



**PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY
GOVERNMENT OF PAKISTAN**

**SHATUNG NULLAH DIVERSION PROJECT, SKARDU
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT
(DRAFT)**



February, 2024



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Annex II: National Environmental Quality Standards (NEQS)

Annex III: WHO Standards

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Annex V: Environmental Monitoring & Testing Results

Annex VI. Comments of Stakeholders about Shatung Nullah Project

LIST OF ABBREVIATIONS

ADB	Public Sector Development Program
ADC	Aluminum Conductor Steel Reinforced
AKRSP	Agha Khan Rural Support Program
AP	Affected Person
Aol	Area of Influence
BAP	Biodiversity Action Plan
BID	Basic Information Document
BHU	Basic Health Unit
BoQ	Bill of Quantity
BP	Bank Policy
CC	Construction Contractor
CCA	Cultivable Command Area
CCR	Community Complaint Register
CFP	Chance Finds Procedure
CESAP	Construction Environmental & Social Action Plan
CH	Civil Hospital
CITES	Convention on International Trade in Endangered Species
CO	Carbon Mono Oxide
CO ₂	Carbon Dioxide
CP	Communication Plan
CSC	Construction supervision Consultant
CRE	Chief Resident Engineer
C&W	Communication and Works
DHQ	District Head Quarter
DNP	Deosai National Park
EA	Environmental Assessment
EMP	Environmental Management Plan
ECA	Employment of Child Act
EE	Environmental Engineer
EHSS	Environment Health Safety and Social
EIA	Environmental Impact Assessment
EMONC	Emergency Obstetrics and Newborn Care
EPA	National Environmental Quality Standards
EPC	Engineer Procure Construct

EPP	Emergency Preparedness Plan
EQS	Environmental Quality Standards
ES	Environmental Standards
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMMP	Environmental and Social Management and Monitoring Plan
FGD	Focus Group Discussion
GB	Gilgit Baltistan
GBV	Gender Based Violence
GIS	Geographic Information System
GLOF	Glacial Lake Outburst Flood
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GoP	Government of Pakistan
HDI	Human Development Index
HIV	Human immunodeficiency viruses
HSE	Health Safety and Environment
IA	Impact Assessment
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labor Organization
IR	Involuntary Resettlement
ISRIP	International Sedimentation Research Institute Pakistan
ITS	Indus Tsangpo Suture
IUCN	International Union for Conservation of Nature
JHA	Job Hazard Analysis
LAA	Land Acquisition Act
LAC	Land Acquisition Commissioner
LARS	Land Acquisition and Resettlement Survey
LARP	Land Acquisition and Resettlement Plan
LBC	Left Bank Canal
LFS	Life and Fire Safety
LHW	Lady Health Worker
LHS	Lady Health Supervisor
MCH	Mother and child Health

MKT	Main Karakorum Thrust
MMM	Mitigation Management Matrix
MMT	Main Mantle Thrust
MNCH	Maternal, Neonatal and Child Health
MSDS	Material Safety Data Sheet
MTP	Material Transportation Plan
NCCP	National Climate Change Policy
NCS	National Conservation Strategy
NEP	National Environmental Policy
NFP	National Forest Policy
NGO	Non-Governmental Organization
NHA	National Highway Authority
NO ₂	Nitrogen Dioxide
NTFPs	Non-Timber Forest Products
NWP	National Water Policy
OHSAS	Occupational Health and Safety Assessment Specification
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration
OP	Operational Policy
PD	Project Director
PIs	Performance Indicators
PM	Particulate Matter
PMD	Pakistan Meteorological Department
PMU	Project Management Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RBC	Right Bund Canal
RE	Resident Engineer
RHC	Rural Health Center
RoW	Right of Way
RUP	Resource Utilization Plan
SBC	Seismic Building Code
SEA	Sexual Exploitation and Abuse
SMP	Security Management Plan
SWMP	Solid Waste Management Plan

SWHP	Surface Water Hydrology Project
TMP	Traffic Management Plan
ToR	Terms of Reference
UN	United Nations
VTTC	Vocational Technical Training College
WAPDA	Water and Power Development Authority
WAP	Worker Accommodation Plan
WEC	WAPDA Environment Cell
WHO	World Health Organization
WHC	World Heritage Convention
WMP	Waste Management Plan

Measuring Units

C	Celsius
\$	US Dollar
GWh	Gigawatt Hour
km	kilometer
kg	Kilogram
kph	Kilometer per hour
KV	Kilo-volt
KW	Kilowatt
KWh	Kilo Watt Hour
m	Meter
$\mu\text{g}/\text{m}^3$	Microgram per cubic meter
MHz	Mega hertz
mm	Millimeter
MW	Megawatt
MWh	Mega Watt Hour
PKR	Pakistani Rupee
T	Ton

EXECUTIVE SUMMARY

Water and Power Development Authority (WAPDA) on behalf of Government of Pakistan (GoP) has decided to execute Shatung Nullah Diversion Project in Skardu (Gilgit Baltistan region). The Shatung Nullah Diversion Project entails the diversion of the Shatung Nullah, which is a left tributary of the river Indus, into Raghichan Nullah, which flows in to Satpara Nullah leading towards Satpara Dam.

The objective of the diversion of Shatung Nullah is to divert 10 m³/s of water from Shatung Nullah to enhance the power generation of Satpara dam project throughout the year. This additional water not only supplements the Satpara dam reservoir to increase water availability for power generation but also for household usage and for irrigation during crop sowing seasons. The project also includes an Environmental Impact Assessment (EIA) in the Deosai Plains, which is a designated National Park.

BACKGROUND

Shatung Nullah Diversion Project was identified by Water and Power Development Authority (WAPDA) as a part of the original Satpara Dam Project. Objective of this scheme is to augment the supplies to Satpara Dam for:

- Irrigation supplies for a total command area of 15,000 acres
- Drinking water supplies for Skardu up to 20 million gallons per day
- Energy generation for supplies to Skardu valley and its surroundings

The sizing of Project components of Satpara Dam was accordingly carried out by considering the diversion of Shatung Nullah. The scheme had to be deferred because of environmental concerns raised by various stakeholders especially considering the concerns of international organizations regarding vulnerable ecosystem of Desai National Park.

Skardu city and its surroundings are now facing severe shortages of irrigation and drinking water supplies. The situation of electric supplies is even worse. There are serious issues regarding quantity as well as quality of electricity in the area. There is a huge gap in supplies and demands, which is increasing day by day with increased population as well as enormous developments in tourism industry.

Considering this grave situation in the area, it was decided by GoP through WAPDA to undertake the feasibility of the Shatung Nullah Diversion Project. For this purpose, WAPDA has got the PC-II of the Project approved by the Government of Pakistan.

LOCATION

The Shatung Nullah Diversion Project is located on Deosai Plains at an altitude above 13,000 ft. (4000 meter) a.m.s.l. in District Skardu of Gilgit-Baltistan area, which drains the world famous and picturesque Deosai Plains. Shatung Nullah is a left bank tributary of Indus River. The Project area is located south of Skardu city, approximately 30 km upstream of Satpara Dam, the coordinates of Weir sites are $75^{\circ}34' 28.92''$ Longitude & $35^{\circ} 1' 28.49''$ Latitude. The location map is given below:

Location Map of the Project



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

This ESIA has been conducted to meet the regulatory requirements set out by the Gilgit Baltistan Act 2015 (GB-EPA 2014), and Pakistan Environmental Assessment Regulation, 2000. The study also meets World Bank operational policies.

THE PROJECT DESCRIPTION

As mentioned previously, Shatung Nullah Diversion Project was identified by Water and Power Development Authority (WAPDA) as a part of Satpara Dam Project. The main purpose of this scheme was to augment the supplies in Satpara Nullah by

diverting flows from Shatung Nullah by means of a diversion weir, a connecting tunnel (about 6.5 km long) bringing the diverted water to Raghichan Nullah (main tributary flowing into Satpara reservoir). Salient features of the Project as originally conceived are as follows:

Description	Original Study	Current Study
General:		
Location	30 km South of Skardu town	
Name of Tributary	Shatung Nullah, left tributary of Indus River	
Project Access:		
Location	Skardu to Satpara Dam to Ali Malik Top to Deosai Plains	
Distance	30 km (Up to Deosai Plains)	
Hydrology:		
Catchment Area at Proposed Weir Site	216 km ²	169.9 km ²
Mean Annual Flow (observed)	4.19 m ³ /s	4.70 m ³ /s
Diversion Discharge	3 m ³ /s	10 m ³ /s
Environmental Flows	-	0.225 m ³ /s
100-year Flood	358 m ³ /s	403.50 m ³ /s
Average Annual Sediment Inflow	2741 Tons (2.13 A-Ft)	
Diversion Weir:		
Coordinates of Weir	E 75° 33' 04.46" N 35° 02' 23.08"	E 75° 34' 28.92" N 35° 01' 28.49"
Type of Weir	Free Overflow with Gated Under-Sluices and Lateral Intake	
Height Above Existing Nullah Bed	7 m	3 m
Length of the Crest	67 m	49 m
Crest Elevation	4,032.61 m	4029 m
Undersluice Width	7.62 m	9.40 m
Undersluice Bays	2 x 3.32 m	3 x 2.60 m
Total Length of Weir	76.54 m	58.40 m
Total Length of Footbridge		61.40 m
Saddle Dam:		
Type	--	CFRD
Height	--	4m
Length	--	237m
Crest Elevation	--	4032m
Connecting Channel/ Desander:		
RCC Connecting Channel X-Section	2.13 m x 2.28 m	2.50 m x 2.00 m
Longitudinal Slope	1 in 500	1 in 300

Description	Original Study	Current Study
Length of Connecting Channel	610 m	75 m
Desander Length (Excluding Transitions)	-	67 m
Flushing Gate	-	2 m x 2 m
Buried Conduit:		
Size	2.13 m x 2.28 m	2.50 m x 2.00 m
Longitudinal Slope	1 in 500	1 in 300
Minimum Embedment below NSL	-	1.5 m
Length (Option-1)	-	345 m
Length (Option-2)	-	3447 m
Length (Option-2A)	-	1829 m
Diversion Tunnel/ Adit:		
Internal Size of Diversion Tunnel/ Adit Tunnel	3.66 m x 3.66 m (Horseshoe Shape)	3.40 m x 3.70 m (Horseshoe Shape)
Type of Section	RCC Lined	
Length of Diversion Tunnel (Option-1)	6500 m	6607 m
Length of Diversion Tunnel (Option-2)	-	4126 m
Length of Adit Tunnel (Option-2)	-	592 m
Length of Diversion Tunnel (Option-2A)	-	5296 m
Longitudinal Slope of Diversion Tunnel	1 in 250	1 in 1000
Outfall Structure	Stone Dumping up to Ragichan Nullah	Gabion Outfall Structure up to Ragichan Nullah

POLICIES, LEGAL FRAMEWORK AND RELEVANT LAWS

The proposed project requires an ESIA in accordance with the GB Environmental Protection Act, 2014 and IEE/ EIA Regulations, 2014 and also to fulfill the requirements of international financial institutions.

Upon a careful perusal of these legal frameworks, the project has been categorized under Category "A" of World Bank O.P 4.01 'Environmental Assessment' and Schedule II according to the Review of EIA and IEE Regulations, 2000 set by the Pakistan Environmental Protection Agency and thus requires the formulation of an Environmental Impact Assessment (EIA)/ Environmental and Social Impact Assessment (ESIA) study for the proposed project.

Environmental & Social Policy Framework

National Policies Relevant to the Project

Policy	Content Summary	Relevance to the Project
National Conservation Strategy (1992)	<p>The Pakistan National Conservation Strategy (NCS) is the principal policy document for environmental issues in the country and was developed and approved by the Government of Pakistan on March 01, 1992. The NCS deals with 14 core areas:</p> <ul style="list-style-type: none"> • Maintaining soils in cropland • Increasing irrigation efficiency • Protecting watersheds • Supporting forestry and plantations • Restoring rangelands and improving livestock • Protecting water bodies and sustaining fisheries • Conserving biodiversity • Increasing energy efficiency • Developing and deploying material for renewable energy • Preventing/abating pollution • Managing urban wastes • Supporting institutions for common resources • Integrating population and environmental programs • Preserving cultural heritage. 	This ESIA considers impacts on all relevant environmental issues specified in this Strategy.
National Environmental Policy (NEP) (2005)	The NEP was implemented in 2005 to provide an overarching framework for addressing Pakistan's environmental issues. It provides directions for addressing sectorial issues and provides a means for promoting conservation and environmental protection in water, air and waste management, forestry, and transport. The NEP aims to promote protection of the environment, the honoring of international obligations, sustainable management of resources and economic growth.	The present ESIA has been prepared in consistence with this Policy
National Water Policy 2018 (NWP)	Objectives of the NWP include, amongst others, efficient management and conservation of existing water resources, optimal development of potential water resources and improved flood control and protective measures.	Protection of water resources has been considered in this EIA.
National Forest Policy 2010 (NFP)	The NFP establishes the policy framework for the restoration, development, conservation and sustainable management of forests and allied natural resources. It seeks to ensure the sustainability of ecosystem functions, services and benefits for present and future generations.	Protection of forest resources has been considered in this ESIA.
National Climate Change Policy, 2012 (NCCP)	In September, 2012 Government of Pakistan launched its National Climate Change Policy. Environmental assessment is integrated in the preamble of the policy. The policy commits for taking appropriate measures for mitigation and adaptation to climate change through tools of environmental assessment.	The present ESIA has been prepared in consistence with this Policy

Environmental and Social Legislation

The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, soil, marine, and noise pollution, as well as to the handling of hazardous wastes.

The IEE/ EIA Regulations 2000 establish the framework for the preparation, submission, and review of the IEE and EIA. The Regulations categorize development projects for IEE and EIA into two schedules (Schedules I and II). Schedule I includes projects where the range of environmental issues is comparatively narrow, and the issues can be understood and managed through less extensive analysis. Schedule II covers major projects that have the potential to affect a large number of people in addition to generating potentially significant adverse environmental impacts. Preparation of a complete EIA is required for Schedule II projects. Under the IEE/ EIA Regulations 2000, Construction of Shutang Nullah is likely to cause adverse environmental effects. The proposed project is therefore classified as a Schedule II project and hence an EIA is required to be carried out.

In 2010, through the 18th Amendment to the 1973 Constitution of the Islamic Republic of Pakistan, environment became a purely provincial subject, empowering each province to make its own law and the role of Federal EPA has been limited to the jurisdiction of Islamabad Capital territory only. In 2015, Gilgit-Baltistan framed its own law and adopted the Federal Act with minor amendments. It was called The Gilgit-Baltistan Environmental Protection Act, 2014. Under Section 5 (1) of the Act, the Government of Gilgit-Baltistan established the Gilgit-Baltistan Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations. Similarly, the Act bound the Project Proponent(s) to submit relevant IEE and EIA report(s) of proposed project(s) falling within the provincial boundaries of Gilgit-Baltistan to GB-EPA for requisite review and approvals.

Other Regulations

Other policies and regulation are given below:

- a. Factories Act, 1934 (as amended to 1997)
- b. Labor Laws
- c. Employment of Children Act (1991)
- d. Land Acquisition Act

Gilgit Baltistan Biodiversity³ Specific Legislations

- I. Gilgit Baltistan (Northern Areas) Wildlife Preservation Act, 1975
- II. Gilgit Baltistan (Northern Areas) Fisheries Act, 1975
- III. The Gilgit-Baltistan Forest Act, 2019

- IV. The Gilgit-Baltistan Prohibition of Employment of Children Act, 2019
- V. The Gilgit-Baltistan Disaster Management Act, No. II of 2017
- VI. The Gilgit-Baltistan Local Government Act, 2014

Secondary and Complimentary Environmental Legislation

1. National Environmental Quality Standards 2012
2. Forest Act (1927) and Forest (Amendment) Act (2010)
3. Protection of Trees and Brushwood Act (1949)
4. Antiquity Act (1975)
5. Motor Vehicle Ordinance (1965) and Rules (1969)
6. Highway Safety Ordinance (2000)
7. Pakistan Penal Code (1860)
8. Pakistan Explosives Act (1894)
9. Regulation of Mines and Oil Fields/ Mineral Development Act (1948)

Environmental Guidelines

- 1) Policy and Procedures for the Filing, Review and Approval of Environmental Assessments (1997)
- 2) Guidelines for the Preparation and Review of Environmental Reports (1997)
- 3) Guidelines for Public Consultation (1997)
- 4) Guidelines for Sensitive and Critical Areas (1997)

International Treaties and Conventions

Pakistan is a signatory to a number of international environment and social related treaties, conventions, declarations and protocols. The following are the relevant international treaties and conventions to which Pakistan is a party:

- Convention on the Conservation of Migratory Species of Wild Animals
- Convention on International Trade in Endangered Species (CITES),
- Convention on Wetlands of International Importance
- Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal

- Convention concerning the Protection of World Culture and Natural Heritage
- Convention on the International Trade in Endangered Species
- International plant protection convention
- International Covenant on Economic, Social and Cultural Rights
- International Labor Organization's (ILO) Core Labor Standards on
- Freedom of association (convention 87)
- Elimination of forced and compulsory labor (conventions 29 and 105)
- Elimination of discrimination in respect of employment and occupation (conventions 100 and 111)
- Abolition of child labor (conventions 138 and 182)
- Kyoto Protocol to the Convention United Nations Framework on Climate Change
- Stockholm Convention on Persistent Organic Pollutants
- United Nations Convention on Biological Diversity
- United Nations Convention on the Rights of the Child
- United Nations Framework Convention on Climate Change.

ILO Conventions:

ILO Conventions Ratified by Pakistan

Convention	Date Ratified by Pakistan
Fundamental	
C029 Forced Labor Convention, 1930 [Convention concerning Forced or Compulsory Labor]	23 Dec 1957
C087 Freedom of Association and Protection of the Right to Organize Convention, 1948 [Convention concerning Freedom of Association and Protection of the Right to Organize]	14 Feb 1951
C098 Right to Organize and Collective Bargaining Convention, 1949 [Convention concerning the Application of the Principles of the Right to Organize and to Bargain Collectively]	26 May 1952
C100 Equal Remuneration Convention, 1951	11 Oct 2001
C105 Abolition of Forced Labor Convention, 1957 [Convention concerning the Abolition of Forced Labor]	15 Feb 1960
C111 Discrimination (Employment and Occupation) Convention, 1958 [Convention concerning Discrimination in Respect of Employment and Occupation]	24 Jan 1961
C138 Minimum Age Convention, 1973 [Convention concerning Minimum Age for Admission to Employment]	06 Jul 2006

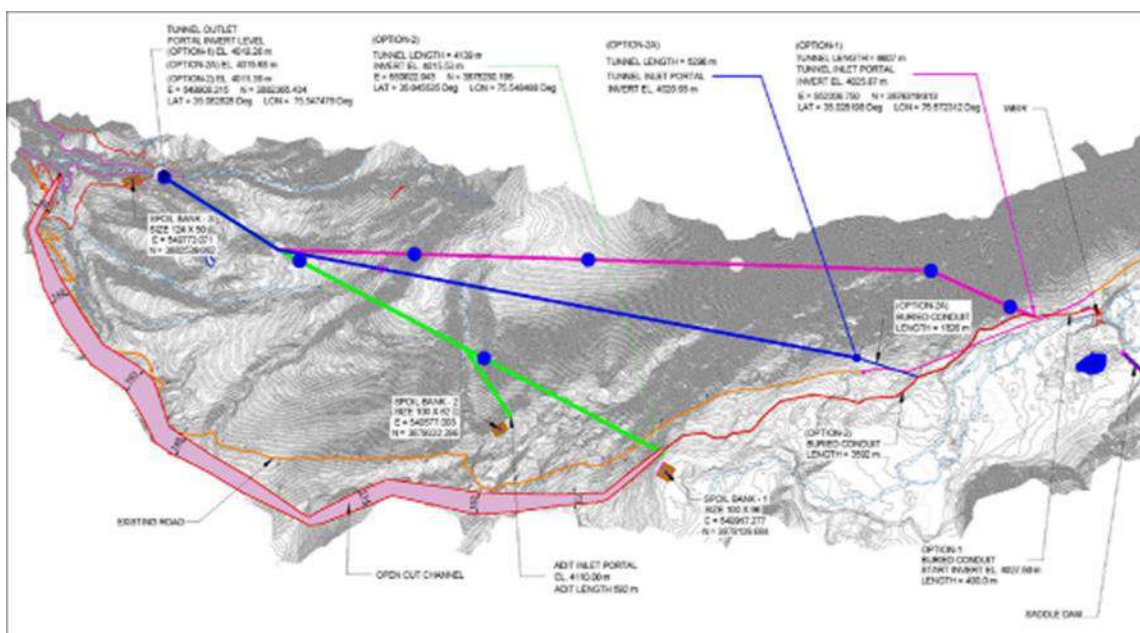
Convention	Date Ratified by Pakistan
C182 Worst Forms of Child Labor Convention, 1999 [Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labor]	11 Oct 2001
Governance	
C081 Labor Inspection Convention, 1947 [Convention concerning Labor Inspection in Industry and Commerce]	10 Oct 1953
C144 Tripartite Consultation (International Labor Standards) Convention, 1976 [Convention concerning Tripartite Consultations to Promote the Implementation of International Labor Standards]	25 Oct 1994
Technical	
C001 Hours of Work (Industry) Convention, 1919 [Convention Limiting the Hours of Work in Industrial Undertakings to Eight in the Day and Forty-eight in the Week]	14 Jul 1921
C004 Night Work (Women) Convention, 1919 [Convention concerning Employment of Women during the Night]	14 Jul 1921
C006 Night Work of Young Persons (Industry) Convention, 1919 [Convention concerning the Night Work of Young Persons Employed in Industry]	14 Jul 1921
C014 Weekly Rest (Industry) Convention, 1921 [Convention concerning the Application of the Weekly Rest in Industrial Undertakings]	11 May 1923
C018 Workmen's Compensation (Occupational Diseases) Convention, 1925 [Convention concerning Workmen's Compensation for Occupational Diseases]	30 Sep 1927
C019 Equality of Treatment (Accident Compensation) Convention, 1925 [Convention concerning Equality of Treatment for National and Foreign Workers as regards Workmen's Compensation for Accidents]	30 Sep 1927
C089 Night Work (Women) Convention (Revised), 1948 [Convention concerning Night Work of Women Employed in Industry (Revised 1948)]	14 Feb 1951
C090 Night Work of Young Persons (Industry) Convention (Revised), 1948 [Convention concerning the Night Work of Young Persons Employed in Industry]	14 Feb 1951
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington,	1975

World Bank Safeguards Policies/Guidelines

The ESIA will comply with the World Bank safeguards requirements given in the below listed Operational Policies (OPs) for Category "A" projects.

