields shall not be allowed			
	• Water contamination	• Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be TSS, BOD, COD and Oil & Grease.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			• Waste management plan in place • Photographic record		
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Protective fencing to be installed around the Camp to avoid any accidents • Firefighting equipment shall be made available at the camps • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store hazardous substances, such as fuel • Contractor shall prepare and submit a Site-specific EMP (SSEMP), Site Specific Health & Safety Plan(SSHSP) and SOP to manage COVID-19 risks for approval by Supervision consultant t	• Use of personal protective equipment at campsite • Site Specific Health and Safety Management Plan (SSHSMP) in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		frictions are identified and resolved before they become inflamed. There are safety requirements for construction projects that include control of public access to the site along with regulations aimed at safeguarding workers. Suitable arrangements that conform to national health and safety requirements and also appropriate international best practice will need to be followed. There are specific procedures that need to be observed for the transport, storage and handling of explosives that will be required for the operation of quarries and also underground excavation. It will be necessary to liaise with local communities and initiate and support a public awareness program, particularly targeted at children, about the risks and dangers of large construction sites	• Dissemination material		

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Transportation of construction material	• Soil erosion and contamination	• Vehicular traffic on unpaved roads shall be avoided as far as possible. • Vehicles and equipment shall not be repaired in the field. If unavoidable, impervious sheathing shall be used to avoid soil and water contamination.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution	• Vehicular traffic on unpaved roads shall be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir shall be minimized. • Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation • Nighttime traffic shall be avoided near the communities. Local population shall be taken in confidence if such work is unavoidable.	• Log of vehicle movement time • Visual inspections of the vehicles • Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			• The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be kept low, to avoid safety hazard and dust emissions.	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared	• Evidence of plan in place. • Photographic record	ortnightly monitoring eports uarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Cultivation fields should be avoided for borrowing material to the extent possible • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before, during, after) should be kept for the borrow and disposal areas. • Leveling of borrow sites.			• Monitoring by Supervision Consultant
	• Loss of natural vegetation	• Compensatory tree plantation (five times the trees cut down for construction) should be carried out at appropriate locations within the project area	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Site overburden	• Wind direction shall be considered while selecting sites for stock piles. • Stockpiles of overburden shall be kept covered where possible. • Ensure proper disposal of construction waste at designated landfill/disposal sites. If the project area does not have any disposal	• Visual inspections • Monitoring Particulate Matter PM_{10}	• Daily monitoring reports • Fortnightly monitoring reports of PM_{10} • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		site the construction contractor shall use any depression for waste dumping. Prior to dumping the contractor should get the NOC from local authorities for disposal of solid waste. Proper disposal of waste material. Demarcate the waste site and provide details of land use. Finally take approval from supervision consultant. • An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. After the dumping of solid waste the depression should be covered by scarified material Dismantled asphalt pavement shall be dumped to the waste site.			
	• Borrow pit management	• As far as possible wasteland or natural areas with a high elevation will be demarcated for borrowing earth material.	• Monthly rent receipts.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Where the use of agriculture land is unavoidable, the top 300 mm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. • Where deep ditching is to be carried out, the top 1 m layer of ditching area will be stripped and stockpiled. The ditch will initially fill with scrap material from construction and then leveled with the stockpiled topsoil. • Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize the erosion and to avoid creating hazards for people and livestock. • Land owners will be compensated according to the terms of lease agreement negotiated with the land owners, and restoration action agreed upon by the contractor will be duly carried out.			• Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• Proponent shall ensure that the construction contractor staff is educated about the location and importance of the cultural sites that exist in the Project area. The contractor shall ensure that these sites are not affected by the construction related activities including movement of the project vehicles and obtaining borrow material for construction. These aspects will be included in the trainings to be conducted for the contractor's staff. • In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall ensure that the work is stopped at that site, the	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		provincial and federal archeological departments are notified immediately, and their advice is sought before resumption of the construction activities at such sites.[31] • Graveyards shall not be disturbed during the construction activities including movement of the project vehicles and obtaining borrow material for construction.			
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Avoid night time activity	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

[31] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-14**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Air pollution	• Proper engine tuning of machinery/ equipment to meet National Environmental Quality Standards of Pakistan limits. • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Blocked of access due to earth works and stockpiling of excavated material	• A bypass route should be constructed at the project site to divert the through traffic, thus avoiding the public traffic passing through the site.	• Traffic diversion plan	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. The contractor will prepare Site-specific EMP (SSEMP), Site Specific Health and Safety Management Plan (SSHSMP) and a Standard Operational Procedure (SOP) to manage COVID-19	• Use of personal protective equipment • Site Specific Health and Safety Management Plan (SSHSMP) in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		risks. These plans will be approved by Supervision consultant			
C. Operation and Maintenance Phase					
Conflicts caused by unavailability or improper distribution of water in the area	• Social issues	• Agreements between different communities/tribes • Perennial irrigation schemes may function smoothly in normal conditions and circumstances but do face problems during extraordinary situations, i.e. when flow is higher or lower than normal. From the outset water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows. • Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. This needs to be done on collaborative basis with irrigation and agriculture department where communication system among farmers, water user association and department is assured.	• Agreement between parties • Training records	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Farmers in downstream areas should be compensated in case they lose their water rights. • All villages deprived of Project's water rights should be compensated for drinking water supply schemes otherwise very soon all villages and settlements will be deserted as underground water may not be fit for drinking purpose for every village and it would probably not be within the financial or technical capacity of local population to initiate such schemes on their own.			
Use of water for drinking purposes	• Health issues	• Proper treatment system shall be provided • Water quality will be tested as per WHO/ GOP standards to ensure the integrity of the water supply system. • Turbidity and free residual chlorine tests shall be regularly performed. • Arsenic will be tested as per WHO standards.	• WHO/ GOP Drinking Water Standards	• Daily monitoring reports of turbidity and free residual chlorine test • Monthly analysis of water quality parameters • Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Periodic cleaning and maintenance of the system	• Solid waste generation	• Ensure proper disposal of waste at designated landfill/disposal sites.	• Visual inspection	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Increase of agricultural lands	• Loss of pastoral lands	• Stall feeding practices for livestock, so that remaining pastoral lands are available for wild animals	• Monitoring records	• Monthly monitoring and quarterly reporting	• Agriculture Department • Forestry Department • Wildlife Department
Community Participation for management and operation of the irrigation system	• Social issues • System sustainability	• Ensure community participation in management and operation of the irrigation system • Training of community	• Training records • Community participation records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Water User Association
Disruption to wildlife	• Conservation issues	• Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. • It will be the responsibility of BIPD to ensure the proper maintenance of aforementioned structures. By adopting the aforementioned measures, the impact would be finally	• Monitoring and maintenance records	• Monthly monitoring and quarterly reporting	• Irrigation Department • Wildlife Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		of low significance.			
Use of fertilizers & pesticides	• Banned fertilizer & pesticides will cause health issues • Contamination of fresh water through surface runoff	• Concerted efforts by the department of agriculture to disseminate information regarding sustainable use of fertilizers will help in keeping the use at an optimal level; • Ammonium Nitrate (AN) and Calcium Ammonium Nitrate (CAN) fertilizers will not be allowed; and • Use of restricted pesticides identified by WHO shall not be allowed. The list of restricted pesticides is attached as **Annexure 15** of this report	• Visual inspection • Monitoring records • Market survey for availability of AN and CAN fertilizers	• Monthly monitoring and quarterly reporting	• Agriculture department
Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	• Emergency Response Plan for Breaching of Infiltration Gallery will be followed which is attached as **Annexure – 12** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
Mula River Intervention: Flood Protection Bund					
A. Design & Planning Phase					
Design works construction of flood protection bund as per proper engineering standards	• In case of design failure system will be collapsed	• Review of engineering design works will ensure the proper design of the system. The system should be designed on proper engineering standards.	• Design Report	• Once before start of construction works	• Design Engineer
Public disclosure of final design	• Social issues	• Continual two-way communication with relevant stakeholders to understand causes of previous failures, community needs, and establish rationale perceptions	• Minutes of Meetings with Stakeholders	• Once before start of design works • Once before start of construction works	• Design Engineer • Project Director
B. Implementation & Construction Phase					
Construction contractor mobilization and establishment of campsite and machinery/ equipment Yard	• Changes in land use pattern • Cultural conflicts • Influx of external work force • Land degradation due to solid waste disposal of camp site • Workshop facilities will spread oils & chemicals • Soil erosion	• In order to avoid spread of oil by virtue of establishment of fuel depot / Workshop facilities, the contractor should avoid it altogether. Incase, it cannot be avoided, the contractor must house it and underlay the area with proper liner. • Dispensing pumps should be used. • Spent Oil shall be properly collected in impermeable	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		containers. Spent oil shall be disposed in accordance with MSDS shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Residents of village shall be employed for the construction phase (mostly for unskilled jobs).			
	• Workshop facilities may spread oils & chemicals	• Proper disposal of used oil and chemical waste in accordance with MSDS shall be ensured. • Efficient Use of Chemicals shall be ensured. • Good housekeeping practices shall be ensured at workshop areas. • Mixing of waste into fresh water sources shall not be allowed.	• Visual inspection	• Daily monitoring report • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Deterioration of air quality due to machinery & equipment	• Proper engine tuning of machinery/ equipment every month shall be carried out to comply with National Environmental Quality Standards of Pakistan.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant PM