1. OP/ BP4.01: Environmental Assessment
2. OP/ BP4.04: Natural Habitats
3. OP/ BP4.11: Physical Cultural Resources
4. OP/ BP4.12: Involuntary Resettlement

THE ALTERNATIVES



Three options were developed on actual topographic survey as shown in the following Figure & Table. These are:

- Option-1; Diversion Tunnel Layout
- Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)
- Option-2 A; Modified Hybrid Layout

Alternative Options

	Option-1; Diversion Tunnel Layout	Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)	Option-2 - A; Modified Hybrid Layout
Engineering Design			
Tunnel inlet Elevation	4019.03 m	4015.30 m	4020.93 m
Tunnel Length	6607	4126 m	5296 m
Tunnel outlet Elevation	4025.64 m	4011.17 m	4015.63 m
Buried Conduit length	345 m	3447 m	1826 m
Tunnel Slope	1 inch in 1000 m	1 inch in 1000 m	1 in 1000 m
Environment & Social Aspects			
Physical displacement:	• No physical displacement	• No physical displacement	• No physical displacement

	Option-1; Diversion Tunnel Layout	Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)	Option-2 - A; Modified Hybrid Layout
Economic displacement:	• No Economic Displacement	• No Economic Displacement	• No Economic Displacement
Cultural and Religious sites	No Cultural & Religious sites	No Cultural & Religious sites	No Cultural & Religious sites
Ecology	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No plant species of conservation importance has been observed or reported from the Aol. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW 	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No wetlands, notified by the GOP, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW 	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No plant species of conservation importance has been observed or reported from the Aol. • No wetlands, notified by the GOP, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW.
Land, Residential & Commercial Structures	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership in the Protected Area. • No Commercial Activities to be affected 	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership in the Protected Area. • No Commercial Activities to be affected 	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership in the Protected Area. • No Commercial Activities to be affected

As explained above, the technically viable options are only Option-1 and Option-2A. Since the biggest challenge in construction of this Project is the construction of Diversion Tunnel. Option 2-A has been preferred on the basis of a shorter tunnel length, which can be constructed in a shorter duration compared to Option 1. As such, Option 2A has been selected as the preferred option for this Project.

DESCRIPTION OF BASELINE ENVIRONMENT

Area of Influence

The Direct Area of Influence (AOI) or corridor of impact refers to the corridor or area that will be directly affected by the project activities. For this project, the right of way (RoW), measures to about 10 m (5 m on either side of centerline of alignment), which is also the direct area of influence.

The indirect area of influence refers to the area that will have indirect impacts of the project activities. For this project, the indirect AOI was selected to be about 65 Sq km to study the flora, fauna, noise and other constructional impacts of the proposed project.

Physical Environment

Topography, Geography, Geology and Soil: The Deosai National Park is located between Kharmang, Astore and Skardu districts in Gilgit Baltistan area of Pakistan. It encompasses an area with altitude ranging from 3,500 to 5,200 meters a.m.s.l. In terms of topography, it has a mix of plains, plateaus, hills, streams, lakes and mountains. The central part of the park is relatively flat and gentle with a valley elevation of around 4,000 meters a.m.s.l. Almost 63% of the area has an elevation ranging from 4,000 to 4,500 meters, and 22% of the area is above 4500 meters, constituting the famous Deosai Plains.

Previous study reveals that the area under investigation falls in the Karakoram Mountain Range; Kohistan (Ladakh) geological province. All the rocks exposed in the area are of igneous origin especially around the locality of Project ranging in age from Miocene to Cretaceous.

Geologically speaking, Shatung Nullah has a steep gradient with falls at different locations and its bed contains large size boulders of various sizes, which are brought down by the glaciers and avalanches. Apart from the glacial characteristics, the valley

shows talus/ scree accumulation and alluvial terraces, which indicates that valley is a modified glacial valley, where glacial-fluvial and colluvial activities have taken place. The soils of this area are severely eroded, of a coarser nature and mixed with gravel and stones of various material and sizes. In the flat areas between the mountains, soil is deep with marshy vegetation.

Seismicity: According to the Building Code of Pakistan (2007), Pakistan is divided into five seismic zones. The project area lies in moderate to severe damage earthquake zone.

Hydrology and Sedimentation: Shatung Nullah is one of the tributaries of Indus River. Mean monthly flows are minimum during February and maximum during July, with values of 0.83 m³/s and 16.37 m³/s respectively. Mean annual flows are 4.67 m³/s. The average mean monthly observed Shatung Nullah flows for period of 1995-2000 are 4.67 m³/s, while for the period of (1973-2021) estimated mean annual available flows resulted with value of 4.70 m³/s, respectively.

Average Annual sediment yields (0.53 Ac-ft/sq.km) or (776.39 Tons/Sq.km) in region has been estimated in the feasibility studies. As catchment area of proposed weir is 169.88 Sq.km, the annual sediment yield of 0.133 MCM or 108.07 Ac-ft per year was estimated at weir site.

For estimating design flood at Shatung Diversion Weir, (Peak instantaneous floods from nearby rivers – regional approach) was used. Recommended design flood at proposed weir is (403.5 m³/s) against return period of 100 years. However, the structures shall also be checked to be safe against return period of 1000 years for flood of 538.8 m³/s.

Environmental Flows: The Shatung Weir is designed to divert 10 m³/sec flows by means of a lateral intake on right bank of Nullah. So, Ecological considerations for the Shatung nullah, downstream of water abstraction require reserved or minimum flow. According to the hydrological calculation, 10% of lean month's average flow, which is (0.225 m³/sec) has been considered as environmental flow for survival of biota in vulnerable reach during this period. Water availability in the months from July and August are more than the designed flow of 10 m³/s. So, lean months are considered as September to June.

Climatology: The climatic conditions in Skardu are mostly characterized by a frigid and moderate climate. The temperature here averages -1.2°C (29.9°F). The annual rainfall is 1203 mm (47.4 inch). The average annual wind speed of the project area is about 1.7 knots. Months of the year with higher temperatures are usually having high wind speeds and the vice versa. The relative humidity in the study area is usually above 40% with an average of 51% and a maximum of 56%.

Water, air and Noise Quality: The water of the project area analyzed according to the NEQS, the drinking water quality parameters are within the limits and good for drinking and irrigation purposes. The air and noise quality in the project area are within the permissible limits and it can be termed as highly suitable for living.

Biological Environment:

Deosai National Park has outstanding universal value due to its biodiversity conservation role not only for key species like the Brown Bear, but also for a general collection of fauna species. The park's location in the western Himalayas, classified as an Endemic Bird Area by Birdlife International, is important as a resting and breeding ground of internationally important residential and migratory birds. Deosai hosts over one hundred types of resident and migratory birds. The park welcomes many migratory birds in summers like the gulls, geese, terns, plovers, shanks, sandpipers, Common Merganser and Horned Lark. Other birds in the park include The Goldfinch and Red-fronted Serin, the Turtle Dove, the Rock Bunting, the golden eagle, falcons, Eurasian sparrowhawk, griffon vulture, and snowcock, kestrels, and pheasants.

The waters of Deosai Plains are also home to the enormous-sized snow trout, which also serves as food for many migratory birds.

Like the fauna, the flora of Deosai Plains is also brimming with variety and diversity. Hundreds of species of aromatic flowers growing here are a source of food for wildlife and have great medicinal value. In the spring and summer seasons, the entire area is covered with a cornucopia of wildflowers. One can witness an extensive variety of butterflies belonging to rare species hovering on the richly colored flowers.

In Deosai Plains, growth of around 342 plant species is reported. Some of the plant varieties are Golden Ragwort, Forget-Me-Nots, Pink Sedum, "Tumoro" (local name for wild Thyme), Gentian, Asian Bell Flower, Geranium, Scabious, Thistle, Monkshood,

and many more. Among many other plants used for medicinal value by locals, “Tumoro” is largely used as herbal tea in Skardu and Astore.

Social Environment

Skardu is the main city of the Baltistan Division. Skardu district is further divided into three Tehsils i.e., Gamba, Gultari and Skardu. It has an area of 15,000 sq.km¹ and a population of 214, 818.

Although the government has changed the status of Deosai Plains by declaring it a ‘National Park’ of the region, however, it is still used as a grazing land by the locals of Satpara village. Moreover, the Satpara village is located on the banks of Satpara Nullah therefore, the impact of any change in regime of Nullah on the locals cannot be ignored. Satpara is further comprising of five-villages i.e., Malpain, Miriaq, Dari, Satpara Bara (Chohar) village and Satpara Center (Skildrong) village. The first three villages are located at the north of Satpara Nullah, while the other two (Satpara Bara and Satpara Center-Skildrong) villages are located to the south across the Nullah. These villages can be accessed through a Skardu-Deosai road. The condition of the metalled road is poor, which is always vulnerable to land-sliding/ avalanches during winter seasons. The Satpara villages is located at a distance of about 8 Km from Skardu city.

Satpara Bara (Chohar) village has a total of 150 households with 1650 inhabitants. While in other four villages (Satpara Center (Skildrong), Malpain, Miriaq and Dari), there are 140, 65, 80 and 130 households with a total of 1450, 770, 880 and 1380 inhabitants respectively.

The local population is living in joint family system. The size of average family household is usually comprising of 8-10 persons. All the population is Muslims with a similar ethnic background of Devout Shia sect. The local people speak Shina and Balti languages. They can also easily speak and understand Urdu language. About 53% adults (who are 18 years old or above) of the combined five-villages are identified as unemployed. The major occupation is livestock rearing which is about 32 % of the total population. The average annual income of a household received in PKR from all resources and localities of all five villages is reported as 248,859. All types of land in

¹ https://en.wikipedia.org/wiki/Skardu_District

the Satpara region are privately owned. The average landholding (farmland, grazing land, and land with trees) in possession of each household is about 34 Kanals. Maize and Potato are the main crops, while different fruits are the cash crops.

RESETTLEMENT ACTION PLAN

The Shatung Nullah Project involves construction of a diversion weir with a small reservoir, a buried Water Channel and a tunnel. During construction period, there will be offices/ residential accommodation areas for construction workers in construction camps. Most construction activities will be focused within the right of way (RoW) of the project. The land under all the Project components is uncultivable/ Range land. The total affected land is about 18 acres with breakup as detailed in the following Table.

Land Acquisition Area

Sr. #	Components	Area	Units
1	Weir + Under Sluice+ Intake	4704	m ²
2	Divide Wall	264	m ²
3	Fish Ladder	156.6	m ²
4	Connecting Channel	750	m ²
5	Buried Conduit	18290	m ²
6	Saddle DAM	5387	m ²
7	Desander	2178	m ²
8	3 Spoil Banks	9600+6200+6200 = 22000	m ²
9	Storage Yard	2500	m ²
10	2 Batching Plants	2500 + 2500 =5000	m ²
11	Crushing Plant	2500	m ²
12	Control Room	625	m ²
13	Coffer Dam	Stage -1 (4832)	m ²
14		Stage -2 (3724)	m ²
Total Area Requirement		72910 (18 Acres)	m²

The LARP includes identification, evaluation and compensation of land (no infrastructure and/or land-based assets are going to be impacted). At the Shatung Nullah Diversion Project, there is no requirement of preparation of Resettlement Action

Plan (RAP), as all the Deosai Plains land ownership is with the Government of Gilgit & Baltistan Wildlife Department. This land is declared as a 'Protected Area'.

It is further clarified that all the land is Pasture/ Range land and Riverine Land. In the Project affected land of 18 Acres, no trees, buildings or other infrastructure will be affected. Therefore, no cost has been associated to the resettlement budget and its cost is taken as zero. The land will be used for project free of cost, however, an NOC will be required from Deputy Commissioner of Skardu for acquisition of land for Project.

POTENTIAL SIGNIFICANT IMPACTS & MITIGATION MEASURES

This impact assessment of the project has been made for key environmental and social aspects, identifies significant potential impacts, which may be caused by the project activities, and proposes appropriate mitigation and preventive measures to address these impacts. A summary of these impacts and their significance along with the mitigation measures is presented in following table.

Table: Impact Assessment Matrix

Activity	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Technical Design and Layout Planning	Likely	Major	Medium	Low
Land Acquisition	Unlikely	Low	Low	Low
Seismicity	Certain	Major	High	Low
Loss of vegetation	likely	Moderate	Medium	Low
Biodiversity Conservation	Certain	catestotraphic	Ver High	Medium
Construction Phase				
Soil Erosion and Contamination	Likely	Major	Medium	Low
Borrow Area	Likely	Moderate	Medium	Low
Batching Plant & asphalt plant	Likely	Major	Medium	Low
Construction Camps/Camp site	Certain	Maor	High	Medium
Wastewater Generation at Construction Camp	Likely	Moderate	Medium	Low
Solid Waste (Construction, Municipal and Hazardous Waste)	Likely	Major	Medium	Low
Ambient Air Quality	Certain	Major	High	Low
Noise	Likely	Moderate	Medium	Low
Biological Resources	Certain	catestotraphic	Ver High	Medium
Traffic	Certain	Moderate	Medium	Low
Occupational Health and Safety	Certain	Major	High	Low

Activity	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Community safety	Likely	Major	Low	Low
Influx of Labor	Certain	Major	Medium	Low
Communicable Diseases	Likely	Moderate	Medium	Low
Gender Based Violence	Likely	Moderate	Low	Low
Operation Phase				
Degradation of terrestrial ecology	Likely	Moderate	High	Low
Reduction in downstream flow	Likely	Moderate	Medium	Low
Cumulative and Induced Impact	-	-	-	Positive Impact

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The main objective of the environmental and social management plan (ESMP) is to manage adverse impacts of proposed project interventions on both the environment and the people in the project area. The purpose of the ESMP is to ensure that environmental and social impacts or the risks identified during the ESIA process are effectively managed during the construction, operation and closure of the proposed project. The ESMP specifies the mitigation measures, which are to be implemented by the Contractor's Environmental team. This ESMP not only specifies mitigation measures, but also describes institutional arrangements for the ESMP. The ESMP includes environmental mitigation, testing, monitoring, reporting and budgeting requirements, besides making recommendations on Environmental trainings. Following functionalities will be involved in the implementation of ESMP:

- WAPDA
- WAPDA Environmental Cell (WEC)
- Supervision Consultant
- Contractor of project
- Project Management Unit

The overall responsibility for the implementation of the project rests with the PMU, which will be developed by WAPDA. The PMU will be headed by a Project Director (PD). Besides the PMU, WAPDA Environment Cell (WEC) will be responsible for implementing the ESMP. The WEC headed by the Deputy Project Director

(Safeguards) will include representatives of all actors responsible for ESMP/ SRMP implementation.

The Mitigation Management Matrix (MMM) provides the framework for the implementation of the mitigating measures and environmental management during construction and operation phases of the project.

Environmental and Social Management Budget

An environmental and social management budget of **Rs. 46.69 Million PKR** has been estimated for implementation of the ESMP for two years. This budget also includes cost of environmental monitoring and associated trainings, plantation and its maintenance, biodiversity conservation, equipment used to be used and health and safety cost and will be included in the bid documents for contractor hiring, so that all E&S mitigation costs mentioned in ESMP are part of bid requirement. A summary of environmental management budget is given in Table below:

Summary of Environmental Budget

Sr. No.	Component	Total Cost (PKR)	Total Cost (Million PKR)
1	Environmental Monitoring Cost	5,600,000	5.600
2	Plantation (includes plantation and maintenance for 3 years) for Green Belt/ along route plantation	2,000,000	2.000
3	HSE & staffing	16,460,000	16.460
4	Training	1,000,000	1.000
5	External Monitor (2 years)	3,800,000	3.800
6	Biodiversity Conservation Budget	17,827,920	17.828
Total		46,687,920	46.688

CONCLUSIONS & RECOMMENDATIONS

1. The proposed project requires ESIA in accordance with the requirements of Schedule II of PEPA-1997 as well as the requirements of other international financing agencies;
2. Impact assessment for construction and operation phases reveals that most of the adverse environmental impacts are associated with the construction phase

- of the Project. The impacts can be minimized and controlled by adopting mitigation measures as suggested in the ESMP;
3. The project area falls in the Protected Area of Daosai National Park, where construction activities will be taken up with extreme care according to the Code of Conduct related to Sensitive areas for National Parks, Wildlife Sanctuaries, Game Reserves, Reserved Forests and Protected Wetlands.
 4. As the construction activities will be carried out in the Protected Area, a Biodiversity Action Plan (BAP) is also prepared. The budget for BAP has been allocated to be utilized for the protection of the biodiversity of the area, especially for Brown Bears and Migratory Birds.
 5. The project traverses through the Uncultivated Range land / Riverine areas of District Skardu.
 6. No trees will be cut for project construction.
 7. No land compensation will be made, as the land is owned by GoGB.
 8. In the proposed alignment, there will be no effect on residential structures, community structures or any other infrastructures.
 9. Local communities having the rights of grazing only have shown some concerns, which need to be addressed to the maximum possible extent by the Project Authorities.
 10. Their major concern was to build a concrete wall or provide rip rap along critical reaches of Satpara Nullah where there are chances of damage to their agriculture lands and residential structures during high flow season. With the diversion of Shatung Nullah, they are fearing that the situation might become worse. These works have been included in the Project estimate under the head of improvement of access road infrastructure.
 11. The Project must have a functional and an effective GRM setup in place before start of construction works.
 12. The project must employ a proactive communication strategy to ensure management of Daosai National Park and the local population must be made aware of project works, its benefits, and its impacts in a manner that is easy to understand. These awareness campaigns must be taken up in a timely manner.
 13. ESMP provides a detailed mitigation matrix that covers impacts, measures, roles/ responsibilities and timings. Monitoring plan for both the phases has also been separately given in the ESMP.

14. Surface and groundwater are available in and around the project area. Nearest potable water source for construction and other uses are the active streams in the area.
15. The water quality in the project area is also fit for drinking purpose.
16. Objectives of this scheme is augment the supplies to Satpara Dam reservoir for:
 - Irrigation supplies for a total command area of 15,000 acres
 - Drinking water supplies for Skardu up to 20 million gallons per day
 - Energy generation for supplies to Skardu valley and its surroundings

1. INTRODUCTION

Water and Power Development Authority (WAPDA) on behalf of Government of Pakistan (GoP) has decided to execute Shatung Nullah Diversion Project in Gilgit Baltistan (Skardu region). The Shatung Nullah Diversion Project entails the diversion of the Shatung Nullah (situated in Deosai National Park), which is a left tributary of the river Indus, into Raghichan Nullah, which leads to Satpara Nullah. WAPDA conducted a feasibility study on the Satpara dam project in 1987. WAPDA Hydro Division carried out the conceptual level study for Shatung Nullah Diversion Project. The project would include the construction of an ogee type Diversion Weir, an Intake Structure, a Closure Dyke, an Approach Channel, and a Horseshoe Tunnel.

The objective of the diversion of Shatung Nullah is to divert 3m³/s of water from Shatung Nullah into Raghichan Nullah leading to Satpara Nullah to enhance the power generation of Satpara dam project throughout the year especially during winter season. Simultaneously supplementing the Satpara dam reservoir to increase water availability for power generation, for household usage and for irrigation during crop sowing seasons. The project also includes an Environmental Impact Assessment (EIA) in the Deosai Plains, which is a designated National Park.

Accordingly, the Consultancy Services includes, the Review of the previous Project development stage, the elaboration of the Detailed Engineering Design, preparation of Environment Impact Assessment (EIA) study and the preparation of the Tender Documents for the Project's construction contracts are to be performed by the Consultants. This document the EIA, is undertaken to comply with Gilgit-Baltistan Environment Protection Agency (GB-EPA) regulations and other Donor requirements.

1.1 Background

Shatung Nullah Diversion Project was identified by Water and Power Development Authority (WAPDA) as a part of Satpara Dam Project. The main purpose of this scheme was to augment the supplies in Satpara Nullah by diverting flows from Shatung Nullah by means of a diversion weir, a connecting tunnel (about 6.5 km long) bringing the diverted water to Raghichan Nullah (mainstream flowing into Satpara). Objective of this scheme (In original) was to augment the supplies to Satpara Dam for:

- Irrigation supplies for a total command area of 15,000 acres

- Drinking water supplies for Skardu up to 20 million gallons per day
- Energy generation for supplies to Skardu valley and its surroundings

The sizing of Project components of Satpara Dam was accordingly carried out by considering the diversion of Shatung Nullah. The scheme had to be deferred because of environmental concerns raised by various stakeholders especially considering the concerns of international organizations regarding vulnerable ecosystem of Desai National Park.

Skardu city and its surroundings are now facing severe shortages of irrigation and drinking water supplies. The situation of electric supplies is even worse. There are serious issues regarding quantity as well as quality of electricity in the area. There is a huge gap in supplies and demands, which is increasing day by day with increased population as well as enormous developments in tourism industry.

Considering this grave situation in the area, it was decided by GoP through WAPDA to undertake the feasibility of the Shatung Nullah Diversion Project. For this purpose, WAPDA has got the PC-II of the Project approved by the Government of Pakistan. JV of Pakistan Engineering Services (Pvt) Ltd, MM Pakistan (Pvt) Ltd, Barqaab Consultants (Pvt) Ltd in association with The Spatio (Pvt) Ltd were appointed as Consultants in June 2022 with date of commencement as June 04, 2022. The main objective of these Studies is to prepare a bankable Feasibility report of Shatung Nullah Diversion Project to meet the following objectives:

- Additional availability of flows during crop sowing season;
- Additional energy generation at Satpara Dam Project;
- Increased water supply requirement of Skardu town

1.2 Location

The Shatung Nullah Diversion Project is located on Deosai Plain at an altitude above 13,000 ft. (3,962 meter) a.m.s.l. in District Skardu of Gilgit-Baltistan area, which drains the world famous and picturesque Deosai Plains. Shatung is a left bank tributary of Indus River. The Project area is located south of Skardu city, approximately 30 km upstream of Satpara Dam, which is accessible in about 2 hours journey by jeep through a kacha track winding along the Satpara Nullah (**Figure 1.1**).

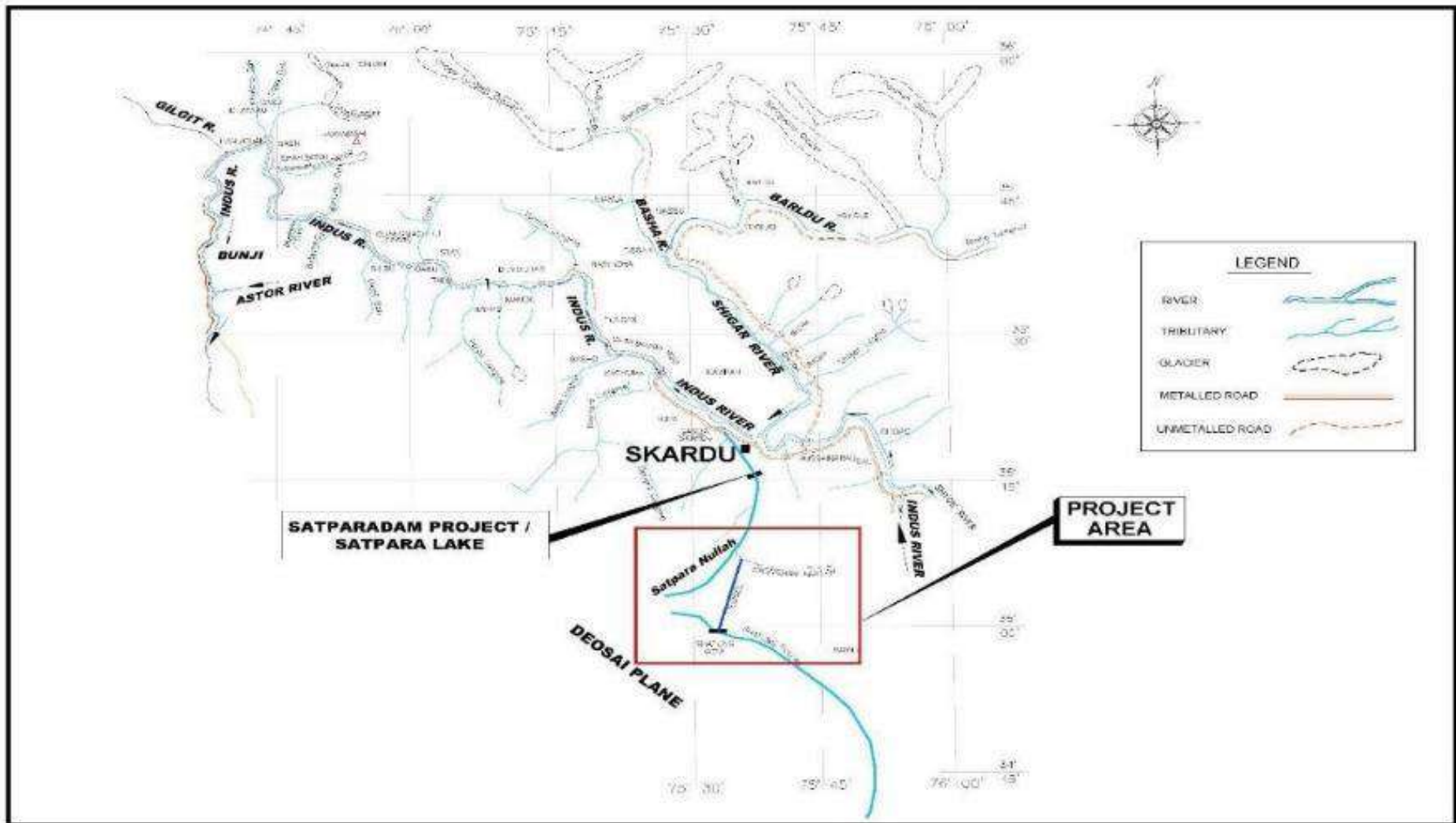


Figure 1.1: Project Location

1.3 Environmental and Social Impact Assessment Study

This ESIA has been conducted to meet the regulatory requirements set out by the Gilgit Baltistan Act 2015 (GB-EPA 2014), and Pakistan Environmental Assessment Regulation, 2000. The study also meets World Bank operational policies.