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			Smoke, H2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.		
	• Noise Pollution	• Equipment with high levels shall be fitted with noise reduction devices • Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured • Activity having high noise potential shall be postponed to day time i.e. in between 0800hrs to 1700hrs	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Land degradation due to solid waste disposal of camp site	• Construction contractor shall not dispose of any solid waste in the area. The construction Contractor may dump solid waste with proper lining material in depressions and have a daily and monthly cover on	• Visual inspection	• Weekly monitoring reports • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		it. Contractor shall collect in separate bins and segregate solid waste according to its type. An impervious liner shall be laid to waste sites before the dumping of solid waste. The impervious liner shall be approved by the supervision consultant. The Contractor shall transport and dispose solid waste at existing municipal dump site at the outskirts of Khuzdar after acquiring approval / NOC from Town Municipal Authority at Khuzdar every month. The contractor shall submit the NOC to the office of BIPD every month.			
	• Water contamination	• Waste management plan to be prepared for appropriate disposal of sewage – such as septic tank and soaking pits	• Monitoring compliance to NEQS of sanitary wastewater generated from campsite. The monitoring parameters will be	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
			TSS, BOD, COD and Oil & Grease. • Waste management plan in place • Photographic record		
	• Loss of vegetation	• The construction crew shall be provided with LPG as cooking (and heating, if required) fuel. Use of fuel wood shall not be allowed.	• Use of LPG cylinders at campsite	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Protective fencing to be installed around the Camp and its latrines to avoid any accidents. Open defecation shall not be allowed. • Firefighting equipment shall be made available at the camps. Sand being excessively available shall also be used and stored in buckets along with other necessary fire fighting equipment. • The camp staff shall be provided firefighting training. • All safety precautions shall be taken to transport, handle and store	• Use of personal protective equipment at campsite • Site Specific Health and Safety Management Plan (SSHSMP) in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		hazardous substances, such as fuel the contractor will prepare Site-specific EMP (SSEMP), Site Specific Health and Safety Management Plan (SSHSMP) and a Standard Operational Procedure (SOP) to manage COVID-19 risks. These plans will be approved by Supervision consultant			
Transportation of construction material	• Soil erosion and contamination	• Only Ratodero-Gawadar (M-8) paved highway shall be used for transportation of construction material. • Vehicles and equipment shall not be repaired in the field.	• Log of vehicle and equipment repairs	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions	• Route maps of vehicle movement • Log of vehicle maintenance • Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H2S, SOx, CO, VOCs and NOx.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Noise pollution	• Vehicles shall have exhaust mufflers (silencers) to minimize noise generation. • Construction material shall be transported during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• Log of vehicle movement time • Visual inspections of the vehicles • Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009) • The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Health and Safety issues	• Road signage shall be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. • Project drivers shall be trained on defensive driving • Vehicle speeds near / within the communities shall be limited to 10-15 km/hr. to avoid damage to infrastructure.	• Visual inspections • Training record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Photographic records • Infrastructure restoration records	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
Construction Works: Earthen Bund with Stone Pitching: 1. Hatachi Village = 3,104 m Long 2. Kharzan Village = 3,737 m Long	• Soil erosion and contamination	• Material borrowing and disposal plan should be prepared by contractor and submitted to Supervising Consultant / BIPD for approval. • Lands used for agricultural purposed shall not be used borrowing material. • Written consent of the land owner should be obtained for material (soil) borrowing • Photographic record (before and after) should be kept for the borrow and disposal areas. • Leveling of borrow sites shall be done by contractor on his own expense.	• Evidence of plan in place. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Loss of natural vegetation	• Compensatory tree plantation (ten times the trees cut down for construction) should be carried out at appropriate locations within the project area.	• Evidence of plantation. • Photographic record	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Damage to infrastructure	• All damaged infrastructure shall be restored to original or better condition.	• Visual inspections • Monitoring Particulate Matter PM_{10}	• Daily monitoring reports • Fortnightly monitoring reports of PM_{10} • Quarterly Reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Sites of Historical, Cultural, Archeological or Religious Significance	• In case of chance find of any sites or artifacts of historical, cultural, archeological or religious significance, contractor shall immediately stop work and notify the provincial and federal archeological departments along with Supervising Consultant and BIPD. [41] • The appropriate line of action shall be sought from the concerned department before resumption of the construction activities at such sites. [1]	• Evidence of training provided to contractor staff. • Evidence of maps in place with these sites shown. • Record of appropriate action taken in case of chance find. • Photographic record of chance find	• Immediately after chance find, to be reported in next quarter.	• Execution by construction contractor • Monitoring by Supervision Consultant
	• Noise pollution	• Equipment with high levels shall be fitted with noise reduction devices.	• Monitoring compliance to NEQS for noise (SRO 72 (KE) / 2009)	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor

[41] Project routing does not envisage any archeological site, however in case of any chance find the ***"Chance Find Procedures"*** should be adopted, as given in **Annexure-14.**

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
		• Regular inspection, maintenance and lubrication of the construction vehicle and equipment shall be performed • Use of PPEs such as ear plugs and ear muffs by the workers shall be ensured. • Construction work shall be carried out during 0800hrs to 1700hrs to avoid night time disturbance. If unavoidable, the Supervising Consultant in consultation with BIPD and Contractor shall resolve this issue and shall ensure that such incidents do not become a regular feature.	• The sampling shall be done twice on monthly basis at 7m from the source. The duration of sampling shall be 24 hours @ 15 seconds interval over 15 minutes every hour (averaged)		• Monitoring by Supervision Consultant
	• Air pollution	• Vehicles shall be kept in good working condition and properly tuned, in order to minimize the exhaust emissions • Water should be sprinkled where needed and appropriate, particularly at work sites near the communities to suppress dispersion of dust.	• Monitoring shall be done on stack of machinery and equipment. The parameters required to be monitored are Smoke, H_2S, SOx, CO, VOCs and NOx. • Evidence of measurement records.	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant

Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring and Reporting Frequency	Party(ies) Responsible for Implementation & Monitoring
	• Health and Safety issues	• Demarcation tapes to be installed around the construction site to avoid any unauthorized entry • Personal protective equipment should be made available at site and the usage of the PPEs should be ensured. the contractor will prepare Site-specific EMP (SSEMP), Site Specific Health and Safety Management Plan (SSHSMP) and a Standard Operational Procedure (SOP) to manage COVID-19 risks. These plans will be approved by Supervision consultant	• Use of personal protective equipment • Site Specific Health and Safety Management Plan (SSHSMP) in place	• Fortnightly monitoring reports • Quarterly reporting	• Execution by construction contractor • Monitoring by Supervision Consultant
C. Operation & Maintenance Phase					
Breaching of flood protection bund	• System sustainability	• The Irrigation Department should monitor the system on a regular basis. • Capacity building of the communities should be carried out in the O&M activities. • Liaison with the communities to be maintained to identify potential weaknesses in the system that could cause breaches.	• Monitoring reports	• Quarterly reporting	• Environmental Specialist to develop reports • PD to review and take management actions, where needed

Risk due to Natural Hazard i.e. Flooding and Earthquakes	• System sustainability	Emergency Response Plan for Flood Protection Bund will be followed which is attached as **Annexure – 13** of this report.	• Training record of emergency response plan	• Monthly monitoring and quarterly reporting	• Irrigation Department

7.1.9 Planning for Implementation of EMP

274. NOC and Other Approvals

- ***BEPA Approval Process***

275. The BID has obtained No Objection Certificate (NOC) from the EPA Balochistan that was mandatory requirement before project commencement.

- ***Stakeholder Coordination***

276. Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

277. Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information to the affected male population through Friday prayers. Local business community, specially the affected one, should also be brought into the process of awareness and participation.

278. The related institutional arrangements should also be in place for continuous consultation throughout the process of planning and implementation. During construction, BID will have to implement both EMP. For EMP, an exclusive Environmental & Social Management and Monitoring Cell (ESMMC) will be established. Project Information Centre will be also established for liaison with key stakeholders through continuous process of information disclosure, consultation and participation.

7.2 Training

279. In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational stage of the project.

280. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational stage of the project.

281. The training consultant will organize training courses for Proponent and Contractor staff to train them in specialized areas such as air and noise pollution monitoring and water quality monitoring etc. The details of this training program are presented in **Table 32**.

Table 32: Personnel Training Program

Training Provided by	Contents	Trainees	Duration
supervision / training consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations, daily monitoring and supervision	• Irrigation Staff • Contractor • project staff • Project Implementation Staff	1 day
Training consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	• Project staff dealing • in Social/lands • matters	1 day
Training consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	• Contractor's staff	2 days

7.3 Communication & Documentation

282. Communication and documentation is an essential feature of EMP. The key features of such mechanism are:

- ***Data Recording and Maintenance***

283. All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form.

- ***Database***

284. The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliance;
- Corrective actions
- List of environmental data and
- List of environmental data to be maintained:
- Soil and land pollution
- Disposal of excavated silt and earth
- Disposal of waste
- Water resource
- Fuel oil and chemical spills
- Vegetation record
- Noise pollution
- Air and dust pollution
- Socio-economic data

- ***Meetings***

285. The following environmental meetings during the project will take place. Primary meeting for setting out the requisite end frame sounding for the regular meetings. Scheduled meetings between Contractor and Supervising Consultants.

286. The purpose of the meeting will be to discuss the conduct of the operation, non – compliances noted by the consultant's environmental team and measures for their remedy. The meeting will be recorded in the form of a daily/monthly environmental report.

- ***Social Complaint Register***

287. The Supervising Consultant (SC) and ESMMC will maintain a register of complaints record from local communities and measures taken to mitigate these concerns.

- ***Photographic Records***

288. Contractors, SC and ESMMC will maintain photographic records during the implementation of the project. As a minimum, the photographic records will include the site photographs, all the roads, camp sites and monitoring activities etc.

7.4 Grievance Redressal Mechanism

289. The Grievance Redress Mechanism (GRM), outlines the policy and procedure for documenting, addressing, responding and employing methods to resolve project grievances (and complaints) that may be raised by displaced persons (DPs) or community members arising from environmental and social performance, the engagement process, land acquisition and resettlement and/or unanticipated environmental or social impacts resulting from project activities that are performed and/or undertaken by PMO/PIO. The document describes the scope and procedural steps and specifies roles and responsibilities of the parties involved. The purpose of the GRM is to receive, review and resolve grievances from DPs and ensure smooth and fair implementation of subproject activities.

- ***Principles***

290. A GRM is proposed to address any complaints or grievances arising during the implementation period of the projects undertaken by the PMO/PIO. Members of the public may perceive risks to themselves or their property or their legal rights or have concerns about the possible adverse environmental and social impact that a project may have. Any concerns or grievances should be addressed quickly and transparently, and without retribution to the DP or complainant.

291. The primary principle is that any complaints or grievances are resolved as quickly as possible in a fair and transparent manner.

292. All minor complaints regarding land or property disputes that can be resolved should be resolved immediately on the site at the village level Displaced Person Committees (DPCs)/ Farmer Organizations (FOs). In case the concerned parties are unable to resolve the said dispute on the site, the DP may make a complaint to the Grievance Redress Committee (GRC) at the subproject level/district/basin level (PMO/PIO), the details of which are provided herein below. The focus of the GRM is to resolve issues in a customarily appropriate fashion and record details of the complaint, the complainant and the resolution.