The present environmental and social impact assessment (ESIA) presents the environment and socio-economic baseline conditions of the project area, identifies potential impacts of the project on the environment and people, proposes appropriate mitigation measures to address the identified potential impacts, and includes details of consultations. An Environmental and Social Management and Monitoring Plan (ESMMP) is also included in this ESIA to address potential impacts as well as to enhance the environment and social benefits of the project. In addition, Resettlement Action Plan (RAP) also prepared to respectively address the resettlement impacts and related social impacts of the project.

1.4 Study Objective

The main objectives of carrying out Environment and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) study is to comply with the legal requirements of the Government of Pakistan, Government of GB and World Bank and obtaining environmental clearance from the regulatory agencies. This will be accomplished through the following:

- Carry out field surveys in detail, data collection from the secondary sources, laboratory test analyses of noise, air and water quality for preparation of ESIA studies;
- The investigations and studies will be of such quality as to allow client to arrive at definite decisions on project implementation and to enable WAPDA to make a definite decision regarding project implementation;
- Accomplish the ESIA & RAP studies with a level and degree of details on each aspect for meeting the acceptability criteria of international lending agencies that can be approached for funding of the project;
- Provide information for decision-making on the environmental and social consequences of proposed project interventions;

- Determine potential environmental impacts and assess these in terms of severity, magnitude and timescale;
- Promote environmentally and socially sound and sustainable development through identification of appropriate enhancement and mitigation measures and monitoring programs that will be required to ensure development of the project without significant adverse impacts;
- Meet all the provincial, national, international and WB standards;
- Public consultation and information disclosure, including amongst the local community;

1.5 ESIA Methodology

ESIA commenced with the review of technical details and preceding environmental assessment reports conducted for this project. This was followed by a reconnaissance site visit and discussion with the implementing agency to reconfirm the technical details of the project improvement work. This helped to identify those environmental attributes which may get altered with the passage of time and incorporate additional information to the baseline environmental scenario/environmental setting of the project. Further steps followed for ESIA has been concisely described in following paragraphs.

ESIA extent has been decided considering all likely impacts and risks analyzed in the context of the project's area of influence encompassing (i) the primary project site(s) and related facilities like site clearance, utility shifting etc. (ii) associated facilities project viz. Borrowing, quarrying, disposal of debris, construction camp etc. (iii) Areas and communities potentially affected by impacts and (iv) potential impact from unplanned but predictable developments caused by the project that may occur at later stage or at a different location.

Review of Country's Legal Framework: Pakistan has a well-defined policy/legal framework for safeguard of environment. Prior to initiation of any civil work, it is essential to analyze the various permissions/clearances required for any developmental project.

Primary Data Collection: Environmental resource inventory has been prepared for all environmental features viz. terrain, land use, waterways/water bodies, vegetation,

sensitive receptors, common property resources, utilities, drainage, flooding/ water logging, industries, accident prone areas etc. within the area of interest/core zone. Information about this has been collected by trained persons under the supervision of an expert team. Similarly, biodiversity survey was also carried out. Baseline monitoring was conducted at the locations as per slandered of WB and Government of Pakistan.

Secondary Data Collection: Secondary sources include published government reports, environmental impact assessments conducted in the similar region, government websites, recognized institutions and relevant government departments (forest, irrigation, pollution control, fisheries, statistics, Meteorological Department etc. Recent Google images have been captured to view environmental features at regional scale.

Public Consultation: Meaningful consultations were organized with all the Stake holders, local people/beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information's were gathered about existing baseline environmental condition viz. ambient levels and its effects on health, water resources, water logging/flooding, flora and fauna, socio-economic standing of local people, impact due to loss of land other assets and common property resources, accident risk during construction and operation stage, perceived benefits and losses, etc. Information thus gathered was used to integrate it in project design and formulate mitigation measures and environmental management plan.

Other Tools, Surveys and Studies: Assessment of land use of larger area beyond the project site has been prepared for better planning and decision-making. A detailed Bio-diversity assessment was also carried out to generate baseline on floral and faunal elements in the project area. Because almost whole of the project area falls in the territory of Protected Area. Therefore, comprehensive Critical Habitat Study (CHA) and Biodiversity Action Plan (BAP) were prepared as special deliverables. The survey also helped in assessing impact on any rare threatened or endangered species of flora and fauna in the project area. Extensive air, noise, water quality monitoring & analysis has been carried out in the project RoW.

Assessment of Potential Impacts: The assessment of the type, nature, direct, indirect, or induced impacts and their significance to the physical, biological, and socio-

economic components of the environment has been done to ascertain whether the project is environmentally sustainable or not. Nature of impacts has been classified as significant, insignificant, short-term, long-term, reversible, irreversible etc. After identification of nature and extent of impacts, mitigation measures have been suggested.

Preparation of the Environment Management Plan: The project specific Environment Management Plan (EMP) was formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes:

- Mitigation of potentially adverse impacts
- Monitoring of impacts and mitigation measures during project implementation and operation
- Institutional capacity building and training
- Compliance to statutory requirements
- Integration of EMP with Project planning, design, construction and operation.

Environment Monitoring Plan: The monitoring and evaluation are critical activities in implementation of the project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. The environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and these result in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMP.

The broad objectives are:

- To evaluate the performance of mitigation measures proposed in the EMP.
- To evaluate the adequacy of environmental assessment.
- To suggest ongoing improvements in management plan based on the monitoring

- To enhance environmental quality through proper implementation of mitigation measures.
- To meet existing environmental regulatory framework and community obligations.

Performance Indicators: The significant physical, biological and social components affecting the environment at critical locations serve as wider/overall performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring because of their regulatory importance and the availability of standardized procedures and relevant expertise. Performance indicators requiring quantitative measurements are:

- Air quality with respect to PM2.5, PM10, NOx and SO2 at selected location.
- Water quality as per National Quality Standards
- Noise levels as per National Quality Standards
- Survival rates of trees planted as compensatory plantation.

The ESIA methodology chart is presented in **Figure 1.2**.

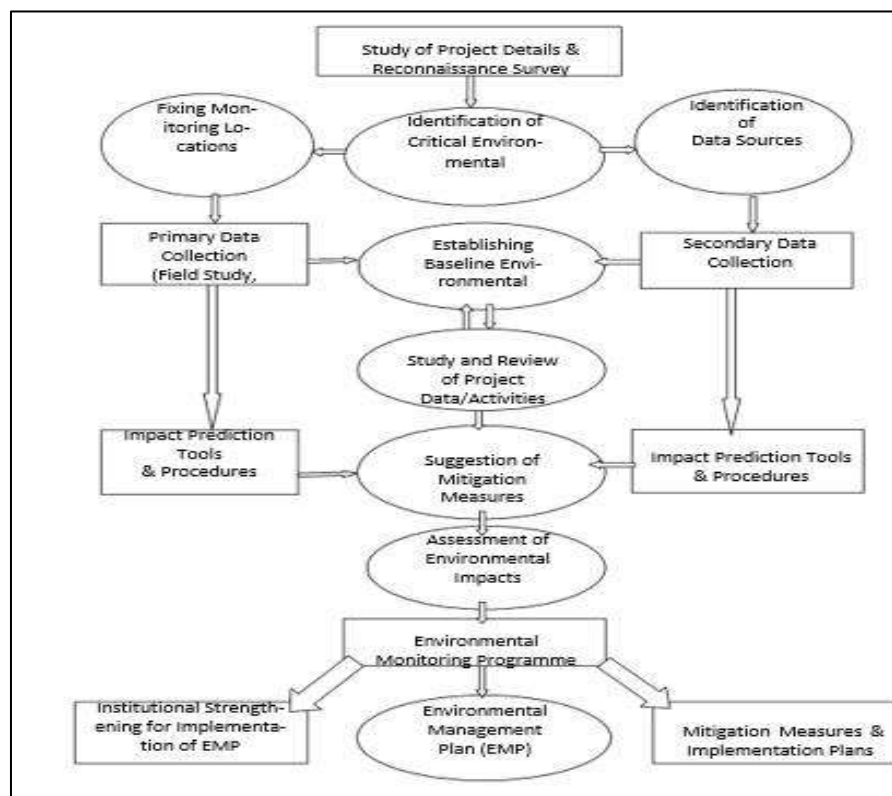


Figure 1.2: ESIA Methodology Chart

1.6 ESIA Process

The first step in ESIA process was to assess the proposed project. The assessment was based on technical, environmental, socioeconomic and cultural heritage criteria with the aim to identify a technically feasible option with the least environmental, socioeconomic and cultural heritage impacts. After the selection of alternatives, the Scoping process commenced with the aim to define the required scope of the ESIA. This report presents the findings of this activity. The schematic process of ESIA is shown in **Figure 1.3**.

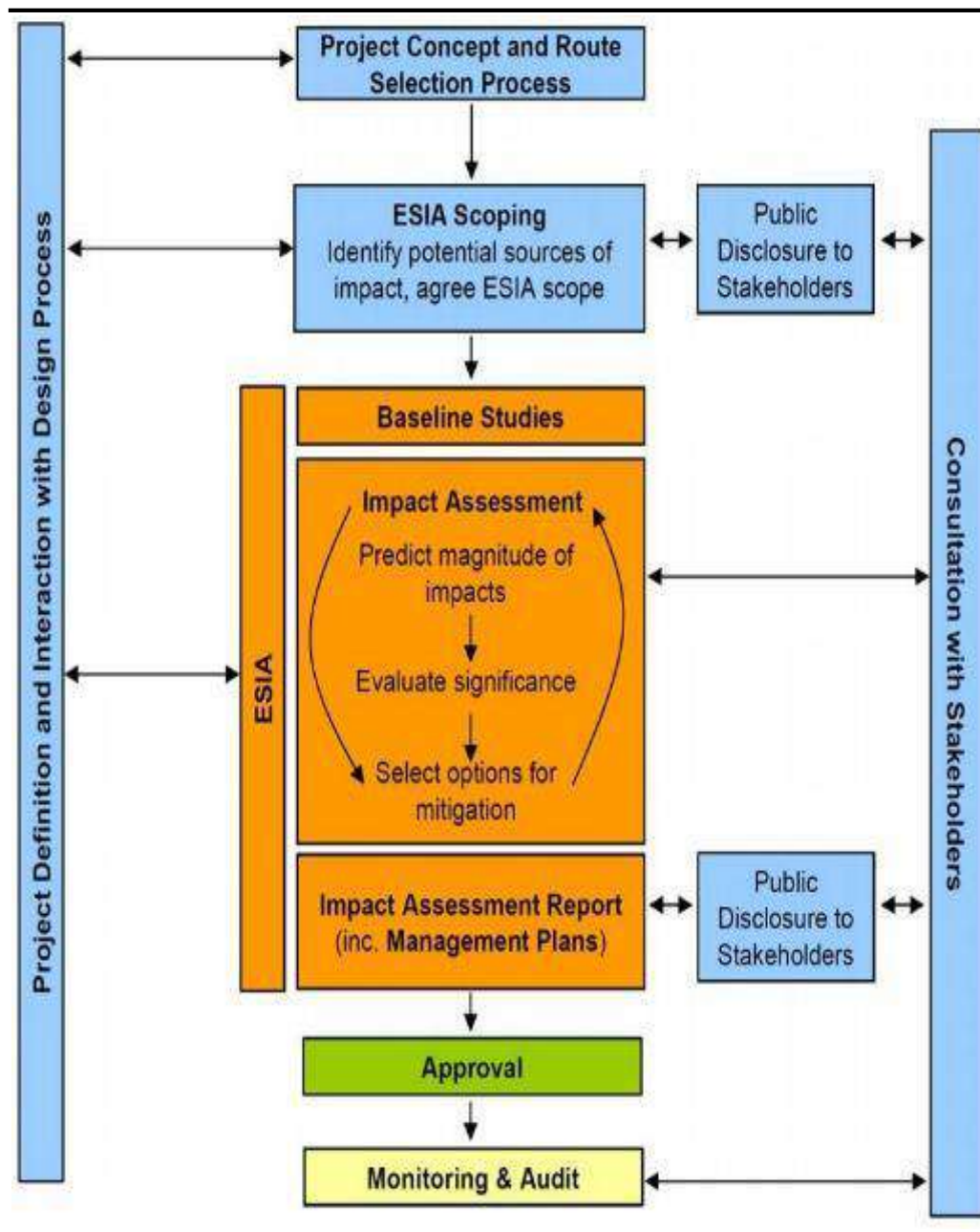


Figure 1.3: Schematics Process of ESIA

Scoping: Scoping identifies the key issues to be addressed in the ESIA Scoping, as presented in this report, ensure that the process is focused on the potentially significant environmental and social impacts which may arise from the project. It will take into account the results of consultations undertaken to date on the project. Ultimately scoping defines the scope of work of the ESIA, including stakeholder engagement.

Baseline Studies: For the key issues identified in scoping, available information on the existing environmental and social conditions (also referred to as baseline conditions) have been gathered. This has been supplemented by field studies and surveys where necessary. The future development of the baseline conditions in the absence of the project have also been considered.

1.7 Study Team

The main study team for this ESIA study includes:

Sr.	Name	Position
1	Shabir Ahmad Khan	Environmental Expert
2	Dr Ashraf Bodla	Biodiversity Expert
3	Moazzam Ali	Environmentalist
4	Dr Jamil Khan	Social Expert
5	Ali Salman Zafar	Environmentalist
6	Dr Salar Ahmad	Flora Taxonomist

1.8 Report Structure

This report includes following Chapters/Sections:

Section 1: Introduction: Provides a Background of the Project and Rationale for Carrying Out the Study;

Section 2: Review of Policy, Legal and Institutional Framework: Provides a Brief overview of the relevant EPA and International ESIA Regulatory Framework and International Best Practice;

Section 3: Project Description: Describes the Main Components of the Project and the Main Construction, Pre-Commissioning, Operation and Decommissioning Activities;

Section 4: Analysis of Alternatives: Analyze the Different Options for Project Alternatives with Respect to Technical, Socio – Economic and Environmental Viability;

Section 5: Baseline Environment: Provides an Overview of the Baseline Environmental Condition I.E. Physical, Biological and Socioeconomic and Cultural Heritage Characteristics of the Study Area;

Section 6: Land Acquisition & Resettlement: This section comprises of land acquisition & Resettlement Impacts if any?

Section 7: Potential Environmental & Social Impacts and Mitigation Measures: Summarizes Potential Significant Environmental, Socioeconomic and Cultural Heritage Impacts;

Section 8: Environmental and Social Management Plan (ESMP): Presents the Environment and Social Management Plans and Monitoring Indicators during Pre-Construction, Construction and Operational Stages;

Section 9: Public Consultation and Disclosure: Presents the Proposals for Consultation with Identified External Stakeholders, Including Affected Communities, who may have an interest in the project during scoping. The Section also summarizes the consultation activities undertaken earlier in the ESIA process.

Section 10: Grievance Redressal Mechanism: Represents the Mechanism to Redresses the Public & Stake holder Grievance's if any?

Section 11: Conclusion and Recommendations

2. POLICIES, LEGAL FRAMEWORK AND RELEVANT LAWS

This section deals with the current environmental policy as well as legal and administrative framework related to carrying out the Environmental & Social Impact Assessment (ESIA) of Shatung Nallah project. All the relevant provisions of Environmental policies and Guidelines of GB-EPA, Pak-EPA, World Bank and legal frameworks have been duly discussed.

The proposed project requires an ESIA in accordance with the GB Environmental Protection Act, 2014 and IEE/EIA Regulations, 2014 and to fulfill requirements of international financial institutions.

Upon a careful perusal of these legal frameworks the project has been categorized under Category “A” of World Bank O.P 4.01 ‘Environmental Assessment’ and Schedule II according to the Review of EIA and IEE Regulations, 2000 set by the Pakistan Environmental Protection agency and thus requires the formulation of an Environmental Impact Assessment/ Environmental and Social Impact Assessment study for the proposed project.

2.1 Historical and Constitutional Context

The development of statutory and other instruments for environmental management has steadily gained priority in Pakistan since the late 1970s. The Pakistan Environmental Protection Ordinance (PEPO), 1983 was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed, in 1984, by the establishment of the Pakistan Environmental Protection Agency (Pak-EPA), the primary government institution at that time dealing with environmental issues.

Significant work on developing environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy (NCS). Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. In 1997, the Pakistan Environmental Protection Act (PEPA) 1997 was enacted to replace the 1983 Ordinance. PEPA conferred broad-based enforcement powers to the environmental protection agencies. This was followed by the publication of the Pakistan Environmental Protection Agency Review of Initial Environmental

Examination and Environmental Impact Assessment Regulations 2000 which provided the necessary details on the preparation, submission, and review of Initial Environmental Examinations (IEE) and Environmental Impact Assessments (EIA).

Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the 'Concurrent List' contained subjects regarding which both the federal and provincial governments could enact laws. The subject of "Environmental Pollution and Ecology" was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment, this subject is now in the exclusive domain of the provincial government. The main consequences of this change were as follows:

The Ministry of Environment at the federal level was abolished. Its functions related to the national environmental management were transferred to the provinces. To manage the international obligations in the context of environment, a new ministry—the "Ministry of Climate Change" was created at the federal level.

The PEPA 1997 is technically no longer applicable to the provinces. The provinces were required to enact their own legislation for environmental protection. However, to ensure legal continuity PEPA 1997 continued to be the legal instrument for environmental protection in the provinces till enactment of provincial laws.

All four provinces have enacted their own environmental protection laws. These provincial laws are largely based on PEPA 1997 and; hence; provide the same level of environmental protection as the parent law.

2.2 National Constitutional, Policy, and Legislative Framework

Pakistan has in place a comprehensive constitutional, policy, and legislative framework for the protection of the environment and people. This section is structured around the constitutional foundation and legislative hierarchy. An overview of relevant national policies is presented, followed by separate discussion of national and provincial environmental and social legislation applicable to the Project and supporting guidance documents. National and provincial regulatory authorities with mandate to oversee

implementation of and compliance with, environmental and social legislation are introduced at the end of the section.

2.2.1 Constitution

Whilst the constitution of the Islamic Republic of Pakistan is silent on the topic of environmental protection as such, however the Constitution does ensure the “right to life” and the “right to dignity” under Articles 9 and 14 of the Constitution. According to these Articles, the right to clean environment is a fundamental right of all citizens of Pakistan, as defined by the Supreme Court of Pakistan. In addition, the Constitution also supports the “promotion of social justice and eradication of social evils” (paragraph 37) and requires that the state makes “provision for securing just and humane conditions of work, ensuring that children’s and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment” (Paragraph 37(e)).

2.2.2 Environmental & Social Policy Framework

The environmental and social policies guiding the legislative framework in Pakistan are summarized in **Table 2.1**.

Table 2.1: National Policies Relevant to the Project

Policy	Content Summary	Relevance to the Project
National Conservation Strategy (1992)	<p>The Pakistan National Conservation Strategy (NCS) is the principal policy document for environmental issues in the country and was developed and approved by the Government of Pakistan on March 01, 1992. The NCS deals with 14 core areas:</p> <ul style="list-style-type: none"> Maintaining soils in cropland Increasing irrigation efficiency Protecting watersheds Supporting forestry and plantations Restoring rangelands and improving livestock Protecting water bodies and sustaining fisheries Conserving biodiversity Increasing energy efficiency Developing and deploying material for renewable energy Preventing/abating pollution Managing urban wastes Supporting institutions for common resources Integrating population and environmental programs Preserving cultural heritage. 	This ESIA considers impacts on all relevant environmental issues specified in this Strategy.
National Environmental Policy (NEP) (2005)	The NEP was implemented in 2005 to provide an overarching framework for addressing Pakistan's environmental issues. It provides directions for addressing	The present ESIA has been prepared in consistence with this Policy

Policy	Content Summary	Relevance to the Project
	sectorial issues and provides a means for promoting conservation and environmental protection in water, air and waste management, forestry, and transport. The NEP aims to promote protection of the environment, the honoring of international obligations, sustainable management of resources and economic growth.	
National Water Policy 2018 (NWP)	Objectives of the NWP include, amongst others, efficient management and conservation of existing water resources, optimal development of potential water resources and improved flood control and protective measures.	Protection of water resources has been considered in this EIA.
National Forest Policy 2010 (NFP)	The NFP establishes the policy framework for the restoration, development, conservation and sustainable management of forests and allied natural resources. It seeks to ensure the sustainability of ecosystem functions, services and benefits for present and future generations.	Protection of forest resources has been considered in this ESIA.
National Climate Change Policy, 2012 (NCCP)	In September, 2012 Government of Pakistan launched its National Climate Change Policy. Environmental assessment is integrated in the preamble of the policy. The policy commits for taking appropriate measures for mitigation and adaptation to climate change through tools of environmental assessment.	The present ESIA has been prepared in consistence with this Policy

2.2.3 Environmental and Social Legislation

2.2.3.1 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment.

The act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. As defined in the Act "environment" means: "(a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the inter-relationships between any of the factors in sub-clauses (a) to (f).

2.2.3.2 Pakistan EPA (Review of IEE and EIA) Regulations, 2000

The IEE/EIA Regulations 2000 establish the framework for the preparation, submission, and review of the IEE and EIA. The Regulations categorize development projects for IEE and EIA into two schedules (Schedules I and II). Schedule I includes projects where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule II covers major projects that have the potential to affect a large number of people in addition to generating potentially significant adverse environmental impacts. Preparation of a complete EIA is required for Schedule II projects. Under the IEE/EIA Regulations 2000, Construction of Federal, Provincial Highways likely to cause adverse environmental effect. The proposed project is therefore classified as a Schedule II project and hence an EIA is required to be carried out. After the 18th amendment, Pakistani constitution decentralized environmental management responsibilities, according to IEE/EIA Regulations, the project also falls in schedule-II and requires and ESIA.