- ***Objectives***

293. The objectives of the GRM are to:

- develop an organizational framework to address and resolve the grievances of individual(s) or community(s), fairly and equitably;
- provide enhanced level of satisfaction to the aggrieved;
- provide easy accessibility to the aggrieved/affected individual or community for immediate grievance redress;
- ensure that the targeted communities and individuals are treated fairly at all times;
- identify systemic flaws in the operational functions of the project and suggest corrective measures; and
- Ensure that the operation of the project is in line with its conception and transparently to achieve the goals for sustainability of the project.

- ***Structure of Grievance Redress Mechanism***

294. The project shall have multi-tier GRM with designated staff responsibilities at each level. These levels comprise the following:

1. Displaced Person Committees (DPCs)

295. For effective coordination in the field with DPs and community, DPCs will be established at the village level to maintain a close rapport with affected persons and local community throughout project implementation. The DPC will act as coordinator among the PMO/PIO, the DPs and local community for coordination and information dissemination to keep them informed about day to day development on the project, particularly about the grievance resolution progress. The Senior Sociologist (PMO/PIO), Social/Community Organizer & Environment Specialist of supervision consultant (Design team) will coordinate with the affected persons for constitution of DPC at the village level comprising of at least five members with one as committee convener. The DPC at village level will provide a platform for DPs to raise and discuss their concerns, resolve petty issues at the village level with PMO/PIO assistance, and coordinate with project executors to communicate the issues and concerns regarding social & environmental issues unresolved at DPC. The project safeguards and engineering staff will coordinate with DPs and village level committees to review and resolve the issue or concern related to LAR planning or implementation & environmental concerns preferably within 15 days from receipt of the grievance. DPC will comprise of the following members;

- Social/Community Organizer of SC (male/female);
- Female member; and
- Two male members
- Environment Specialist of SC (Design Team)

2. District/ Project Management Office (PMO)/ Project Implementation Office (PIO)/Basin Level

296. Baluchistan Irrigation Department (BID) shall constitute a Grievance Redress Committee (GRC) headed by Deputy Project Director (DPD) at District/PMO/PIO level for each river basin i.e Zhob & Mula to resolve all grievances and complaints of the DPs and the complainants. The GRC shall comprise of the following members:

- Deputy Project Director (DPD)/EXEN, PMO/PIO as head/convener of GRC;
- Senior Sociologist-Female, PMO/PIO; act as secretary of GRC
- Land Acquisition Collector (LAC) as Member;
- Resettlement Specialist;
- Environment Specialist of SC (PMO Support)and
- Any notable personality from the area to be nominated in writing by the relevant District Administration in consultation with the community.

297. Note: Representative from any other Department may be called as and when required by the GRC. Environmental Specialist of SC will join GRC meeting related to Environmental issues only.

298. The GRC will meet once a month and when the need arises. The GRC will review grievances involving all LAR planning and implementation, environmental issues (water, Air, Noise pollution etc) and social issues including, compensation, relocation, and other assistance as well as social issues that may arise due to restricted access to the resources and amenities.

299. GRC will perform following functions:

- Record grievances, categorize and prioritize the grievances that need to be resolved by the committee and solve them within a month;
- Summon and hear aggrieved persons/parties to produce evidence of their claims and record their view point;
- Communicate its decisions and recommendations on all resolved disputes to project executors and the aggrieved persons for implementation;
- Forward the unresolved cases to GRC-BID/project level within an appropriate time frame with reasons recorded and its recommendations;
- Develop an information dissemination system and acknowledge the aggrieved parties about the development regarding their grievance and decision of GRC-BID/project level;
- Maintain a complaint register accessible to the stakeholders with brief information about complaints and GRC decision with status report; and,
- Maintain complete record of all complaints received by the GRC with actions taken.

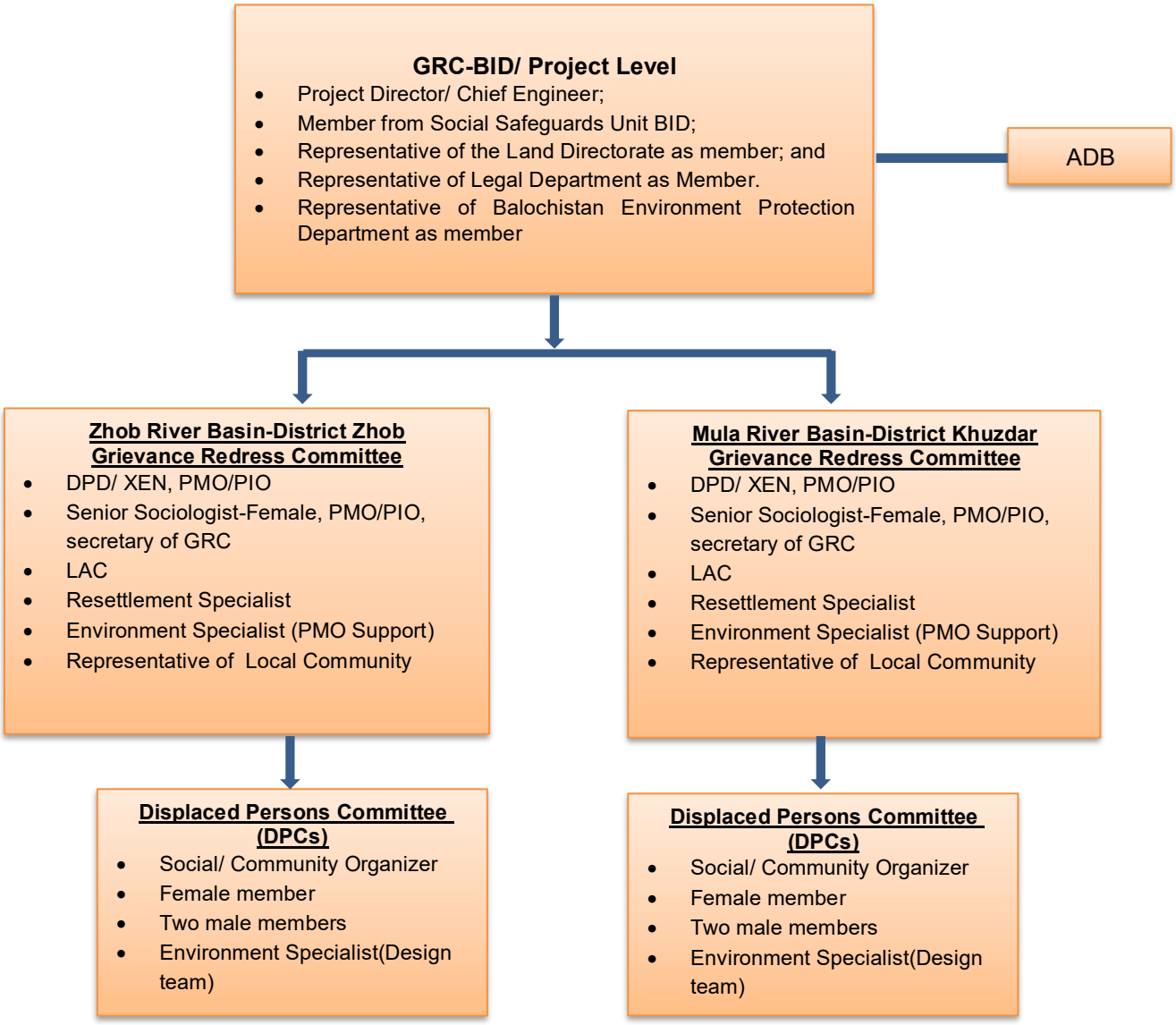
3. BID/ Project Level

300. BID shall constitute a Grievance Redress Committee (GRC) at BID/ project level. The committee will have following composition:

- Project Director/ Chief Engineer, as head/ convener of GRC;
- Member from Social Safeguards (female) Unit BID;
- Representative of the Land Directorate as member; and
- Representative of the Legal Department as member.
- Representative of the Balochistan Environment Protection Department as member.

301. This GRC-BID/project level, through authorized representative, will acknowledge the complainant about his complaint, scrutinize the record of the GRC-PMO/PIO/basin, investigate the remedies available and request the complainant to produce any record in favour of his claim. After thorough review and scrutiny of the available record on complaint, visit the field and collect additional information, if required. Once the investigations are completed, the GRC-BID/project level shall give decision within 30 days of receipt of the complaint. If the complainant is still dissatisfied with the decision, he can go to the court of law, if he/she wishes so.

Figure-16: Organogram for GRM



302. Gender representation will be ensured by inducting a female member in both GRCs. The mechanism will ensure the access of DPs to a GRM that openly and transparently deals with the grievances and makes decision in consultation with all concerned that are consistent with SPS-2009 and country safeguard system.

- ***Grievance Redress Proceedure***

303. The intention of GRM is to resolve a complaint as quickly and at as low a level as possible to avoid a minor issue becoming a significant grievance. Irrespective of the stage of the process, a complainant has the option to pursue the grievance through the court as is his or her legal right in accordance with law. The details of the process are given below:

304. The GRC will work both at the project and field level. The PMO/PIO safeguards and engineering staff, in coordination with district-level BID staff will inform the DPs about the GRC and its mechanism through consultations, focus group discussion and by posting at prominent places. The complaints received through any media will be screened by type and category and registered in a community complaints register (CCR), where the name &

address of complainant, date, description of complaint and action taken will be recorded. The GRC will acknowledge the complaints within 5 days of receipt and will review available records. If required, GRC will advise the safeguards/engineering staff to conduct field visits in consultation with the aggrieved person, local community and the land revenue staff and submit a fact finding report. Preferably the fact finding will be completed within 15 days from receipt of complaints. The GRC in its formal meeting to be conducted within 30 days from receipt of complaint, will hear and clarify with the complainant (if required so) about the issue and shall conclude and communicate its recommendations for further implementation. Complainant will be kept informed during the process and the GRC decision will be communicated to him in a language and form understandable to him. The GRC proceedings will be documented step by step and all records will be maintained and summarized in the project progress and internal monitoring reports.