National guidelines for undertaking ESIA in accordance with the IEE/EIA Regulations 2000 include the Policy and Procedures for Filing, Review and Approval of Environmental Assessments, 1997 and Guidelines for the Preparation and Review of Environmental Reports, 1997. The ESIA approval process in Pakistan as described in these Guidelines is illustrated in **Figure 2.1**.

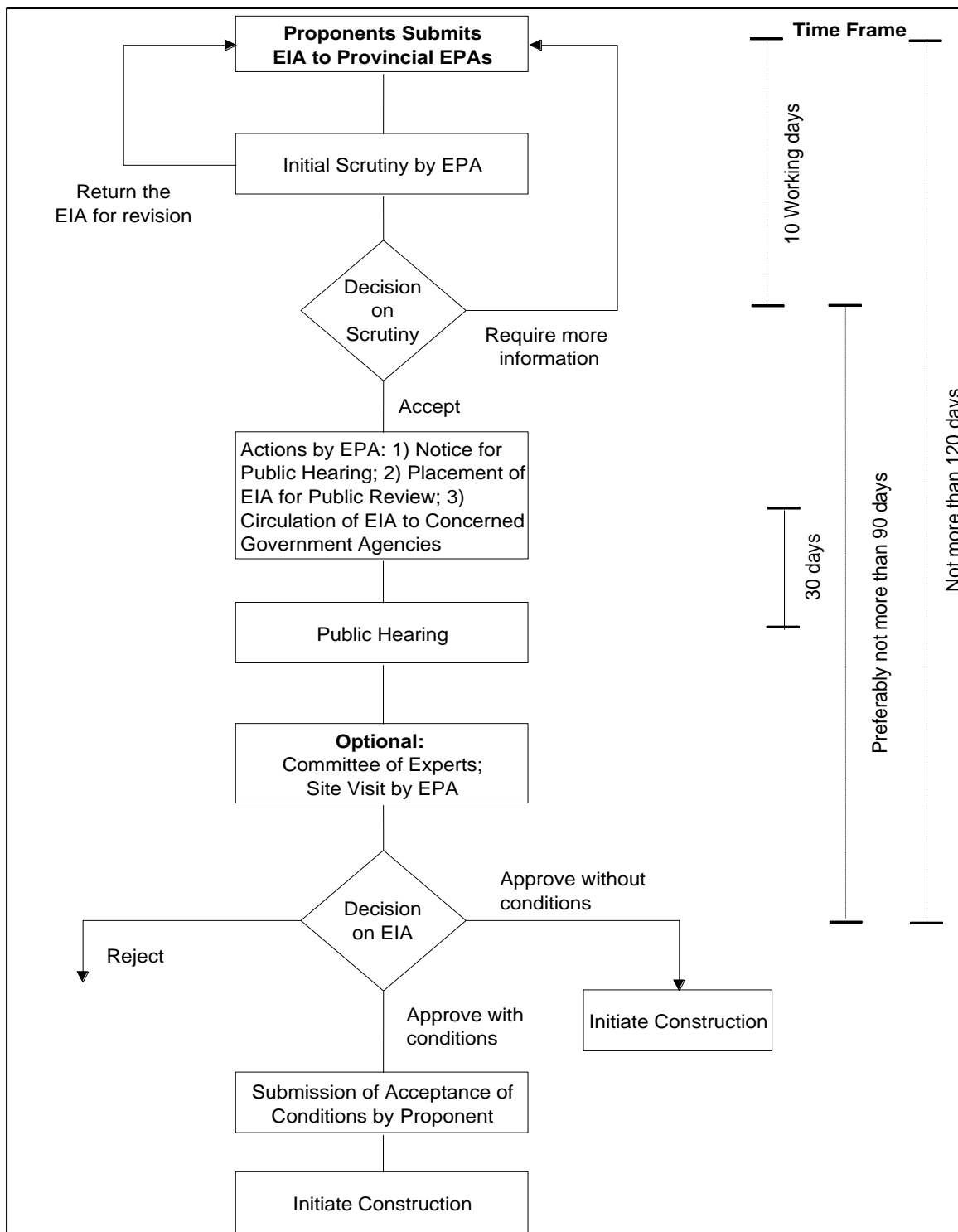


Figure 2.1: ESIA Process in Pakistan

2.2.3.3 GB-EPA Environmental Impact Assessment Act, 2014

In 2010, through the 18th Amendment to the Constitution of the Islamic Republic of Pakistan, 1973, environment became a purely provincial subject, empowering each province to make its own law and the role of Federal EPA has been limited to the jurisdiction of Capital Islamabad. In 2015, Gilgit-Baltistan framed its own law and

adopted the Federal Act with minor amendments, calling it The Gilgit-Baltistan Environmental Protection Act, 2014. Under Section 5(1) of the Act the Govt of Gilgit-Baltistan established the Gilgit-Baltistan Environmental Protection Agency, to exercise the powers and perform the functions assigned to it under the provisions of this Act and the rules and regulations. Similarly, the Act bound the Project Proponent(s) to submit relevant IEE and EIA report(s) of proposed project(s) falls within the provincial boundaries of Gilgit-Baltistan to GB-EPA for requisite review and approval.

Gilgit-Baltistan Legislative Assembly enacted “The Gilgit Baltistan Environmental Protection Act, 2014” to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto. The act comprises on twelve parts and is applicable and covers almost all environmental domains such as air, ecology, biodiversity, water and soil, etc. A framework for establishment of Gilgit-Baltistan Environmental Protection Council, Gilgit-Baltistan Environmental Protection Agency, Gilgit-Baltistan Sustainable Development Fund, Environmental Courts and Green Courts has been developed in the Act. Similarly, the Act also deals with environmental examinations, assessments, monitoring and auditing. Following **Table 2.2** provides key abstracts of the Act that have a direct bearing, but not limited to these, on the proposed Project:

Table 2.2: Key Abstracts of Gilgit Baltistan Environmental Protection Act, 2014

Part	Section of the Act	Brief Description
Part V - Prohibitions and Enforcement	11. “Prohibition of certain discharges or emissions”	“Subject to the provisions of this Act ^{2 3} and the rules and regulations, no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the Gilgit-Baltistan Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6”.
		“Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or otherwise use or deal with any hazardous substance except— “

² According to GB Environment Protection Act 2014 “Initial Environmental Examination” means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impacts on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impact assessment.”

³ According to GB Environment Protection Act 2014 “environmental impact assessment” means an environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mediatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;

Part	Section of the Act	Brief Description
	13. "Handling of hazardous substances"	(a) under a license issued by the Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law, rule, regulation or notification for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party.
	14. "Prohibition of import of hazardous waste"	"No person shall import hazardous waste into Gilgit-Baltistan."
	15. "Regulation of motorvehicles"	"(1) Subject to the provisions of this Act, and its rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Gilgit-Baltistan Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6."
Part Vi - Environmental Examinations and Assessments	16. "Initial environmental examination ¹ and environmental impact assessment ² "	"(1) No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof." "(2) The Agency shall – (a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental impact assessment by the proponent."
	18. "Environmental monitoring"	"(1) The Agency shall carry out or arrange environmental monitoring of all projects in the province in respect of which it has approved an environmental impact assessment to determine whether the actual environmental impact exceeds the level predicted in the assessment or whether the conditions of the approval are being complied with." "(2) For purposes of sub-section (1), the Agency may require the person in charge of a project to furnish such information as it may specify pertaining to the environmental impact of the project, including data regarding: (a) discharge of effluents and waste and emissions of air pollutants and noise from the project on daily, weekly, monthly or annual basis; (b) Ambient quality of the air, water and soil before, during and after construction, and during operation, of the project."
Part Vii - Environmental	20. "Environmental Protection Order"	"(1) Where the Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other act or omission is likely to occur, or is occurring, or has occurred, in violation of any provision of this Act, the rules or regulations or of the conditions of a license, or is likely to cause, or is causing or has caused an adverse environmental effect, the Agency may, after giving the person responsible for such discharge, emission, disposal, handling, act or omission an opportunity of being heard, by order direct such person to take such measures as the Agency may consider necessary within such period as may be specified in the order."

Part	Section of the Act	Brief Description
Part VIII – Offences and Penalties	21. “Penalties”	(1) Whoever contravenes or fails to comply with the provisions of sections 11,14, 16 and 20 or any order passed issued there under shall be punishable with a fine which may extend to one million Rupees, and in the case of a continuing contravention or failure, with an additional fine which may extend to one thousand Rupees for every day during which such contravention or failure continues: Provided that if the contravention of the provisions of section 11 also constitutes a contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2).
	23. “Offences by Government Agencies, local authorities or local councils”	“Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of or is attributable to any negligence on the part of, the Head or any other officer of the Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.”
Part XI - Access to Information	31. “Access to information”	“Every citizen shall have the right to obtain from any Government Agency any information pertaining to the environment in the possession of such Government Agency, including information regarding an initial environmental examination or environmental impact assessment filed by the proponent of a project, in accordance with such procedure as may be prescribed:” “Provided that no information shall be disclosed by such Government Agency which relates to—(i) trade, manufacturing or business activities, processes or techniques of a proprietary nature, or financial, commercial, scientific or technical matters which the proponent has requested should remain confidential, unless for reasons to be recorded in writing, the Director General of the Agency is of the opinion that the request for confidentiality is not well- founded or the public interest in the disclosure outweighs the possible prejudice to the competitive position of the project or its proponent.”

2.3 Factories Act, 1934 (as amended to 1997)

The clauses relevant to the project are those which concern health, safety and welfare of workers, disposal of solid wastes and effluents, and damage to private and public property. The Factories Act also provides regulations for handling and disposal of toxic and hazardous materials. As construction activity is classified as ‘industry’, these regulations will be applicable to the EPC Contractor. Particular sections of the act applicable to project are:

Section 13(1): Every factory shall be kept clean and free from effluvia arising from any drain, privy or other nuisance.

Section 14(1): Effective arrangements shall be made in every factory for the disposal of wastes and effluents due to the manufacturing process carried on therein.

Section 16(1): In every factory in which, by reason of the manufacturing process carried on, there is given off any dust or fume or other impurity of such a nature and to such an extent as is likely to be injurious or offensive to the workers employed therein, effective measures shall be taken to prevent its accumulation in any work-room and its inhalation by workers and if any exhaust appliance is necessary for this purpose, it shall be applied as near as possible to the point of origin of the dust, fume or other impurity, and such point shall be enclosed so far as possible.

Section 16 (2): In any factory no stationary internal combustion engine shall be operated unless the exhaust is conducted into open air and exhaust pipes are insulated to prevent scalding and radiation heat, and no internal combustion engine shall be operated in any room unless effective measures have been taken to prevent such accumulation of fumes there from as are likely to be injurious to the workers employed in the work-room.

Section 20 (1): In every factory effective arrangement shall be made to provide and maintain at suitable points conveniently situated for all workers employed therein a sufficient supply of whole-some drinking water.

2.4 Labor Laws

Labor laws in Pakistan are governed by many legislative tools. Principal labor rights are provided by the constitution of Pakistan. In addition to constitutional rights, acts and ordinances have been enforced time to time for limiting working hours, minimum working age, and conditions of employment.

Of the 24 labor-related laws that existed in 2014 in Pakistan, those set out in Table 2.2 relate directly to the International Labor Organization's (ILO's) core labor standards and will broadly be applicable to the proposed project.

Pakistan has ratified the ILO conventions for the core labor standards including:

- Freedom of association and collective bargaining (conventions 87 and 98)
- Elimination of forced and compulsory labor (conventions 29 and 105)
- Elimination of discrimination in respect of employment and occupation (conventions 100 and 111)
- Abolition of child labor (conventions 138 and 182).

Pakistan has also ratified the United Nations (UN) Convention on the Rights of the Child in 1990 but is not yet subscribed to the UN Convention of the Protection of the Rights of all Migrant Workers and Members of their Families. The related ILO law is shown in **Table 2.3**.

Table 2.3: Laws Related Directly to the ILO Core Labor Standards

Legislation / Guidelines	<i>Brief Description</i>
Employment of Children Act (1991)	<p>Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows child labor in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth years of age.</p> <p>The ECA states that no child shall be employed or permitted to work in any occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out. The processes defined in the Act include carpet weaving, beeri (type of cigarette) making, cement manufacturing, textile, construction and others).</p>

2.5 Land Acquisition Act

The Land Acquisition Act (LAA) of 1894 provides for the acquisition of private properties for public purposes including development projects in Pakistan. It comprises 55 sections dealing with area notifications, survey, acquisition, compensation, apportionment awards, disputes resolutions, penalties and exemptions. The key clauses of the Act are summarized in **Table 2.4**.

Table 2.4: Key Clauses of Land Acquisition Act

LAA Section	Description
Section 4	Publication of preliminary notification and power for conducting survey.
Section 5	Formal notification of land needed for a public purpose. Section 5a covering the need for enquiry of the concerns or grievances of the affected people related to land prices.
Section 6	The Government makes a more formal declaration of intent to acquire land.
Section 7	The Land Commissioner shall direct the Land Acquisition Collector (LAC) to take order the acquisition of the land.
Section 8	The LAC has then to direct that the land acquired to be physically marked out, measured and planned.
Section 9	The LAC gives notice to all project-affected persons (PAPs) that the Government intends to take possession of the land and if they have any claims for compensation then these claims are to be made to him at an appointed time.
Section 10	Delegates power to the LAC to record statements of the PAPs in the area of land to be acquired or any part thereof as co-proprietor, sub-proprietor, mortgage, and tenant or otherwise.
Section 11	Enables the Collector to make enquiries into the measurements, value and claim and then to issue the final "award". The award includes the land's marked area and the valuation of compensation.
Section 16	When the LAC has made an award under Section 11, he will then take possession and the land shall thereupon vest absolutely in the Government, free from all encumbrances.
Section 17	Special powers in cases of urgency.
Section 18	In case of dissatisfaction with the award, PAPs may request the LAC to refer the case onward to the court for a decision. This does not affect the Government taking possession of land.

LAA Section	Description
Section 23	The award of compensation to the title holders for acquired land is determined at: i) its market value of land, ii) loss of standing crops, trees and structures, iii) any damage sustained at the time of possession, iv) injurious affect to other property (moveable or immoveable) or his earnings, v) expanses incidental to compelled relocation of the residence or business and vi diminution of the profits between the time of publication of Section 6 and the time of taking possession plus 15% premium in view of the compulsory nature of the acquisition for public purposes.
Section 28	Relates to the determination of compensation values and interest premium for land acquisition.
Section 31	Section 31 provides that the LAC can, instead of awarding cash compensation in respect of any land, make any arrangement with a person having an interest in such land, including the grant of other lands in exchange.
Section 48A (LAA-1986)	If within a period of one year from the date of publication of declaration under section 6 in respect of any land, the Collector has not made an award under section 11 in respect to such land, the owner of the land shall, unless he has been to a material extent responsible for the delay be entitled to receive compensation for the damage suffered by him in consequence of the delay.

2.6 Gilgit Baltistan Biodiversity⁴ Specific Legislation's

2.6.1 Gilgit Baltistan (Northern Areas) Wildlife Preservation Act, 1975

Wildlife Preservation Act 1975, a very important legal document for preservation of wildlife, provides insight for formation of Northern Areas Wildlife Board, establishment of National Parks, Wildlife Reserves and Wildlife Sanctuaries, provision of certificates of lawful possession and the issuing of hunting licenses etc. This Act not only prohibits use of National Parks for residential purposes but also regulates hunting activities aforesaid area(s). Illegal hunting, fire arm, introduction of domestic animal(s), grass

⁴ According to GB Environment Protection Act, 2014 "biodiversity" or "biological diversity" means the variability among living organisms from all sources, including *inter alia* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species and of ecosystems.

fire, cultivation, and pollution to water bodies and introduction of any exotic animal or plant into a National Park etc. is strictly prohibited under the Act. The Act also banned use of inhumane methods for hunting and imposes certain other limitations, such as time of day, season and area in which hunting is permitted. The Act contains a detail of animals which can be hunted on small and big game shooting licenses.

2.6.2 Gilgit Baltistan (Northern Areas) Fisheries Act, 1975

This Act consolidate the law(s) relating to fisheries in the Gilgit-Baltistan and is to enforce the overall protection of fisheries resources through issuance of permits to catch fish. Destruction of Fish by use of explosive material, poisoning of water and lime or noxious material is strictly prohibited under the Act. The law also forbids the use of net or fixed engine traps without a permit or license and fish catching is completely banned during the breeding season. Section-06 of the Act provides details about species of fish and relevant prohibition period.

2.6.3 The Gilgit-Baltistan Forest Act, 2019

The Gilgit-Baltistan Forest Act, 2019 covers whole of the Gilgit-Baltistan and is applicable to all forests, including natural forests, private forests of District Diamer, planted forests, watershed areas, rangelands, wastelands, wetlands, river and stream beds, and glaciers and their biodiversity and allied resources found in forests and such lands or areas, whether government owned, community or privately owned. It also extends to trees grown under farm forestry and social forestry.

The Act provides broad details about ownership of forests, forest lands, ecosystem products and services of protected forests, aims and objectives, principles, policy, strategy and institutional arrangements, organization, functions and administration, financial provisions, protected forests, village forests, private forests, regulated landscapes and reserved trees, wastelands, riverbeds and Khalisa lands, forest planning and management, forest management and multilateral environmental agreements (MEAS), participation of stakeholders and communities in forest planning and management, building forest ecosystem services and climate change mitigation, adaptation and forest carbon programs and projects, trade and traffic of forest and biodiversity products, control of timber and other forest produce in transit, sale and sawing of timber, collection of drift and stranded timber, duty and fees on timber and other forest and renewable natural resources produce, control over non-timber forest

products (NTFPs) including medicinal and aromatic plants (maps), promotion of private sector, sustainable use of forest and other renewable natural resource products, in-situ conservation of forest genetic resources, ex-situ conservation of forests, forest protection and general restrictions, prevention, detection, suppression, investigation and prosecution of offences, adjudication of forest offence cases, information gathering, surveys, monitoring and evaluation, research, training and education, powers, duties and obligations of forest officers, rights, duties and obligations of local communities, duties and obligations of other government functionaries, offences and penalties, enforcement and compliance, conservation orders, easements and incentives, offenders, dues recoverable and recovery, acquisition of land and other property and appointment of experts, general and miscellaneous provisions, repeal, savings, removal of difficulties and transitional provisions, rules making and overriding effect etc.

Schedule-1 of the Act completed with a list of protected trees found in protected forests, private forests, and protected wastelands and for levy of royalty, duty and Schedule-2 contains list of threatened and endangered species available in Gilgit-Baltistan.

2.6.4 The Gilgit-Baltistan Prohibition of Employment of Children Act, 2019

Article 11 of the Government of Gilgit-Baltistan Order, 2018 provides that no child below the age of fourteen years shall be engaged in any factory or mine or any other hazardous employment. The Gilgit-Baltistan Prohibition of Employment of Children Act, 2019 further prohibit the employment of children and to regulate employment of adolescents in certain occupations and processes in Gilgit-Baltistan. Under the Act Building and Construction Industry categorized as Hazardous Work⁵. Section-13 of the Act deals with occupational health and safety provisions at workplace to adolescent⁶ employee.

⁵ According to the Gilgit-Baltistan Prohibition of Employment of Children Act, 2019 "Hazardous Work" means the work which, by its nature or the circumstances in which it is carried out, is likely to cause harm to health, safety or morals of children and adolescents and includes occupations and processes mentioned in Part-I & II of the Schedule.

⁶ According to the Gilgit-Baltistan Prohibition of Employment of Children Act, 2019 "Adolescent" means a person who has completed his fourteenth but has not completed eighteenth year of his age;

2.6.5 The Gilgit-Baltistan Disaster Management Act, No. II of 2017

This Act has been enacted for the establishment of a Disaster Management System in Gilgit- Baltistan. The Act highlight roles and responsibilities of the concerned authorities and procedures for establishment of Disaster Management Commission, constitution of District Disaster Management Authority, measures to be adopted by the Government for Disaster Management, functions of the Local Authority, establishment of Gilgit-Baltistan Institute of Disaster Management, establishment of Gilgit-Baltistan Disaster Response Force and other requisite measures compulsory for Disaster Management matters.

2.6.6 The Gilgit-Baltistan Local Government Act, 2014

The Local Government System in Gilgit-Baltistan is based on Gilgit-Baltistan Local Government Act, 2014. This Act empowers Local Bodies to enforce laws for land use; conservation of natural vegetation; air, water, and land pollution; disposal of solid waste and wastewater effluents; and public health and safety, including some provisions for environmental protection. Section 48 of the Act pertains to environmental pollution, under which the local council(s) are authorized to prepare and implement schemes for the prevention of the pollution of air and for the prevention of pollution of water or land. The Local Councils of the project area have been consulted for their views on the project interventions, and mitigations are proposed based on their views.

2.7 Secondary and Complimentary Environmental Legislation

An overview of secondary and complimentary legislation relevant to the environmental and social aspects of the Project is presented in **Table 2.5**.

Table 2.5: Secondary and Complimentary Social and Environmental Legislation

Legislation / Guidelines	Brief Description	Relevance to the Current Project
National Environmental Quality Standards 2012	Powers for regulating Environmental Quality Standards (EQS) transferred from the national government to the provincial governments in 2012. The EQS are materially the same as the National EQS (NEQS) that were established in 1993 and were subject to amendment in 2000, 2009 and 2010. EQS relevant to the Project include: Municipal and liquid industrial effluents (32 parameters)	The proposed project will comply with these standards.

Legislation / Guidelines	Brief Description	Relevance to the Current Project
	<p>Industrial gaseous emissions (18 parameters)</p> <p>Motor vehicle exhaust and noise (used and new vehicles)</p> <p>Ambient air quality (9 parameters)</p> <p>Drinking water quality (32 parameters)</p> <p>Noise (four zones during day and night).</p>	
<p>Forest Act (1927) and Forest (Amendment) Act (2010)</p>	<p>The Forest Act of 1927 establishes the right of Government of Pakistan (GOP) to designate areas of reserved forest, village forest and protected forest. GOP is enabled to acquire such areas in order to prohibit or restrict the public use of such resources or other activities within them.</p>	<p>It has been confirmed in consultation with the Forest Department of both the provinces that no such areas are present within the Project Area of Influence (AOI).</p>
<p>Protection of Trees and Brushwood Act (1949)</p>	<p>The Protection of Trees and Brushwood Act of 1949 prohibits the cutting or lopping of trees along roads and canals planted by the Forest Department unless prior permission of the Forest Department is obtained.</p>	<p>ESIA has been prepared in consistence with this Act. EPC Contractor will have to comply with this Act.</p>
<p>Antiquity Act (1975)</p>	<p>The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The act is designed to protect defined “antiquities” from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest and national monuments. The law prohibits new construction in the proximity of a protected antiquity and empowers GOP to prohibit excavation in any area which may contain articles of archaeological significance. The guideline procedure for Environment Assessment recommended by the GB-EPA reads as follows:</p> <p>“If the proponent or the consultant identifies an archaeological site that appears to be of importance but the site is not listed, they should discuss the site with the relevant conservation authority”.</p> <p>“The relevant conservation authority should inform the Responsible Authority of their assessment of the significance of the likely impact of the proposed development early in the process, in order for the Responsible Authority to determine the level of documentation required. The GB-EPA will then be in a position to review the level of reporting required in the light of advice from the Archaeology Department”.</p>	<p>There are no known antiquities in the project area. Chance Find procedures have been included in this ESIA. EPC Contractor will have to comply with this Act.</p>

Legislation / Guidelines	Brief Description	Relevance to the Current Project
Motor Vehicle Ordinance (1965) and Rules (1969)	<p>The ordinance deals with the licensing requirement for driving; powers of licensing authority, Regional Transport Authority and those of Court vis-à-vis disqualification for license and registration requirements to control road transport; compensations for the death of or injury to a passenger of public carrier; powers of Road Transport Corporation; traffic rules, power to limit speed, weight, use of vehicles; power to erect traffic signs; specific duties of drivers in case of accident and powers of police officers to check and penalize traffic offenders.</p> <p>All vehicles used during construction/operation of the Project, by Proponent, Consultants and the EPC contractor will be subject to this Motor Vehicle Ordinance 1965 and rules 1969.</p>	The EPC Contractor will have to comply with these Rules.
Highway Safety Ordinance (2000)	<p>This Ordinance includes provisions for licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control offences, penalties and procedures; and the establishment of a police force for motorways and national highways to regulate and control the traffic as well as keep the highways clear of encroachments.</p>	The EPC Contractor will have to comply with this Ordinance.
Pakistan Penal Code (1860)	<p>The Pakistan Penal Code deals with offences where public or private property and/or human lives are affected due to the intentional or accidental misconduct of an individual or body of people. In the context of the environment, the Penal Code empowers local authorities to control noise, toxic emissions and disposal of effluents.</p>	The EPC Contractor will have to comply with this Code.
Pakistan Explosives Act (1894)	<p>The Pakistan Explosive Act of 1884 provides regulations for the handling, transportation and use of explosives during quarrying, blasting and other purposes. The quarrying of stone for rip rap or concrete aggregates may need blasting at the quarry site. In this event these regulations will be applicable for this project.</p>	The EPC Contractor will have to comply with this Act.
Regulation of Mines and Oil Fields/ Mineral Development Act (1948)	<p>This legislation provides regulatory procedures for the quarrying and mining of construction material on public as well as private lands.</p>	The EPC Contractor will have to comply with this Act.