305. Nonetheless, the complainant will be at liberty to access the formal legal course if he is dissatisfied with the GRC findings and recommendations. If GRC fails to conclude its recommendations either due to some technical or legal constraint, the GRC will immediately report the issue to BID/project level GRC and will request guidance and support it deems necessary. BID/project level GRC will ensure to resolve the grievance in 30 days. In case of any delay, the complainants will be informed on the progress and process about their grievances.

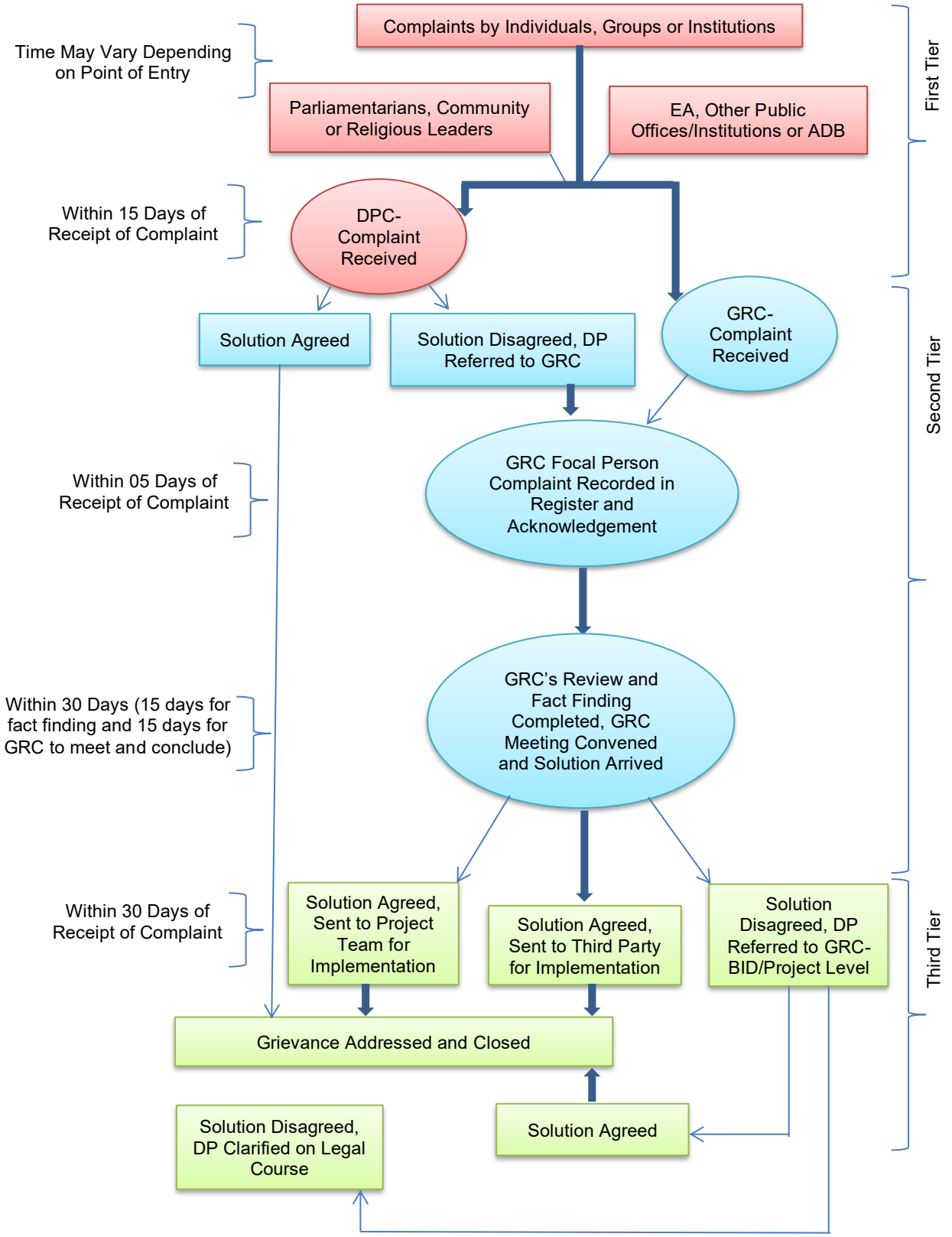
306. Disputes on land title, land compensation awarded and payable under law and apportionment of compensation will be dealt under the grievance redress mechanism provided in the LAA-1894. Environmental issues will be dealt according to Balochistan environmental protection act 2012 and ADB SPS 2009 guidelines. Any complaint received will be registered in the GRM and the DPs will be clarified on the process and supported to access the legal course. All other issues will be resolved through the project-based GRM. Community complaints and grievances will be addressed through two different processes as described in the following Table-33.