2.8 Environmental Guidelines

A number of guidance documents have been published by GoP that set out more details on how environment policy and legislation are expected to be implemented in practice. Environmental guidance documents relevant to the Project are listed in **Table 2.6**.

Table 2.6: Environmental Guidelines

Legislation / Guidelines	Brief Description	Relevance to the current project
Policy and Procedures for the Filing, Review and Approval of Environmental Assessments (1997)	<p>These Guidelines define the policy context and the administrative procedures that govern the environmental assessment process, from the project prefeasibility stage to the approval of the environmental report.</p> <p>Requirements for the preparation of an Environmental Management Plan (EMP) are also covered. An EMP is defined as a “document designed to ensure that the commitments in the Environmental Report, subsequent review reports, and Environmental Approval conditions are fully implemented” and is “usually finalized during or following detailed design of the proposal, after Environmental Approval of the development application”.</p>	The ESIA has been prepared in compliance with this policy
Guidelines for the Preparation and Review of Environmental Reports (1997)	<p>These guidelines address project proponents, and specify the:</p> <p>Nature of the information to be included in environmental reports</p> <p>Need to incorporate suitable mitigation measures into every stage of project implementation</p> <p>Requirement to specify monitoring procedures</p> <p>TORs for the reports to be prepared by the project proponents.</p>	These policies are applicable for review of ESIA
Guidelines for Public Consultation (1997)	The Guidelines for Public Consultation cover approaches and techniques for effective public consultation. An effective consultation strategy is considered to be one that captures the views of all major stakeholders, allowing for the incorporation of concerns in the impact assessment.	Consultations have been carried out during ESIA preparation in accordance with these Guidelines
Guidelines for Sensitive and Critical Areas (1997)	These Guidelines establish environmental assessment procedures (including formal checklists) that are to be followed by projects that are located within or near to officially protected areas in Pakistan. Officially protected areas include those designated to protect critical ecosystems such as biosphere reserves, national parks, wildlife sanctuaries and preserves, and archaeological sites.	The Project area falls in protected areas,

2.9 International Treaties and Conventions

Pakistan is a signatory to a number of international environment and social related treaties, conventions, declarations and protocols. The following are the relevant international treaties and conventions to which Pakistan is a party:

- Convention on the Conservation of Migratory Species of Wild Animals

- Convention on International Trade in Endangered Species (CITES),
- Convention on Wetlands of International Importance
- Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal
- Convention concerning the Protection of World Culture and Natural Heritage
- Convention on the International Trade in Endangered Species
- International plant protection convention
- International Covenant on Economic, Social and Cultural Rights
- International Labor Organization's (ILO) Core Labor Standards on
- Freedom of association (convention 87)
- Elimination of forced and compulsory labor (conventions 29 and 105)
- Elimination of discrimination in respect of employment and occupation (conventions 100 and 111)
- Abolition of child labor (conventions 138 and 182)
- Kyoto Protocol to the Convention United Nations Framework on Climate Change
- Stockholm Convention on Persistent Organic Pollutants
- United Nations Convention on Biological Diversity
- United Nations Convention on the Rights of the Child
- United Nations Framework Convention on Climate Change.

2.10 Environmental Regulatory Authorities

A number of national and provincial governmental agencies perform functions relevant to the Project. These agencies and their relationship to the Project are discussed below.

2.10.1 Ministry of Climate Change

The Environment Division of the Ministry of Climate Change at federal level is the focal agency for national policy, legislation, plans, strategies and programs with regard to

disaster management and climate change including environmental protection and preservation. The division also deals with other countries, international agencies and forums for coordination, monitoring and implementation of environmental agreements. Policies set by the Ministry of Climate Change will influence the design and operation of the project.

2.10.2 Other Provincial Departments

The key relevant departments and their roles are summarized below.

- Department of Forest
- Preparation and implementation of policies and programs in forestry sector.
- Implementation of Forestry Laws and rules.
- Protection, conservation, development and management of renewable natural resources, particularly forests and range lands in the province.
- Sustainable management of forest for production of timber, firewood and other non-timber produce and services.
- Demarcation and protection of Forest lands against encroachment.
- Raising of nurseries and plantations.
- Provide extension services for mass awareness and conduct research and training for capacity building.
- The Forest Department will be involved in case of the need to fell any trees in the government forests.
- Department of Wildlife
- Protection, conservation, preservation and management of wildlife.
- Management of protected areas, wildlife parks, safaris and zoos.
- Public and private participation through trophy hunting, private breeding farms and hunting associations.
- Department of Fisheries
- Extension services/fish farming/aquaculture development.
- Conservation, management and development of natural resources.

- Production of fish seed under controlled conditions.
- Research and training activities.
- Introduction of new technologies for enhancing fish production.

The Fisheries Department will be involved in case of any damage to any fish resources and fish ponds caused by the project activities. In the proposed project, there will impact on fish, Revenue Department

Revenue department is responsible for the acquisition of land (permanent or temporary) including assessment, valuation, disbursement of compensation, and mutation in favor of Project Proponent.

- Agriculture Department

In case of impact on crops and fruit trees, the Agriculture Department is fully responsible for the assessment and valuation of losses.

- Communication & Works (C&W) Department

The C&W will be involved for the assessment and valuation of losses in case of project impact on structures/ buildings and roads.

2.11 ILO Conventions

Construction and operational activities during project implementation can affect occupational health of workers. Employers are required to abide by labor laws in respect of their own employees and also to ensure that EPC Contractors also follow the relevant labor laws and rules relating to safety of the workforce and creating a healthy working environment. The CSC consultant shall ensure that workers engaged at project site are not exposed to any danger by monitoring the Contractor's work frequently.

Pakistan is a member state of ILO and has ratified most of the important conventions as shown below in **Table 2.7**. The requirements of these conventions are mostly captured in the national laws.

Table 2.7: ILO Conventions Ratified by Pakistan

Convention	Date Ratified by Pakistan
Fundamental	
C029 Forced Labor Convention, 1930 [Convention concerning Forced or Compulsory Labor]	23 Dec 1957
C087 Freedom of Association and Protection of the Right to Organize Convention, 1948 [Convention concerning Freedom of Association and Protection of the Right to Organize]	14 Feb 1951
C098 Right to Organize and Collective Bargaining Convention, 1949 [Convention concerning the Application of the Principles of the Right to Organize and to Bargain Collectively]	26 May 1952
C100 Equal Remuneration Convention, 1951	11 Oct 2001
C105 Abolition of Forced Labor Convention, 1957 [Convention concerning the Abolition of Forced Labor]	15 Feb 1960
C111 Discrimination (Employment and Occupation) Convention, 1958 [Convention concerning Discrimination in Respect of Employment and Occupation]	24 Jan 1961
C138 Minimum Age Convention, 1973 [Convention concerning Minimum Age for Admission to Employment]	06 Jul 2006
C182 Worst Forms of Child Labor Convention, 1999 [Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labor]	11 Oct 2001
Governance	
C081 Labor Inspection Convention, 1947 [Convention concerning Labor Inspection in Industry and Commerce]	10 Oct 1953
C144 Tripartite Consultation (International Labor Standards) Convention, 1976 [Convention concerning Tripartite Consultations to Promote the Implementation of International Labor Standards]	25 Oct 1994
Technical	
C001 Hours of Work (Industry) Convention, 1919 [Convention Limiting the Hours of Work in Industrial Undertakings to Eight in the Day and Forty-eight in the Week]	14 Jul 1921

Convention	Date Ratified by Pakistan
C004 Night Work (Women) Convention, 1919 [Convention concerning Employment of Women during the Night]	14 Jul 1921
C006 Night Work of Young Persons (Industry) Convention, 1919 [Convention concerning the Night Work of Young Persons Employed in Industry]	14 Jul 1921
C014 Weekly Rest (Industry) Convention, 1921 [Convention concerning the Application of the Weekly Rest in Industrial Undertakings]	11 May 1923
C018 Workmen's Compensation (Occupational Diseases) Convention, 1925 [Convention concerning Workmen's Compensation for Occupational Diseases]	30 Sep 1927
C019 Equality of Treatment (Accident Compensation) Convention, 1925 [Convention concerning Equality of Treatment for National and Foreign Workers as regards Workmen's Compensation for Accidents]	30 Sep 1927
C089 Night Work (Women) Convention (Revised), 1948 [Convention concerning Night Work of Women Employed in Industry (Revised 1948)]	14 Feb 1951
C090 Night Work of Young Persons (Industry) Convention (Revised), 1948 [Convention concerning the Night Work of Young Persons Employed in Industry]	14 Feb 1951

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, 1975

The convention aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. It protects certain endangered species from over-exploitation by means of a system of import/export permits. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.

Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972

The primary mission of the World Heritage Convention (WHC) is to identify and conserve the world's cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through a closer co-operation among nations.

There are no world cultural or natural heritage sites within the Project corridor.

2.12 Requirements of External Support Agencies

Funds in the form of loans or grants for development Projects in Pakistan are generally available from external support agencies like the World Bank/ IFC and other bilateral organizations. As a policy matter, external support agencies lay emphasis on the protection of environment and resettlement of affected populations. Proponents of projects in Pakistan planning to receive financial support from such organizations must ensure that the projects are not harmful to the environment, and that appropriate mitigation measures are carried out, as necessary, in accordance with the requirements laid down by the external support agencies.

2.13 World Bank Safeguards Policies/Guidelines

The ESIA will comply with the World Bank safeguards requirements given in the below listed

Operational Policies (OPs) for 'Category A' projects.

OP/ BP4.01: Environmental Assessment

OP/ BP4.04: Natural Habitats

OP/ BP4.11: Physical Cultural Resources

OP/ BP4.12: Involuntary Resettlement

In addition of the above, WBG Environmental, Health, and Safety Guidelines and WB ESF/ Safeguards COVID-19 Guidelines for Construction Activities and Health and Safety will be followed. The ESIA will also comply with the National Environmental Requirements defined through Pakistan Environmental Protection Act of 1997 and subsequent provincial act, i.e., GB Environmental Protection Act (2014).

The ESIA will consider natural and social aspects in an integrated way. It will also consider the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

The applicability of environmental and social safeguard policies of the World Bank is summarized in **Table 2.8**.

Table 2.8: Applicability of WB Safeguard Policies

WB Operational Policies		Triggered		Justification/Action Taken or to be Taken
		Yes	No	
Environmental Assessment	OP/BP/GP 4.01	✓		The project has a potential to cause widespread and significant impacts hence this OP is triggered and the project is assessed as category A. The present ESIA (and RAP provided under separate covers) has been prepared in response to this OP.
Natural Habitats	OP/BP 4.04	✓		This policy is triggered since the area falls sensitive habitat in the project area.
Pest Management	OP 4.09		✓	The Project does not require the use of pesticides (or other agrochemicals).
Indigenous Peoples	OP/BP 4.10		✓	There are no distinct, vulnerable, social, and cultural groups in the project/study area which could qualify as indigenous.
Physical Cultural Resources	OP 4.11	✓		PCRs are not known to exist in the study area, however, the Chance Find procedures are included in the ESMP.
Involuntary Resettlement	OP/BP 4.12	✓	✓	The proposed project will result no resettlement impacts including damage to assets such as crops and structures; hence, this OP is triggered and a RAP has been prepared (provided separately).
Forests	OP/BP 4.36	✓		The area falls in protected area. There will be no disruption to forests whereas, the forest trees present in agriculture land will be affected.
Projects on International Waterways	OP/BP/GP 7.50		✓	No project activities will be carried out/ inside or associated with any international waterways nor will the project impact any of such waterways.
Projects In Disputed Areas	OP/BP/GP 7.60		✓	The Project is not located in or near any disputed area.
Access to Information	BP 17.50	✓		Consultations with various stakeholders including affected communities were carried out during ESIA study. The draft ESIA (and other safeguard documents) will be disclosed at WAPDA & WB website.

2.13.1 Environmental Assessment (OP/BP 4.01)

EA Requirement: The World Bank requires environmental assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. The Bank Policy OP/BP 4.01 considers that EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources); and trans-boundary and global environmental aspects. The Bank Policy also envisages that the borrower Government is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements.

The present ESIA has been prepared in compliance with this OP/BP.

EA Classification. The World Bank classifies the proposed project into one of the four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. These categories are defined below.

Category A: A proposed project is classified as Category "A" if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

Category B: A proposed project is classified as Category "B" if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category a project.

Category C: A proposed project is classified as Category “C” if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

Category FI: A proposed project is classified as Category “FI” if it involves the investment of Bank funds through a financial intermediary (FI), in sub projects that may result in adverse environmental impacts.

2.13.2 Natural Habitats (OP 4.04)

The Policy highlights the importance of conservation of natural habitats, like other measures that protect and enhance the environment, for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank also supports and expects borrowers to apply a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank- promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

2.13.3 Physical Cultural Resources (OP 4.11)

This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground, or underwater. Their cultural interest may be at the local, provincial or national level, or within the international community.

The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not

contravene either the borrower's national legislation or its obligations under relevant international environmental treaties and agreements.

2.13.4 Involuntary Resettlement (OP/BP 4.12)

The WB's experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost. This policy includes safeguards to address and mitigate these impoverishment risks.

The overall objectives of the Policy are given below:

- Involuntary resettlement "IR" 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 meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs.
- 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.

2.13.5 Environment, Health and Safety Guidelines

The Environment, Health, and Safety (EHS) Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities or projects by existing technology at reasonable costs. In addition, there are also

industry-specific EHS guidelines. The guidelines that are relevant to the Project are: General EHS Guidelines⁷.

2.13.6 Public Consultation and Disclosure Requirements by World Bank

The Bank reaffirms its recognition and endorsement of the fundamental importance of transparency and accountability to the development process. Accordingly, it is Bank's policy to be open about its activities and to welcome and seek out opportunities to explain its work to the widest possible audience. According to 'OP 4.01: Environmental Assessment' of the World Bank, the following conditions apply to the Project.

Consultations: For all Category "A" and "B" projects, the borrower should consult the project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account. The borrower should initiate such consultations as early as possible. For Category "A" projects, the borrower should consult these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower should consult with such groups throughout project implementation as necessary to address EA-related issues that affect them.

Disclosure: For a Category "A" project, the borrower should provide relevant information on project interventions in a timely manner prior to consultation and in a form and language that is understandable and accessible to the groups being consulted. The borrower should provide a summary of the proposed project's objectives, description, and potential impacts for the initial consultation. For consultation after the draft EA report is prepared, the borrower should provide a summary of the EA's conclusions. In addition, for a Category A project, the borrower makes the draft EA report available at a public place accessible to project-affected groups and local NGOs. The borrower also ensures that EA reports for Category "A" projects are made available in a public place accessible to affected groups and local NGOs. The document needs to be translated into Urdu. Public availability of the EA report for Category A project in the borrowing country and official receipt by the Bank are prerequisites to Bank appraisal of these projects

⁷ <https://docslib.org/doc/6718232/good-practice-note-road-safety-glossary>

3. THE PROJECT DESCRIPTION

3.1 Background

Shatung Nullah is a left bank tributary of Indus River. It flows in opposite direction to Satpara Nullah. Shatung Nullah flows were originally proposed to be diverted to Satpara Nullah by constructing a Diversion Weir through an Intake structure and 4 miles (6.5 Km) long tunnel. These flows were supposed to increase the generating capacity in low flow seasons and increase flow availability during crop sowing seasons.

Shatung Nullah Diversion Project was identified by Water and Power Development Authority (WAPDA) as a part of Satpara Dam Project. The main purpose of this scheme was to augment the supplies in Satpara Nullah by diverting flows from Shatung Nullah by means of a diversion weir, a connecting tunnel (about 6.5 km long) bringing the diverted water to Raghichan Nullah (main stream flowing into Satpara). Objective of this scheme (In original) was to augment the supplies to Satpara Dam for:

- Irrigation supplies for a total command area of 15,000 acres
- Drinking water supplies for Skardu up to 20 million gallons per day
- Energy generation for supplies to Skardu valley and its surroundings

The sizing of Project components of Satpara Dam was accordingly carried out by considering the diversion of Shatung Nullah. The scheme had to be deferred because of environmental concerns raised by various stakeholders especially considering the concerns of international organizations regarding vulnerable ecosystem of Desai National Park.

Skardu city and its surroundings are now facing severe shortages of irrigation and drinking water supplies. The situation of electric supplies is even worse. There are serious issues regarding quantity as well as quality of electricity in the area. There is a huge gap in supplies and demands, which is increasing by the day with increased population as well as enormous developments in tourism industry.

3.2 Location

The Shatung Nullah Diversion Project is located on Deosai Plain at an altitude above 13,000 ft. (3,962 meter) a.m.s.l. A single lane jeepable track connects the dams to the

Shatung Nullah. The Shatung Nullah is located in District Skardu of Gilgit-Baltistan area, which drains the world famous and picturesque Deosai Plains. Shatung is a left bank tributary of Indus River. The Project area is located south of Skardu city (which is 6 km (3.7 miles) south of Skardu town), approximately 30 km upstream of Satpara Dam, which is accessible in about 2 hours journey by jeep through a kacha track winding along the Satpara Nullah (**Figure 3.1**).

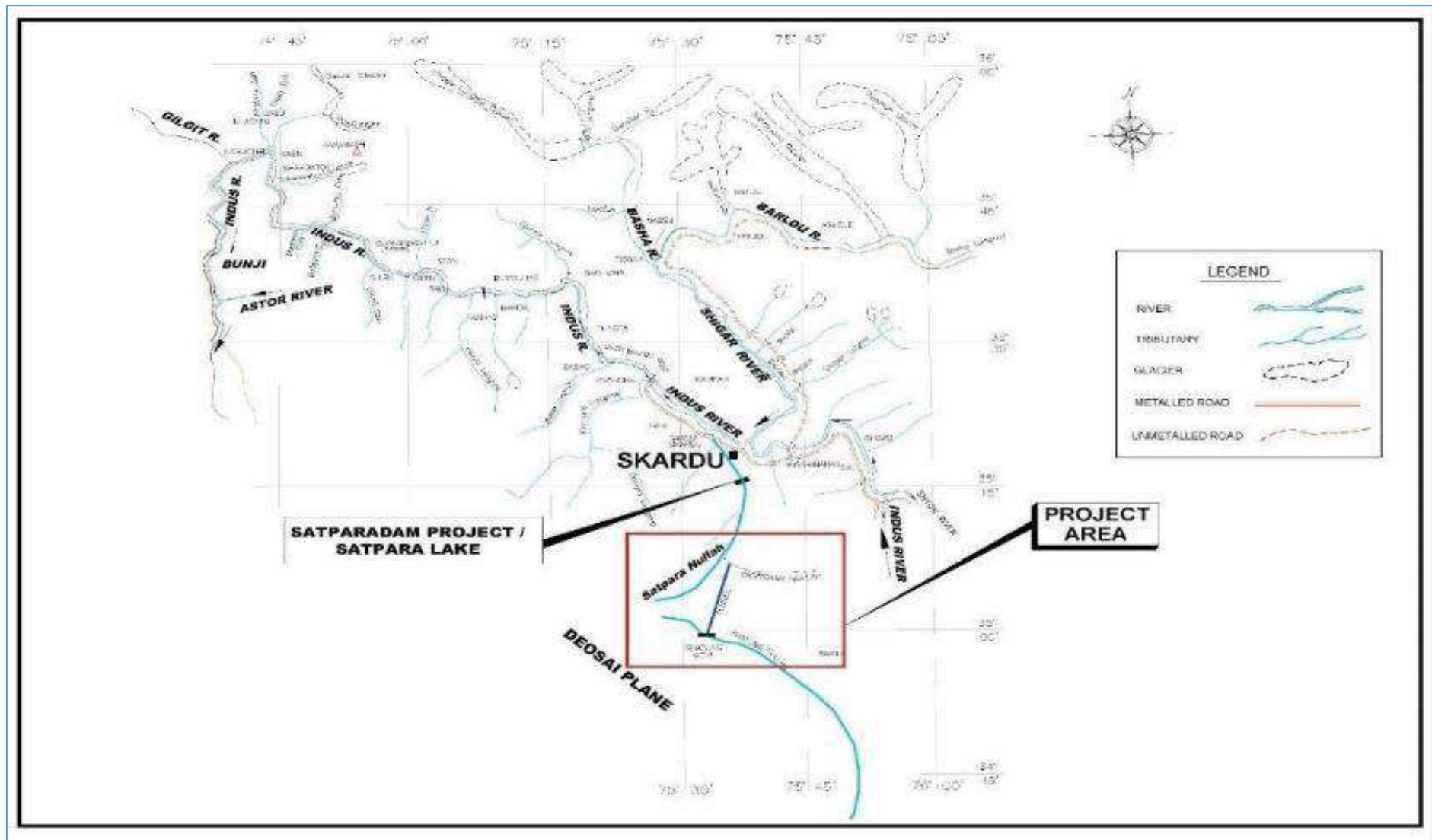


Figure 3.1: Project Location



Figure 3.2: Project Layout

The project (as initially conceived) mainly comprises of a 7 m. high free overflow diversion weir on Shatung Nullah, about 610 m. long connecting channel, a 6.5 km long diversion tunnel and an outfall structure discharging into Ragichan Nullah (which forms Satpara Nullah before flowing in to Satpara reservoir). This is shown in the following figure as Tunnel (Option-1). An alternate diversion scheme has been developed during this study, which is shown below as Tunnel (Option-2) and is discussed in detail in subsequent sections of this report. These diversion structures will enable the flows in Shatung Nullah to be diverted on its right side to flow into Satpara Dam Reservoir (**Figure 3.2**).

3.3 Satpara Dam Project Background

In the original scheme of Satpara multipurpose Dam Project, it was planned to divert part of the flows of Shatung Nullah by constructing a diversion weir through an intake structure and 6.5 km long tunnel to Satpara. These flows will increase the power generation in low flow season and increase the flow availability during crop sowing season. The main objectives of Satpara Dam Project are:

- Optimum utilization of Flows from Satpara lake
- Irrigation supplies for Total Command Area of 15,000 Acres drinking water supply of 20 million gallons/ day (MGD)
- Annual energy generation of 101 GWh by Installing Powerhouses to meet the power demand of Skardu.

Total Cultivable Command Area (CCA) Satpara Dam Project plan is 15,000 acres out of which 4,500 acres is commanded by the Right Bank Canal and 10,500 acres by Left Bank Canal. The annual crop water requirements for RBC and LBC on 10-daily basis are 8,905 Ac. ft and 19,638 Ac. ft respectively with 100% cropping intensity. Based on domestic water requirements of 20 million Gallons per day the annual water requirement for domestic water uses comes out to 4,306 Ac. ft i.e., 6.0 cusecs. Thus, the total annual irrigation and Domestic Water Requirements works out to 32,849 Acre ft.

3.4 Project Brief

3.4.1 Salient Features

Salient features of the Project as originally conceived are as follows:

Description	Original Study	Current Study
General:		
Location	30 km South of Skardu town	
Name of Tributary	Shatung Nullah, left tributary of Indus River	
Project Access:		
Location	Skardu to Satpara Dam to Ali Malik Top to Deosai Plains	
Distance	30 km (Up to Deosai Plains)	
Hydrology:		
Catchment Area at Proposed Weir Site	216 km ²	169.9 km ²
Mean Annual Flow (observed)	4.19 m ³ /s	4.77 m ³ /s
Diversion Discharge	3 m ³ /s	4.67 m ³ /s
Environmental Flows	-	0.225 m ³ /s
100-year Flood	358 m ³ /s	403.50 m ³ /s
Average Annual Sediment Inflow	2757 Tons (2.32 A-Ft)	
Diversion Weir:		
Coordinates of Weir	E 75° 33' 04.46" N 35° 02' 23.08"	E 75° 34' 28.92" N 35° 01' 28.49"
Type of Weir	Free Overflow with Gated Under-Sluices and Lateral Intake	
Height Above Existing Nullah Bed	7 m	3 m
Length of the Crest	67 m	49 m
Crest Elevation	4,032.61 m	4029 m
Undersluice Width	7.62 m	9.40 m
Undersluice Bays	2 x 3.32 m	3 x 2.60 m
Total Length of Weir	76.54 m	58.40 m
Total Length of Footbridge		61.40 m
Connecting Channel/ Desander:		
RCC Connecting Channel X-Section	2.13 m x 2.28 m	2.50 m x 2.00 m
Longitudinal Slope	1 in 500	1 in 300
Length of Connecting Channel	610 m	75 m
Desander Length (Excluding Transitions)	-	67 m
Flushing Gate	-	2 m x 2 m
Buried Conduit:		
Size	2.13 m x 2.28 m	2.50 m x 2.00 m
Longitudinal Slope	1 in 500	1 in 300
Minimum Embedment below NSL	-	1.5 m
Length (Option-1)	-	345 m
Length (Option-2)	-	3447 m
Length (Option-2A)	-	1829 m
Diversion Tunnel/ Adit:		
Internal Size of Diversion Tunnel/ Adit Tunnel	3.66 m x 3.66 m (Horseshoe Shape)	3.40 m x 3.70 m (Horseshoe Shape)
Type of Section	RCC Lined	

Description	Original Study	Current Study
Length of Diversion Tunnel (Option-1)	6500 m	6607 m
Length of Diversion Tunnel (Option-2)	-	4126 m
Length of Adit Tunnel (Option-2)	-	592 m
Length of Diversion Tunnel (Option-2A)	-	5296 m
Longitudinal Slope of Diversion Tunnel	1 in 250	1 in 1000
Outfall Structure	Stone Dumping up to Ragichan Nullah	Gabion Outfall Structure up to Ragichan Nullah

3.5 Shatung Nullah Deferment Effect.

It was expected that Shatung Nullah deferment will have no impact on water requirement of the area, however some shortfall in energy generation was expected. This deficiency was overcome by adding two more Power houses i.e., PH # 3 and PH # 4 to the Project which originally consisted of only two Power houses PH # 1 and PH # 2. After completion of Satpara Dam Project in 2010 Dam Part, the reservoir could be filled only once due to insufficiency of water. The overall record at Figure 3.3 shows a slightly decreasing trend in reservoir filling.

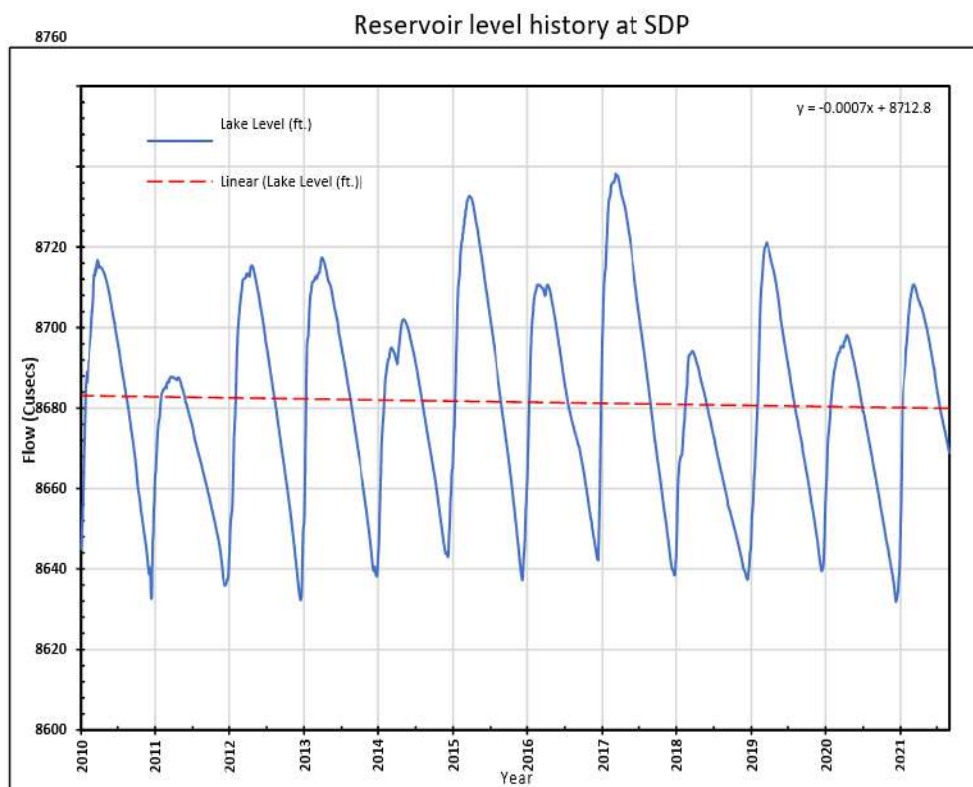


Figure 3.3: Reservoir level history at Satpara Dam Project since 2010

Environmental impacts and global warming have severely affected the main sources of water i.e., Glaciers, which are shrinking in size with the passage of time. Deosai area, the source of flows for Satpara Nullah is no exception. During the consultant's visit to Skardu, a shortfall of irrigation as well as drinking water supply was observed. This situation warrants the need for exploring additional sources of water. Diverting some of water from Shatung to Satpara Nullah through Raghichan Nullah is the only option which was originally a part of Satpara Dam Project but later, was abandoned due to environmental concerns. It is now proposed that 10 Cumecs (355 cusecs) of water be diverted to Satpara Nullah. Due to environmental concerns raised by a number of NGO's, the diversion of Shatung Nullah was deferred.

3.6 Hydraulic Design of Project Components

Hydraulic design of diversion weir, saddle dam, connecting channel, desander, buried conduit, tunnel and other project components remained in progress during the reporting period. Details are as follows:

3.6.1 Diversion Weir

Based on the hydrologic, topographic, hydrographic and geotechnical survey of the area and available published data, the diversion weir was designed using the weir formula. Under sluices are also being provided along with the main weir. The general arrangement of weir and intake is shown in **Figure 3.4**. It is proposed to have a design flood of 100 years ($403.50 \text{ m}^3/\text{s}$) for design of weir and the scheme has been checked for 1000-year flood ($538.80 \text{ m}^3/\text{s}$). The under sluice has been designed for safe passage of a 5-year flood ($172.20 \text{ m}^3/\text{s}$). This has been done in order to enable a two-stage diversion of flows during construction of weir and its appurtenant structures. The high flood levels and downstream parameters were designed on the basis of the topographic/hydrographic data and hydraulic simulation model for the design flood (HEC-RAS) results.

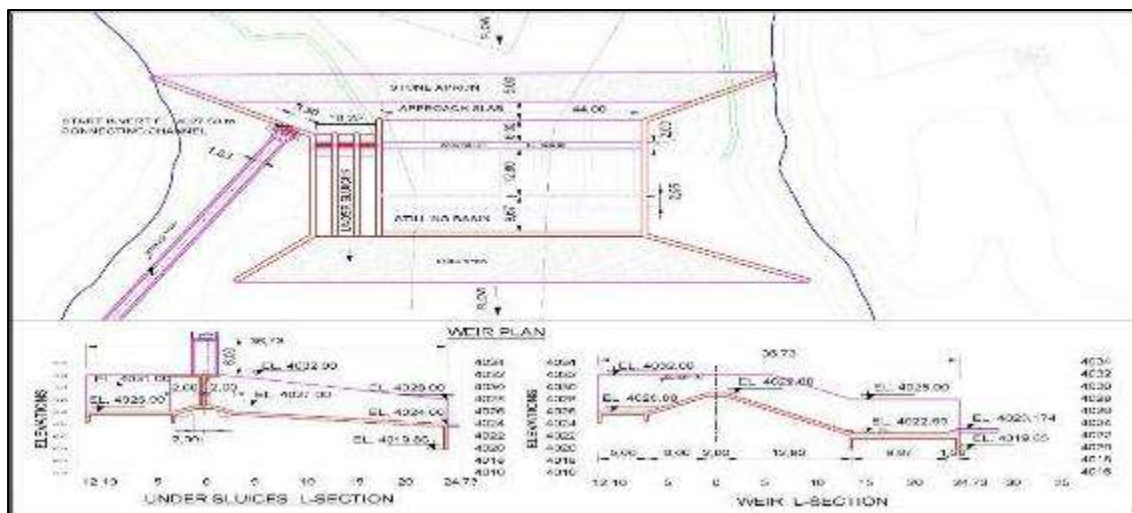


Figure 3.4: Weir Plan & Sections

The salient features of diversion weir thus designed are given below:

Description	Main Weir	Under sluice
Discharge	231.30 cumecs	172.20 cumecs (5 Year Diversion Flood)
Type of Flow	Free Overflow	Gated
No of Bays	1	3
Length of the Crest	44 m	3 x 2.75 = 8.25 m
Crest Type	Broad Crested	Broad Crested
WL u/s	4031.00 m	4031.00 m
WL d/s	4026.29 m	4026.29 m
Crest Elevation	4,029.00 m	4,027.00 m
Crest Width	2 m	2 m
u/s Bed Level	4026.00 m	4026.00 m
Type-III Stilling Basin; Cistern Level	4022.60 m	-
Floor Length	9.67 m	-
d/s Bed Level	4023.60 m	4023.60 m
u/s Top of Retaining Wall	4032.00 m	4032.00 m
d/s Top of Retaining Wall	4028.00 m	4028.00 m
u/s Cut off	1.75 m	1.75 m
d/s Cut off	2.75 m	2.75 m

3.6.2 Intake Structure

Intake structure has been provided at the right side of the diversion weir (shown in **Figure 3.4**) to divert the required amount of water towards Satpara reservoir. The computed salient features are given below;

Description	Parameters	Units
Design Discharge	4.63	Cumecs
No of Bays	2	No
Width of Bays	1.00	m
Crest Level	4027.50	m
Pond Level	4029.00	m
d/s Water Level	4028.72	m
Type of Flow	Free Flow	-
Gate Size	1.45 x 3.50	m
Bottom Lip of Gate	4027.50	m

3.6.3 Connecting Channel/ Buried Conduit

A connecting channel/ buried conduit has been provided to convey the diverted water in the tunnel (see **Figure 3.5**). The tunnel conveys water to the other side of ridge, i.e. towards the Ragichan & Satpara Nullahs. The computed salient features of connecting channel/ buried conduit are as follows;

Description	Parameters	Units
Design Discharge	4.63	cumecs
Width of Conduit	1.83	m
Flow Velocity	2.08	m/s
Design Flow Depth	1.22	m
Height of Conduit	1.52	m
Longitudinal Slope	1/300	m/m
Minimum Earth Cover on Conduit	1.5	m
Type of Flow	Free Flow	-
Manholes Spacing	500	m

Description	Parameters	Units
Length of Conduit in Option-1	345	m
Length of Conduit in Option-2	3447	m
Length of Conduit in Option-2A	1826	m

3.6.4 Desander

Since it is expected to have a design flow velocity of about 2 m/s in the buried conduit and a flow velocity of about 1.3 m/s in the diversion tunnel. As such, there is a strong possibility of having silt accumulation and choking of these channels. It was therefore considered essential to provide a desander to flush the sediments entering the intake back to the Shatung Nullah. The sediment size adopted to be removed from the desander was taken as 0.25 mm. As such a 43 m long desander has been provided along with two flushing gates (see **Figure 3.5**). The accumulated sediments shall be flushed back to Shatung Nullah. The valve for release of environmental flows has also been provided in the desander.

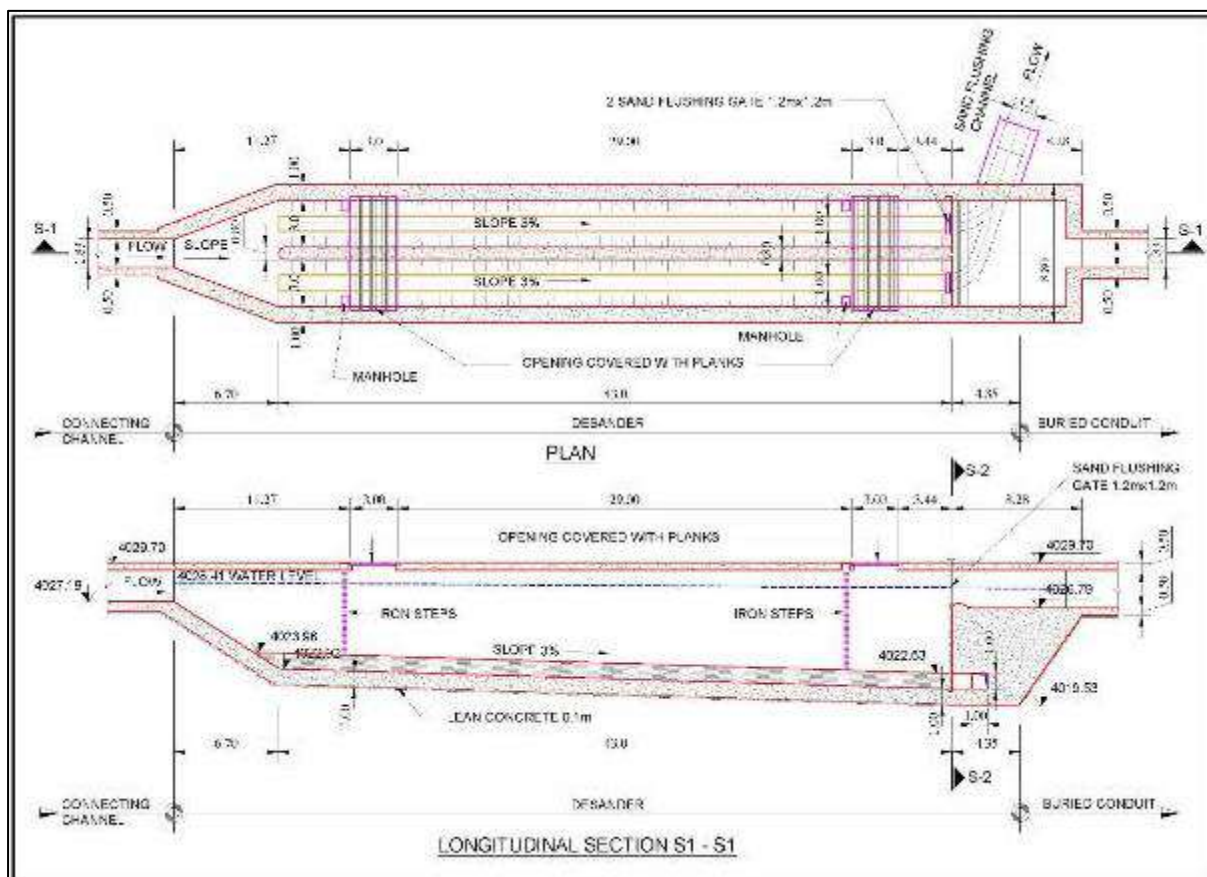


Figure 3.5: Desander Plan & Sections

3.6.5 Diversion Tunnel

A connecting Tunnel is proposed to be provided to convey the diverted water to the other side of ridge, i.e. towards the Ragichan Nullah & Satpara reservoir (See **Figure 3.6**). The computed salient features of Diversion Tunnel are as follows:

Description	Parameters	Units
Design Discharge	4.63	Cumecs
Shape	Semi Circular Horse Shoe	
Flow Velocity	1.31	m/s
Design Flow Depth	1.04	m
Width of Tunnel	3.40	m
Longitudinal Slope	1/1000	m/m
Type of Flow	Free Flow	-
Tunnel Length (Option-1)	6607	m
Tunnel Length (Option-2)	4126	m
Adit Tunnel Length (Option-2)	592	m
Tunnel Length (Option-2A)	5296	m

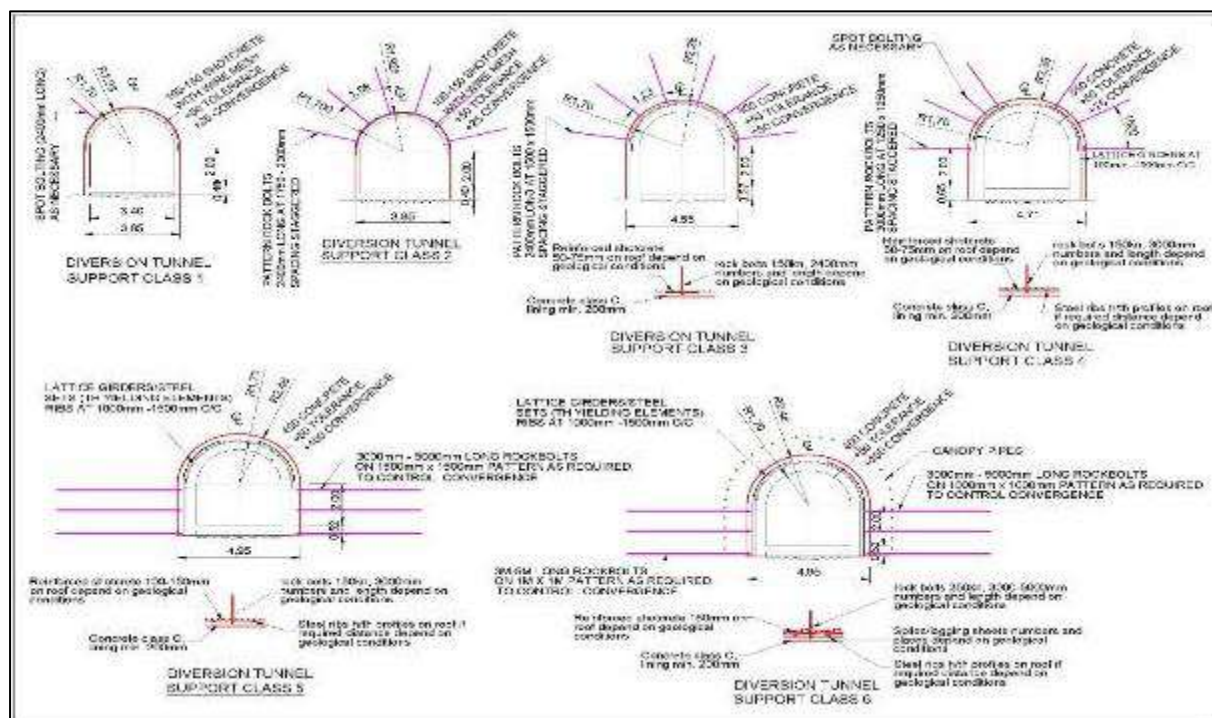


Figure 3.6: Typical Tunnel Support Sections

3.6.6 Saddle Dam

A 210 m long saddle dam shall be required so as to retain water within the proposed reservoir. Considering the availability of construction material, it is proposed to have a Concrete Face Rockfill Dam (CFRD). Detailed design of the dam is currently in progress. Detailed drawings of the designed project components are being prepared in parallel with the finalization of design.

3.6.7 Spoil Banks

In order to accommodate/ dispose of the excavated material resulting from excavation of tunnel, buried conduit, desander and connecting channel and weir etc., it is proposed to have three spoil banks near the three portals of the tunnel. Details of these spoil banks are as follows:

Name	Location & Coordinates	Size (m)	Capacity (m ³)
Spoil Bank No. 1	Near Tunnel Inlet Portal E 75° 33' 04.46" N 35° 02' 23.08"	100 x 96 x 5	48,000
Spoil Bank No. 2	Near Adit Inlet Portal E 75° 33' 04.46" N 35° 02' 23.08"	100 x 62 x 5	31,000
Spoil Bank No. 3	Near Tunnel Outlet Portal E 75° 33' 04.46" N 35° 02' 23.08"	124 x 50 x 5	31,000
Total Capacity (m³)			110,000 m³

The quantities of excavated and fill materials are given below:

Description of Activities	Excavated Material (m ³)	Fill Material (m ³)
Diversion Works		31,023
Weir and Fish Ladder	14591	3,618
Power Intake & Connecting Channel	1624.1225	325
Desander	41,878.19	21,576
Burried Conduit	309,596.51	74,794
Saddle Dam	4,498.67	5,955
Diversion Tunnel	106,264.04	
Total	478,452.14	137,290.72

4. THE ALTERNATIVES

4.1 Analysis of Alternatives

A key component in the ESIA process is the consideration of alternatives. Most guidelines use terms such as „reasonable“, „practicable“, „feasible“ or „viable“ to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

- Incrementally different (modifications) alternatives to the project; and
- Fundamentally (totally) different alternatives to the project.

Alternatives are essentially, different ways in which the developer can feasibly meet the project’s objectives, for example by carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. At the more detailed level, alternatives merge into mitigating measure where specific changes are made to the project design or to methods of construction or operation to avoid, reduce or remedy environmental effects. All ESIA systems also require developers to consider mitigation (i.e., measures to avoid, reduce and remedy significant adverse effects).

Alternatives and mitigation therefore cover a spectrum ranging from a high level to very detailed aspects of project design. The “No Project” scenario must also be considered as the baseline against which the environmental effects of the project should be considered. This section presents an analysis of the following alternatives from the perspective of economic and environmental considerations:

1. No Project Scenario
2. Site Selection Alternatives
3. Construction Alternatives
4. Contractor’s Camp Alternatives
5. Labor Alternatives

4.2 No Project Scenario

Skardu city and its surroundings are facing severe shortages of irrigation and drinking water supplies. The situation of electric supplies is even worse. There are serious issues regarding quantity as well as quality of electricity in the area. There is a huge gap in supplies and demands, which is increasing by the day with increased population. The Project aims to augment the flow availability of Satpara Dam Project throughout the year. This will be supplementing the Satpara Dam reservoir to increase water availability for power generation, for household usage as well as for irrigation during crop sowing seasons. The no project scenario will further worsen the irrigation and drinking water supply situation in the Skardu city. Insufficient water supply will adversely affect agriculture production which will have negative impact on the livelihood of local people and could lead to migration of residents of Skardu city to other areas on large scale.