Table-33: Grievance Redressal Process

Land/Crop Compensation Issues	Project/ Other Issues (Including Environmental)
a. First, complaint resolution will be attempted at site (village level) through the involvement of the PMO/DPC/ FO. **b.** If unsettled, grievance can then be lodged to the GRC or DOR/LAC to proceed under law and communicate decision in least possible time. **c.** GRC will acknowledge the complaint within 5 days of complaint and after initial review and consultation with the LAC, within 15 days of receipt of complaint, the GRC will clarify the legal course of action and guide aggrieved persons to approach appropriate legal forum. PMO will coordinate with the land administration authorities including District Collector and LAC	**a.** First, complaints resolution will be attempted at site (village level) through the involvement of the PMO/DPC/FO. **b.** If unresolved, a grievance will be lodged to the GRC, which will acknowledge receipt of the complaint within 5 days. **c.** The GRC will conduct fact finding in 15 days of receipt of complaint and after review of fact findings reports and hearing the DPs in person will conclude its recommendations in 30 days of receipt of complaint. In case GRC could not decide in stipulated time, the reasons if any will be recorded and the grievance will be resolved in

to request early resolution of the issue/complaint. **d.** In case the grievance pertains to awarded compensation, PMO will clarify with the DPs the process as set out in Section 18 to 22 of the LAA.	next 30 days. **d.** If the complainant is not satisfied, he can pursue further by submitting to the appropriate court of law.

Figure-17: Grievance Process and Time Frame



7.5 Environmental Management Cost

307. The budget presented in **Table 34 and 35** will include estimates for the cost of mitigation measures, staff employed for implementation of the EMP, tree plantation, and technical assistance.

Table 34: Cost for Contractor

Sr. #	Description	Unit Cost* PKR / Month
1	Laboratory Analysis Cost	100,000
2	Contractor Environmental Engineer (each contractor)	80,000
3	Health & safety measures to manage COVID-19	800,000 for whole project period

* based on unit parameter testing and sampling cost for air, water and noise.

Table 35: Cost for Proponent

Sr. #	Description	Amount (PKR)*
A	**During Construction Period**	
1	Third Party Monitoring through EPA registered Environmental lab	500,000/Quarter
2	Training on EMP	100,000
B	**During Operation & Maintenance Period (for one year)**	
1	Laboratory Analysis Cost	61,000/Six Months
5	Training & Community Engagement Cost	200,000

* based on unit parameter testing and sampling cost for air, water and noise.

7.6 Change Management

308. The EIA and the EMP have been updated at the dDetail Design Stage of the project. However, these are dynamic documents. During the construction phase of the project, monitoring will need to be accompanied by a rapid feedback decision taking system that allows any corrective action to be taken if things are not as predicted. The whole environmental management system is a dynamic process that has to be responsive and also anticipate conditions.

309. Specific actions that will need to be made include the following:

- Once a Main Contractor has been appointed then a meeting will need to be held between the proponent of the project, the Supervisory Consultants and the contractor to clearly define the environmental management responsibilities of each party. The detailed nature of the EMP will need to be discussed and agreed, including a matrix of items and responsibilities related to the timing of the construction works and the contracts;
- Based upon the discussions during the meeting, a Change Report will be collectively produced which will include any recommended modifications needed to the EMP;
- The Change Report will be submitted to the relevant department for final approval and form part of the EMP; and
- All relevant project personnel will be given information of the required changes to the EMP.

8. CONCLUSIONS AND RECOMMENDATIONS

310. This section presents the major conclusions and key recommendations of the IEE study.

8.1 Findings and Recommendations

311. 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.

312. 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.

313. No land acquisition and involuntary settlement are involved. No indigenous persons reside or will be affected by the proposed interventions in the areas of influence.

314. 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.

315. 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.

316. During the execution of this study, consultations with relevant government officials, academia, NGOs and local community have been conducted to gain their perceptions of the project and ascertain the nature and scope of local participation in project planning and implementation.

317. Water rights are equally distributed among the agriculturists according to the land holdings. The FOs in the subproject areas have not been active and need to be strengthened. The Agriculture Extension Department in Balochistan can play a vital role in enhancing the cropping intensity of the proposed subproject area with timely knowledge of best agricultural practices.

318. Construction of subproject is going to bring positive changes in the area in terms of availability of water, cultivation of crops, establishment of new settlements and improvement in the standard of life of the inhabitants of the area.

319. Land which is lying barren at present would change to lush green valley through provision of irrigation water.

320. Availability of irrigation and agriculture would support livestock growth and in due course of time would enable farmers to diversify in areas of diary production.

321. The project will generate employment opportunities for local laborers during all three phases of project. The Project will positively contribute in improving the carrying capacity of biological environment and overall improvement of the ecosystem.

322. Household income will increase substantially with irrigation improvement measures owing to availability of water for irrigation, crop yields, increase in the number of animals, and availability of other occupational opportunities.

323. 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.

324. 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.

325. Water rights are equally distributed among the agriculturists according to the land holdings. The FOs in the subproject areas have not been actively and need to be strengthened. The Agriculture Extension Department in Balochistan can play a vital role in enhancing the cropping intensity of the proposed subproject area with timely knowledge of best agricultural practices.

8.2 Conclusions

326. Environmental criteria adopted for this study is comprised of three phases, these are as follows:

- Impacts during Planning and Design Phase;
- Impacts during Implementation and Construction Phase; and
- Impacts during Operation and Maintenance Phase.

327. Following is the conclusion statement of the study on the basis of environmental assessment carried out in this report:

328. "Some activities under this project have been identified to cause low to moderate environmental negative impacts and their mitigation measures have been prescribed. Proper and timely execution of these measures will reverse most the negative impacts in the long term however there will be some residual impacts of the project. Overall the project causes moderate to high positive impacts on the physical and socio-economic environments and should therefore be approved for implementation.