Environmentally, this Project will contribute towards improving the air quality as in the long run it will displace fossil fuels used in power generation such as coal and fuel oil which increase the concentrations of pollutants in the air in the surrounding areas. The project will also reduce greenhouse gas emissions in the atmosphere due to this reason.

4.3 Site Selection Alternatives

Three options were developed on actual topographic survey as shown in the Figure 4.1. These are:

- Option-1; Diversion Tunnel Layout
- Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)
- Option-2 A; Modified Hybrid Layout

Layout of scheme previously finalized before its deferment was transferred on actual topographic data of the Project site and preliminary sizing of project components in this layout was accordingly worked out. This was named as Option-1, which is explained in the following sections of this report. Because of a flat terrain of Deosai plains and a very wide Shatung Nullah channel section, only one feasible option for construction of diversion weir could be located at site, which also allows a gravity flow into Satpara Nullah. As such, the location of diversion weir having a lateral intake was

fixed as considered originally in Option-1. Having this intake location, it is possible to convey the diverted flows from Shatung Nullah through gravity to Satpara Nullah through Ragichan Nullah, which is a right bank tributary of Satpara Nullah.

As explained above, the location of flow diversion from Shatung Nullah and outlet location in Ragichan Nullah are both mainly governed by topography of the area, which enables a gravity flow into Satpara Reservoir. As such, the intake location as well as outlet location both get fixed. The layout options thus considered in this study are the options available for conveying the water from its intake to its outlet, which are discussed in this Report.

Another option was developed through desk study of the actual topographic survey data of the scheme, which was called Option-2 and is shown in **Figure 4.1**. The diverted flows are carried to the toe of the mountain through an 84 m long connecting channel, which is same as in Option-1. This channel shall convey the diverted water to a desander, which is designed to get rid of most of sediments in flow. The skimmed water shall be conveyed through an RCC buried conduit to the diversion tunnel, which shall convey the water towards Ragichan Nullah. The conduit needs to be buried so as to avoid the effects of freezing of diverted flows. This will be a buried conduit of adequate size for conveying flows to the tunnel inlet portal (as considered previously, which has been labelled and described below as Option-1). On the outlet side i.e. left bank of Ragichan Nullah (which conveys flows to Satpara Reservoir), a possibility of developing a small hydropower scheme is being considered. Tailrace of this scheme can discharge in the Ragichan Nullah, which conveys the diverted water to Satpara Nullah leading to Satpara Dam Reservoir. The options considered for diversion in this feasibility study are as follows:

4.3.1 Option-1; Diversion Tunnel Layout

This is the original option which was considered previously by WAPDA at the time of design of Satpara Dam. This option has a tunnel length of 6607 m, along which exploratory boreholes were drilled at site. The tunnel shall be fed by a buried Conduit having a length of 345 m from desander to the inlet portal of tunnel. The tunnel invert elevation at inlet is 4025.64 m outlet portal shall have an invert elevation of 4019.03 m. Longitudinal slope of the tunnel has been taken as 1 in 1000. The outlet shall

convey water to Ragichan Nullah, which is a right bank tributary of Satpara Nullah leading the diverted flows to Satpara Dam Reservoir.

4.3.2 Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)

This option is also shown in Figure 2.1. This consists of a buried conduit having a total length of 3447 m connecting the tunnel inlet portal with the desander. About 4126 m long tunnel discharges the water at outlet side in Ragichan Nullah. The buried conduit can be aligned along the existing kachha track leading to weir site. Manholes can be provided at suitable intervals for maintenance of the conduit. The invert level of tunnel in option-2 is 4015.30 m and 4011.17 m (at its inlet and outlet respectively) with a longitudinal slope of 1 in 1000. The advantage of option-2 is that there is a possibility of providing an adit tunnel (592 m long), which shall enable a relatively shorter construction period. Period is shortened firstly because of a shorter tunnel length and secondly because of availability of additional working faces for the tunnel. It is conveniently possible to have one tunneling party working from tunnel inlet portal, second party working from tunnel outlet portal and third party working from the adit. All three parties have to carry out tunneling of about 1.6 km length each. Whereas, in Option-1 construction of adit is not feasible, therefore two tunneling parties have to perform the complete tunneling operation in excess of 3.3 km on each face of the tunnel. Both these alternatives along with the proposed adit is shown in **Figure 4.1**.

4.3.3 Option-2A; Modified Hybrid Layout

This option is also shown in **Figure 4.1**, named as Option-2A. This alternative has been developed by modifying Option-2. During a joint site visit of experts from Hydro Planning Section of WAPDA and the Consultants (July 19, 2023 to July 22, 2023), it was observed at site that the tunnel inlet as well as the adit portal of Option 2 are both located in overburden material. It would be extremely difficult to carry out tunneling by using the traditional drill & blast technique. As such, a new alignment of tunnel was identified along rock outcrops observed at site. This option was named as Option-2A.

This alternative consists of a buried conduit having a total length of 1826 m connecting the tunnel inlet portal with the desander. About 5296 m long tunnel discharges the water at outlet side in Ragichan Nullah. The buried conduit alignment is same as Option-2 but is shorter in length. The invert level of tunnel in option-2A is 4020.93 m and 4015.63 m (at its inlet and outlet respectively) with a longitudinal slope of 1 in

1000. The advantage of option-2 is that there is a possibility of providing an adit tunnel (592 m long), which shall enable a relatively shorter construction period. Period is shortened firstly because of a shorter tunnel length and secondly because of availability of additional working faces for the tunnel. It is conveniently possible to have one tunneling party working from tunnel inlet portal, second party working from tunnel outlet portal and third party working from the adit. All three parties have to carry out tunneling of about 1.6 km length each. Whereas, in Option-1 construction of adit is not feasible, therefore two tunneling parties have to perform the complete tunneling operation in excess of 3.3 km on each face of the tunnel. Both these alternatives along with the proposed adit is shown in **Figure 4.1**.

4.3.4 Open Channel Layout Option

An open channel option was considered in the study on the insistence of the locals of Skardu. They were of the opinion that an open cut option will be easier to construct and the Project can be executed in a shorter duration also. This option consists of aligning an open contour channel along the buried conduit alignment as in Option 2 (discussed above). Besides the intake of diversion tunnel, the open channel continues and crosses the ridge at Ali Malik Top (Satpara Top) by means of a deep cut towards the Satpara Nullah. The maximum depth of cut required to cross the open channel through this ridge is in excess of 110 m. Construction of such a deep cut at Deosai Top is not only technically unfeasible but environmentally a disaster for whole of Deosai National Park. As such, this option was not pursued further.

In order to discuss the open channel option, an online meeting was held on June 18, 2023 with Chief Minister (CM) Gilgit-Baltistan (GB), which was attended by General Manager (Projects) Northern Area, WAPDA as well as Project Manager/Team Leader of Project Consultants. It was desired by the CM (GB) that the Consultants should study the option of diverting the flows of Shatung Nullah to Satpara Dam via an open cut/ channel besides the other options being considered for this purpose.

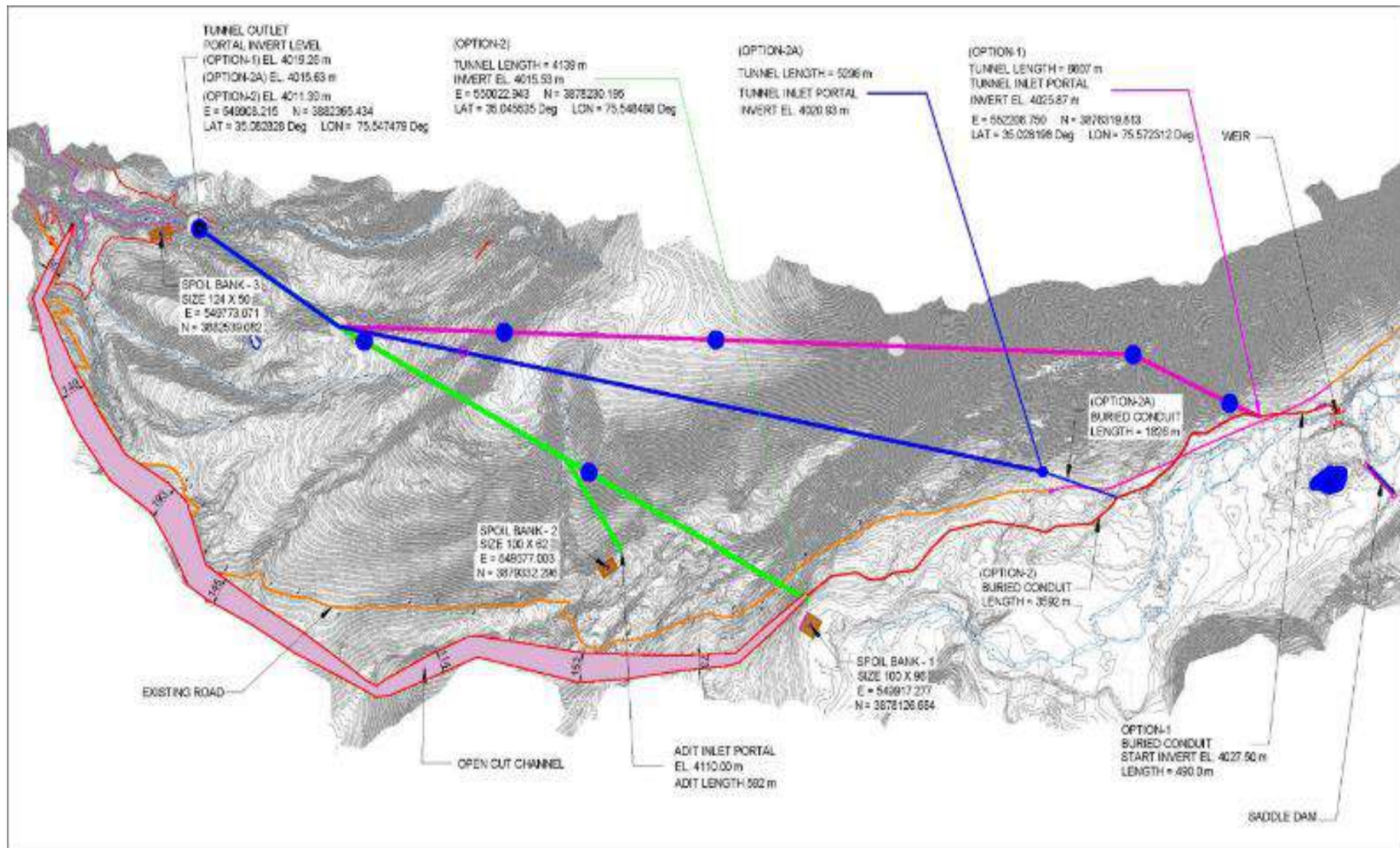


Figure 4.1: Project Layout Options

This option of open cut channel is also shown in **Figure 4.1**. Based on the available site data, the option was not considered to be a viable one since a huge cut is required to divert the flows. The maximum depth of cut is more than a hundred meters deep around Deosai top. Having a stable slope for this deep cut in a terrain such as Deosai Plains is a big engineering challenge and an environmental catastrophe for the region. In addition, keeping an open channel operational during winter months is not possible. This option can be functional only after the snow has completely melt and channel has been cleared of all blockages resulting in extremely high recurring O&M costs.

This option was discussed in detail with the District Administration of Skardu, locals of the area as well as the Ulema Council of Baltistan area (who were leading this campaign of having an open cut option) during a site visit of WAPDA and the Consultants on July 19, 2023. After detailed discussions, it was agreed that the option of having an open cut for diversion of Shatung Nullah flows is neither practicable nor technically viable.

4.3.5 Preferred Layout of Scheme

As explained above, the technically viable options are only Option-1 and Option-2A. Since the biggest challenge in construction of this Project is the construction of Diversion Tunnel. Option 2-A has been preferred on the basis of a shorter tunnel length, which can be constructed in a shorter duration compared to Option 1. As such, Option 2A has been selected as the preferred option for this Project.

The options considered in this feasibility study are as follows in **Table 4.1**.

Table 4.1: Alternatives Options

	Option-1; Diversion Tunnel Layout	Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)	Option-2 - A; Modified Hybrid Layout
Engineering Design			
Tunnel inlet Elevation	4019.03 m	4015.30 m	4020.93 m
Tunnel Length	6607	4126 m	5296 m
Tunnel outlet Elevation	4025.64 m	4015.35 m	4015.63 m
Buried Conduit length	345 m	3447 m	1826 m
Tunnel Slope	1 inch in 1000 m	1 inch in 1000 m	1 in 1000 m
Environment & Social Aspects			
Physical displacement: Economic displacement:	<ul style="list-style-type: none"> • No any physical displacement • No Economic Displacement 	<ul style="list-style-type: none"> • No any physical displacement • No Economic Displacement 	<ul style="list-style-type: none"> • No any physical displacement • No Economic Displacement

	Option-1; Diversion Tunnel Layout	Option-2; Hybrid Layout (Longer Buried Conduit & Shorter Tunnel)	Option-2 - A; Modified Hybrid Layout
Cultural and Religious sites	No Cultural & Religious sites	No Cultural & Religious sites	No Cultural & Religious sites
Ecology	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No plant species of conservation importance has been observed or reported from the Aol. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW 	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No wetlands, notified by the GOP, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW 	<ul style="list-style-type: none"> • Under Protected Area the whole project • Low impact on the flora • High impact on fauna • No wetlands, notified by the GOGB, along the alignment route. Thus, no impact on any wetland biodiversity. • No plant species of conservation importance has been observed or reported from the Aol. • No wetlands, notified by the GOP, along the alignment route. Thus, no impact on any wetland biodiversity. • No fishing activities were observed or reported in the project area. • No plant species of conservation importance has been observed or reported from the Aol. • No threatened or endemic herpetofauna species. • Water bodies are present in ROW.
Land, Residential & Commercial Structures	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership being Protected Area. • No Commercial Activities to be affected 	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership being Protected Area. • No Commercial Activities to be affected 	<ul style="list-style-type: none"> • No Land Acquisition & Resettlement involved for project, as whole land is GoGB ownership being Protected Area. • No Commercial Activities to be affected

Towards the upstream of site selected for the construction of project the width of Shatung Nullah is more than the selected site. This may result in increased cost for dam construction and will not be economically viable.

Towards the downstream of selected site, the gradient will not allow gravity flows, which may involve pumping. This will again require power supply for pump operation and will neither be an economical nor a viable option considering the electricity situation in the city. Furthermore, downstream is wider than the selected site and the construction of dam head towards downstream is not feasible.

4.4 Alternatives for the Type of Structure

Three types of main structure were considered during the feasibility study: (a) RCC; (b) a Concrete Faced Rock fill structure; and (c) an Earth fill structure. The feasibility study recommended a RCC structure on the basis of availability of construction material locally, lower cost and technical advantages. No significant differences in environmental impacts were expected among the three alternatives.

4.5 Contractor's Camp Alternatives

4.5.1 Establishment of Contractor's Camp

a) Outside Project Area:

As a construction project like diversion of water may involve influx of reasonable number of work force which will be further needed to be accommodated in a camp established by the construction contractor. The construction contractors often not aware of the sensitivity of the park and standard practices followed in National Parks while establishing camp do not heed for restoration of the key habitats (fish hatching & breeding areas, marshlands and rocky areas) disturbed by the workers. Therefore, if the contractor's camp might be established outside project area there will be minimum disturbance to natural habitat. On the other hand, the travel time and transportation cost from camp area to project site may increase.

b) Within Project Area:

Considering the time limit available to work in DNP as the park is accessible only for 4 to 5 months throughout the year, there are certain benefits of establishing contractor's camp within project area so that the efficiency of work could be improved. Contractor will have to give training to staff and workers and strictly adhere to conservation

strategy of national park to protect natural resources and unique biodiversity of the park and adopt best management practices to avoid waste pollution.

4.6 Labor Alternatives

4.6.1 Total Local Labor

The biggest advantage of hiring local labor is that they will be aware of the local customary laws and traditions and will be well adapted with harsh climatic conditions. Local labor can also help people of local community better understand the project interventions and ensure smooth functioning of the project because of well-versed with local language.

There might be constraint of availability of skilled workforce for a particular task from local area, which may require induction of skilled labor from outside. Local labor in majority may sometimes resist the recruitment of an outsider and may cause a serious conflict.

4.6.2 Total Outside Labor

The outside labor may have more skill of the particular task due to vast experience of working at different types of projects throughout the country and working under different circumstances. As compare to a remote area labor, workforce from larger cities have more technical and subject related knowledge as compared to any local worker.

Whenever there is a development project initiated in an area the local community puts utmost effort to get a job in the project, as they consider it their legal right to have economic advantage from the project. Policy of hiring 100% outside labor may cause a halt in the project activities due to the resistance of local community.

4.6.3 Mix of Local and Outside Labor

A mix of local and outside labor will be a better choice as project requirement of both skilled and unskilled labor will be fulfilled along with the demand of local community regarding job seeking and sources of livelihood. A code of conduct will have to be developed by the construction contractor to ensure better working atmosphere and ensure implementation on SOPs for conservation of national park.

5. DESCRIPTION OF BASELINE ENVIRONMENT

5.1 General

This chapter highlights the existing environmental and social conditions within the project area and its surroundings, against which the potential project impacts can be measured. The information provided in this chapter is both quantitative and qualitative and is based on secondary and primary sources data collected through field surveys conducted specifically for this study and desk studies related to the project area.

The environmental and social baseline information for the Shatung nullah Diversion Project was collected in the field during the months of September 2022 and July, 2023. Additionally, this information has been supplemented by the acquisition and review of high-resolution satellite data.

5.2 Study Area

The Shatung Nullah Diversion Project entails the diversion of the Shatung Nullah, which is a left tributary of the river Indus, into Raghichan Nullah, which leads to Satpara Nullah to enhance the generation of Satpara Dam. The Shatung nullah flows in Deosai plains which is a designated National Park located in southeast Skardu, Baltistan.

Shatung Nullah is a left tributary of Indus River. It flows in the south of the Satpara catchment. The Nullah flows in North West direction. Several small stream joins with the Shatung Nullah throughout its course. The coordinates of Weir sites are 75°34' 28.92" Longitude & 35° 1' 28.49" Latitude.

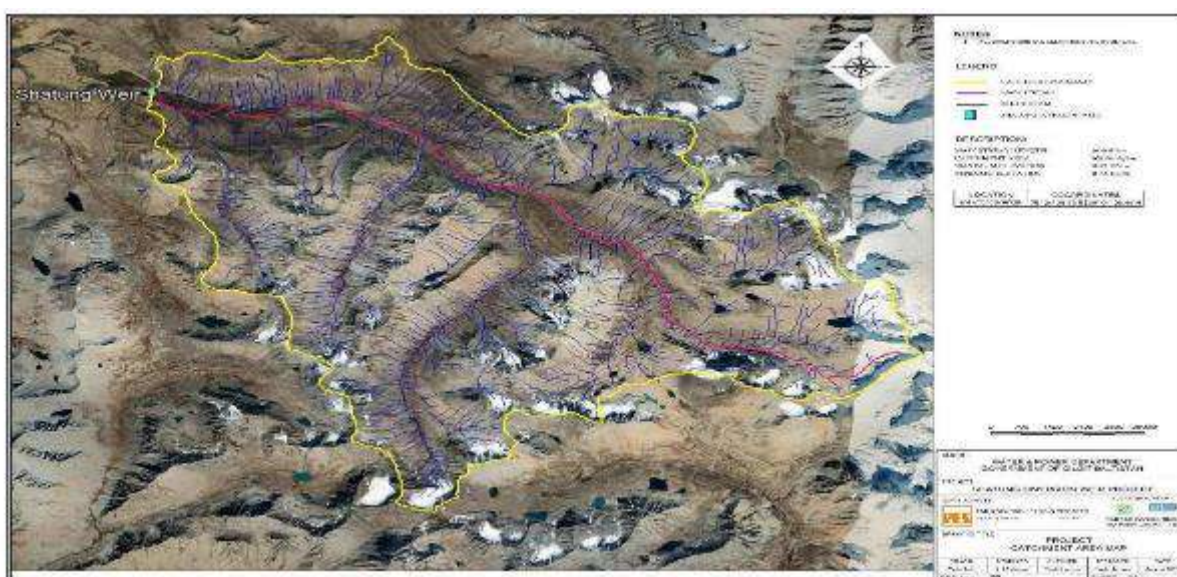


Figure 5.1: Watershed boundary for weir site

The catchment area up to proposed weir site has been measured by using GIS software. It has been estimated as 169.9 Km². Length of mainstream up to proposed weir site is about 26.60 Km with an average slope of about 5 percent. The watershed boundary along with its network of smaller streams for the proposed weir site is shown in **Figure 5.1**.

5.3 Area of Influence

Direct Area of Influence or Corridor of Impact: The Direct Area of Influence (AOI) or corridor of impact refers to the corridor or area that will be directly affected by the project activities. For this project, the right of way (RoW), measures between 10m (5 m on either side), which is also the direct area of influence.

Indirect Area of Influence or Corridor of Impact: The indirect area of influence refers to the area that will have indirect impacts of the project activities. For this project, the indirect AOI was selected to be about 65 Sq. km. to study the flora, fauna, noise and other constructional impacts of the proposed project. **Figure 5.2** given below for Area of Influence.

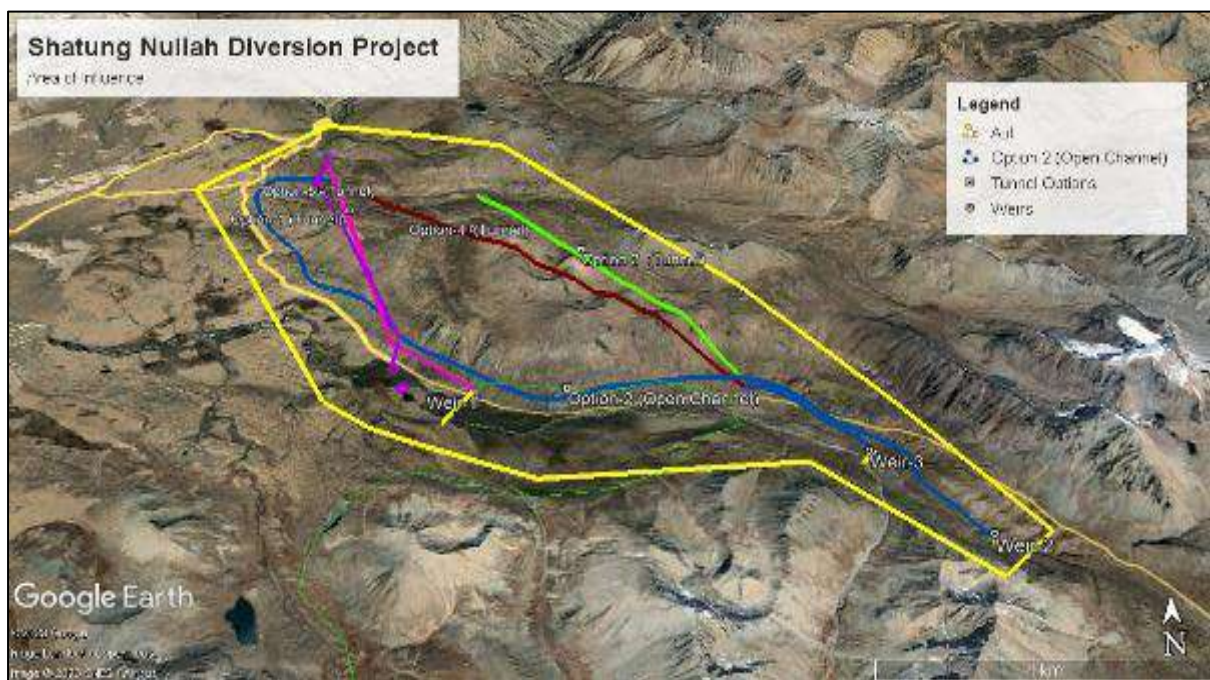


Figure 5.2: Area of Influence

5.4 Baseline Environment:

The information has been compiled from secondary and primary resources. The primary data was collected directly from the concerned communities and affected households while secondary data was the information gathered through secondary

sources such as census report, research publications, topographic sheets, other published data related to the project such as wildlife, livestock, fishery, forestry, agriculture, horticulture, climate etc. The conducted study had three major components:

- Physical Environment
- Biological Environment
- Socioeconomic Environment

5.5 Physical Environment

The physical baseline includes a description of the topography, land use, geology and soils, seismicity, climate, water resources, water quality, ambient air quality and sound levels in the study area of the project.

5.5.1 Topography, Geography, Geology and Soil

The Baltistan region (Skardu Division) shows a highly rugged topography characterized by high peaks, steep cliffy slopes and deeply incised narrow snowmelt fed perennial streams. The Deosai National Park is located between Kharmang, Astore and Skardu in Pakistan. It encompasses an area with altitude ranging from 3,500 to 5,200 meters a.s.l. In terms of topography, it has a mix of plains, plateaus, hills, streams, lakes and mountains. The central part of the park is relatively flat and gentle with a lower elevation of 4,000 meters. Almost 63% of the area has an elevation range from 4,000 to 4,500 meters, and 22% of the area is above 4500 meters making the Deosai Plains the second highest plateau in the world after Changtang Tibetan Plateau.

The regional geology related to the Project area is based on desk studies by making use of the previous studies. Previous study reveals that the area under investigation falls in the Karakoram Mountain Range; Kohistan (Ladakh) geological province. All the rocks exposed in the area are of igneous origin especially around the locality of Project ranging in age from Miocene to Cretaceous.

Considering the "Geological map of Pakistan 1993", North Pakistan is mainly occupied by the Kohistan Island arc sequence of post Eocene age, consisting of granite, diorite, pyroxene- granulite (norites) garnet granulite, slate, quartzite and green stones. The northern edge is marked by Main Karakorum Thrust (MKT). Indus Tsangpo Suture

(ITS) is present in the south marking its edge, Main Mantle Thrust (MMT) is present in the west of the Project area.

South of the MMT on the Indian Mass, Hazara slates and their equivalents ranging in metamorphic grade from slaty shales to Phyllitic schist, sandstone to quartzites and from semi to medium crystalline limestones. Grade of metamorphism is low in this area, except the areas of more highly deformed patches, with in the areas of few kilometers of MMT, rocks are highly metamorphosed e.g., marble, garnet mica schist's, biotitic schist's, graphitic schist's, para- amphibolite and ortho- gneisses in Basham, Dubair, Thakot and Bana areas.

Southern side of the fault zone, igneous rocks show the metamorphic effect by the presence of lineation, foliation and banding in amphibolite and granulite facies.

Geologically, Shatung nullah has a steep gradient with falls at different locations and its bed contains large size boulders of various sizes, which are brought down by the glaciers and avalanches. Apart from the glacial characteristics, the valley shows talus/scree accumulation and alluvial terraces, which indicates that valley is a modified glacial valley, where glacial-fluvial and collegial activities have taken place. The soils of this area are severely eroded, of a coarser nature and mixed with gravel and stones of various material and sizes. In the flat areas between the mountains, soil is deep with marshy vegetation. Erosion due to grazing is rare and is confined to the few areas where grazer enclose their livestock. The soil texture is sandy and sandy-loam, sandier soils accept water quickly, are easy to till, but hold little water. Sandier soils accept water quickly, are easy to till, but hold little water.

Geography: The Deosai National Park encompasses an area with altitude ranging from 3,500 to 5,200 m a.s.l. The central part of the park is relatively flat and gentle with lower elevation of 4000 m. Almost 63% area fall under 4500 to 4000 m and 22% area above 4000 m. above 4500 m the highest plain in the world after Chantang Tibetan Plain. The Park protected an area of 12,000 Km². It has a mixed of plains, plateau, hills, stream and mountains.

Soil: The soils of the area is severely eroded of coarse mature mixed with gravel and stones of different material and sizes. In the flate area between mountains, the Soils is deep with marshi vegetation/ Erosion due to grazing is rare due to grazing. The soils texture is sandy and loamy sand.

5.5.2 Seismicity

According to Building code of Pakistan – 2007, Pakistan is divided into five seismic zones. The project area lies in moderate to severe damage earthquake zones. The seismic zones of Pakistan along with the project site is shown in **Figure 5.3**.

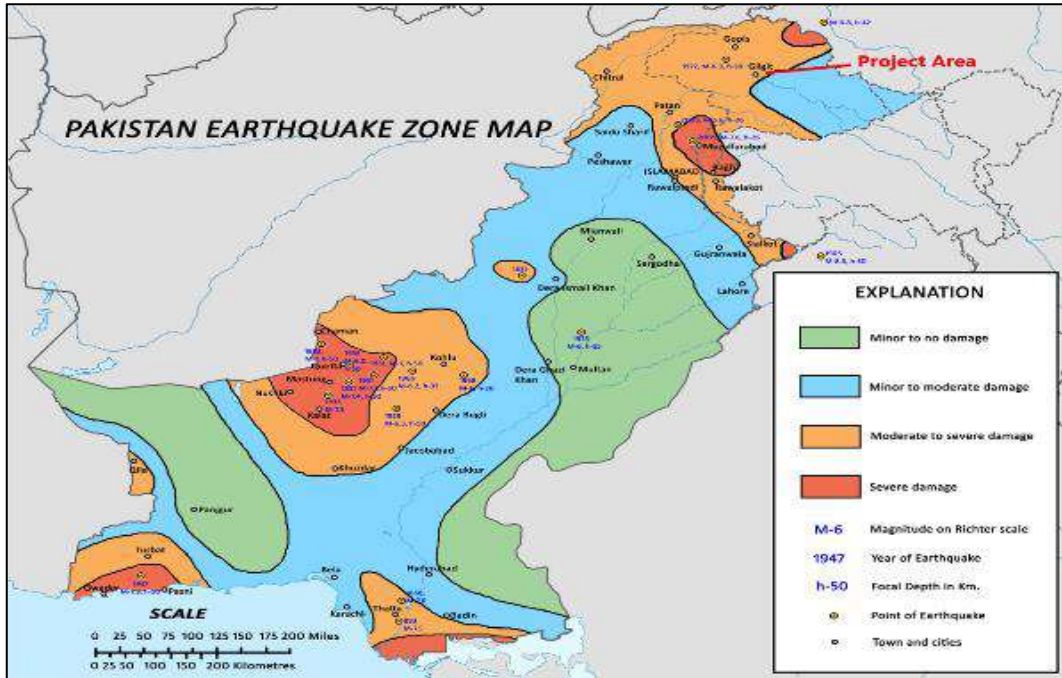


Figure 5.3: Seismic Zones of Pakistan

Tectonically speaking, almost whole of the geological faults, especially in the northern Pakistan are seismically active (TAHIRKHELI 197921, KAZMI 197922). Even the geologic contacts are generating noticeable earthquakes quite off and on. Tectonic map is shown in **Figure 5.4**.

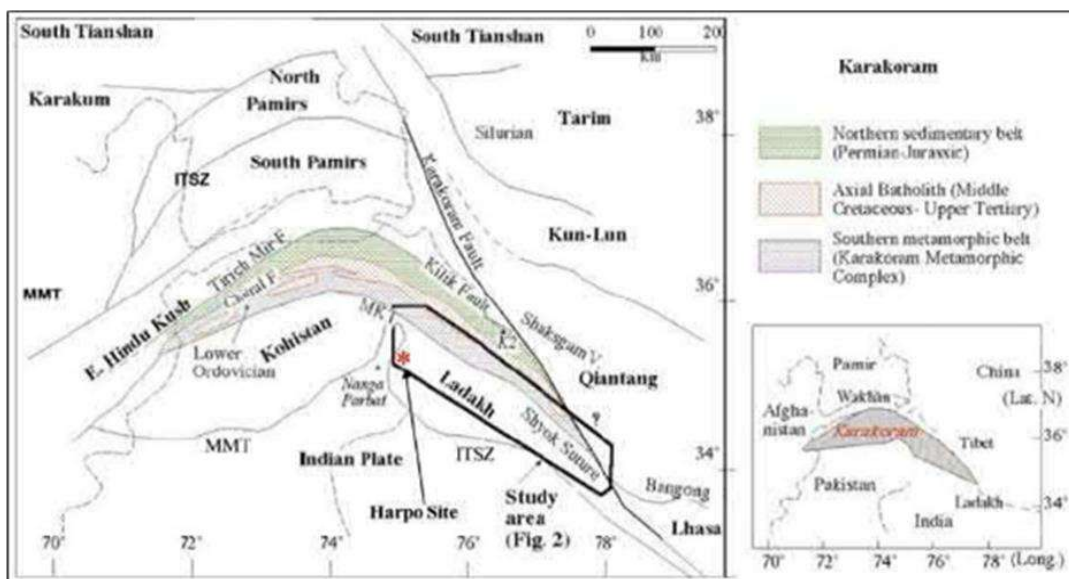


Figure 5.4: Tectonic setup around the project

Within such a seismic-scenario, it becomes necessary that all medium and large-scale projects in the country (especially in northern regions) that could cause hazard to life and property in case of failure should be critically analyzed, very carefully designed and minutely monitored. The government of Pakistan has made it mandatory to carry out 'Earthquake Hazard Assessment' for all the future hydropower projects in the country.

The investigated area is situated in the Trans-Himalayas. It covers rugged topography with steep gradient and high relief. High altitudes are mostly under perpetual snow. Mountain slopes are steep. About 10 km east of Dambodas, the Indus River takes a sudden turn from an almost E-W direction to a southeast direction. At that point, the Tormik Nala coming from northwest joins the Indus River (Latitude 35°-34'-50"; Longitude 75°-22'-10"). Almost all the river tributaries from south originate in the Deosai Mountains, where as the northern tributaries have their origin in the Haramosh Range.

The Karakoram Plate is bounded to the north by Paleo Tethyan Rushan-Pshart Suture Zone that separates the central and southern Pamir (SHVOLMAN, 197823) and to the south by Shyok Suture Zone (SSZ). In places the SSZ has been reactivated by a major late Tertiary break-back thrust, the Main Karakoram Thrust (MKT) (SEARLE & KHAN, 198724). It is bounded to the west by major sinistral strike-slip faults in Afghanistan and Tajikistan (TAPPONNIER, 198125). In the northeast it is bounded by the dextral Karakoram strike-slip fault.

5.5.3 Hydrology and Sedimentation

Deosai National Park is located where the Himalayan and Karakoram mountains meets. Wet lands are produced because of these high altitudes. When the snow melts more water accumulates in the wet land and they become rivers. These snow-clad hills are the source of the Shutang, Barapani and Kalapani rivers. Shutang Nullah join with Barapani River at about 11.5 Km from proposed weir site. The rivers and streams of Deosai Plateau is in the following **Figure 5.5.**

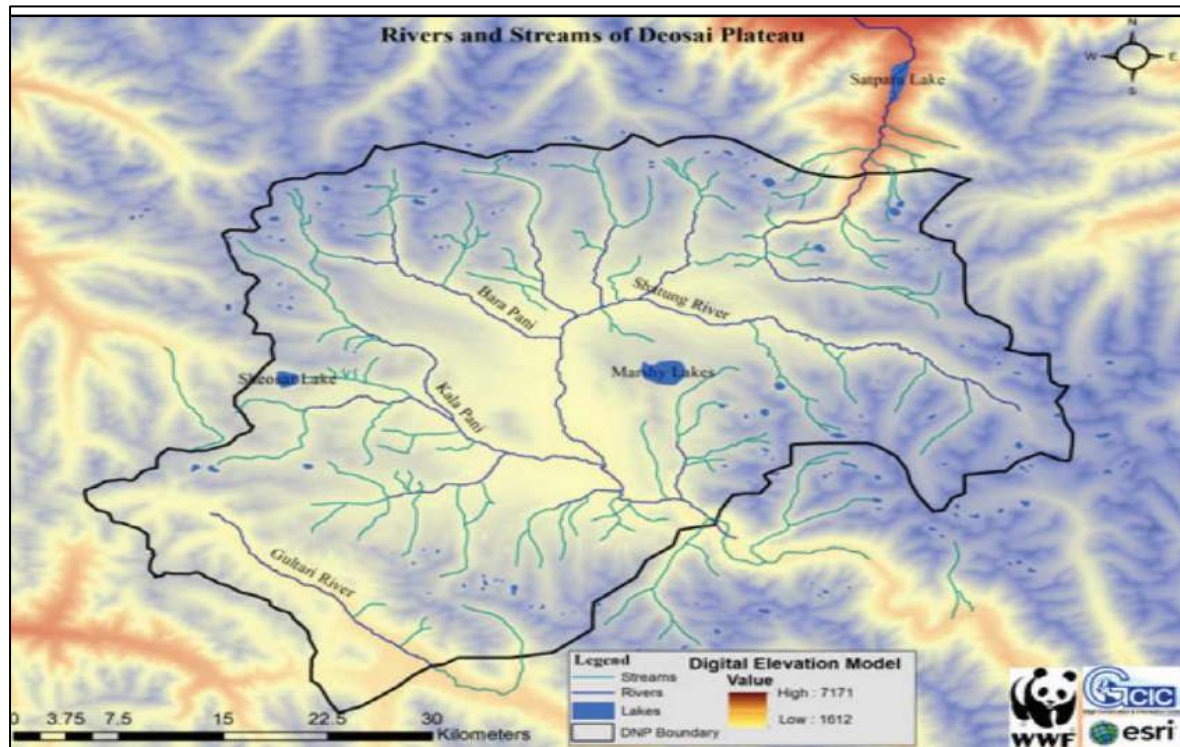


Figure 5.5: Rivers and Streams of Deosai Plateau

Shatung Nullah is one of the inflows of Indus River, located in the Deosai Plan. Shatung Nullah flow were estimated for short term duration (1994-1998) in the previous Study. In the present study, flows need to be updated. For that purpose, flows generated on proposed weir site by developing correlation of observed Shatung Nullah flows with long term observed flows data series of gauging station for the same period and having same hydrological catchment characteristics.

Shatung Nullah daily observed flows available later for the period of 1995-2000, from SWHP-WAPDA. Correlation developed between Shatung Nullah and Yugo station at Shyok River for the same period to extend the estimated flow series at proposed weir site for the period of 1973-2014. Shatung Nullah gauge and proposed weir locations are same. The observed mean monthly flows of Shatung Nullah are shown in table 5.1. Mean monthly flows are minimum during February and maximum during July with values of (0.83 m³/s and 16.37 m³/s) respectively. Mean annual flows are 4.67 m³/s.

Table 5.1: Mean Monthly & Annual Flows at Shatung Nullah at Deosai

Mean Monthly & Annual Flows (m ³ /s) at Shatung Nullah at Deosai Plain for Period 1995-2000													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Annual (m ³ /sec)
1995	0.43	0.45	0.59	0.73	1.03	3.83	28.56	17.34	3.77	1.51	1.06	1.16	5.04
1996	0.74	0.43	0.56	0.66	1.25	13.43	21.28	27.04	7.22	4.17	3.23	1.48	6.79
1997	0.74	0.52	0.86	1.01	1.36	14.28	23.82	12.06	5.44	1.62	1.57	2.16	5.45
1998	0.99	1.03	1.10	1.25	1.88	3.79	7.62	7.99	5.47	2.94	1.82	1.63	3.12
1999	1.33	1.39	1.54	1.76	4.66	13.21	10.61	7.21	3.00	1.39	0.48	0.40	3.91
2000	0.84	1.17	1.52	2.20	11.20	8.84	6.35	6.99	3.05	0.90	0.73	0.82	3.72
Mean Monthly (m ³ /sec)	0.84	0.83	1.03	1.27	3.56	9.56	16.37	13.10	4.66	2.09	1.48	1.27	4.67

The average mean monthly observed Shatung Nullah flows for period of 1995-2000 are 4.67 m³/s, while estimated average mean monthly available flows resulted with value of 4.73 m³/s. It reflected the closest value between observed and estimated flows as shown below in Figure 5.6.

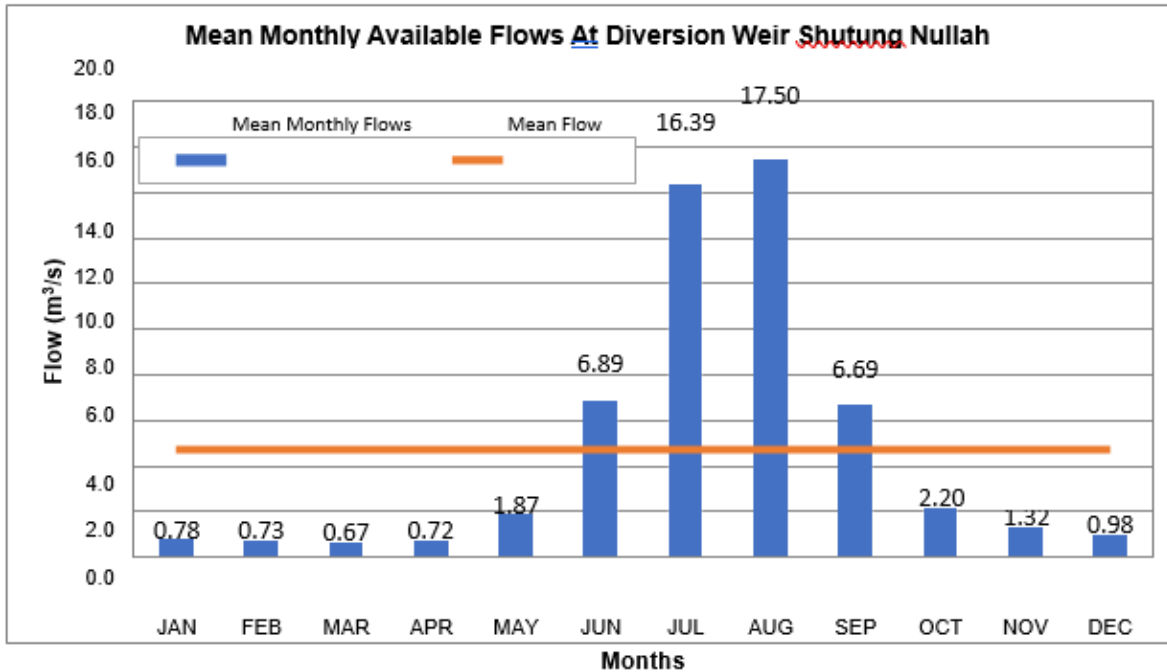


Figure 5.6: Extended Mean Monthly Flows at Weir (1973-2014)

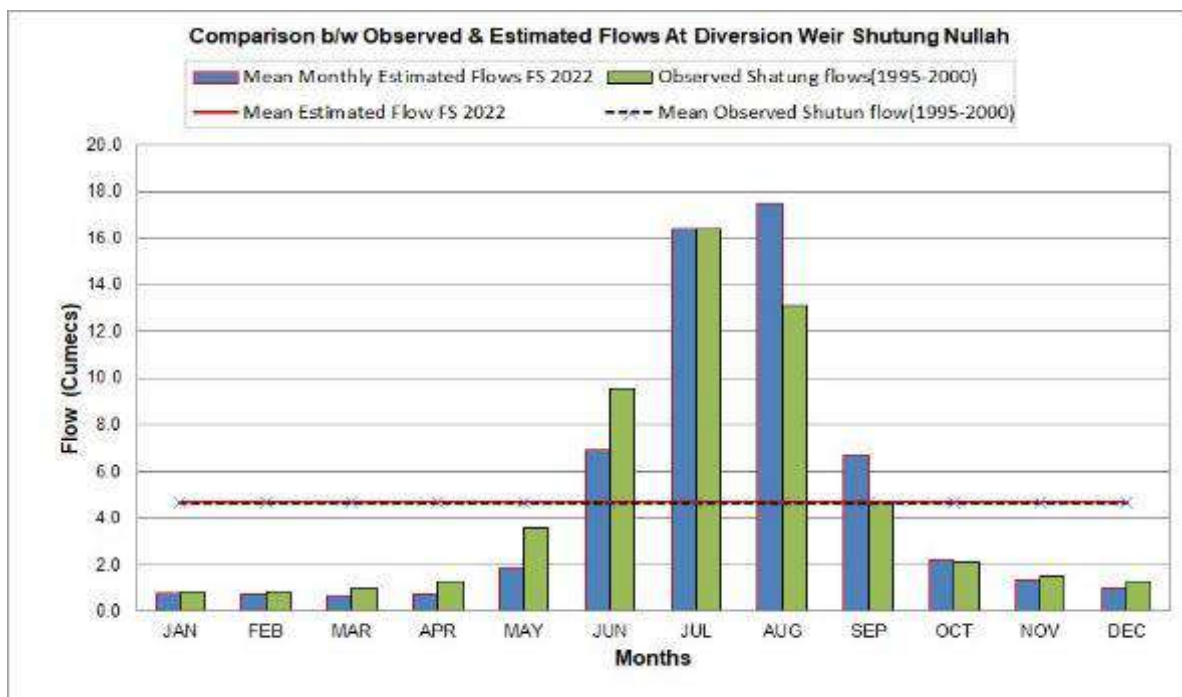


Figure 5.7: Comparison b/w observed and Estimated Flows at Shatung Nullah

Sediment transport studies are essential to estimate total sediment inflow at the weir site, sediment load and the life of the reservoir with and without flushing or sluicing options and all other aspects related to sedimentation.

Observed suspended sediment data at Shatung Nullah is collected from ISRIP-WAPDA, for the year of 2021 is shown in following **Table 5.2**.

Table 5.2: Observed Suspended Sediment at Shatung Nullah

Observed Suspended Sediments against Flow at Shatung Nullah				
DATE	Flows (cusecs)	Flows (cumecs)	Concentration (ppm)	Concentration (tons/day)
14/8/2021	203.03	5.75	40	19.87
20/8/2021	139.62	3.95	29	9.91
24/8/2021	175.58	4.97	12	5.15
28/8/2021	178.71	5.06	7	3.06
1/9/21	196.47	5.56	4.3	2.07
5/9/21	158.58	4.49	6	2.33
9/9/21	146.17	4.14	17	6.08
13/9/2021	265.07	7.51	9	5.84
17/9/2021	172.29	4.88	27	11.38
21/9/2021	139.76	3.96	110	37.61
25/9/2021	132.05	3.74	25	8.08

The above data of suspended sediment at Shatung Nullah is too much short / limited, so that data could not be based for estimation of suspended sediments at Shatung weir. For estimation of suspended sediment at weir site, two approaches are considered.

- Relationship between observed suspend sediments with discharges
- Regional method approach

5.5.4 Relationship between Observed Suspended Sediments with Discharges

Observed suspended sediment data w.r.t discharges of Yugo gauging station have been collected from SWHP-WAPDA, for the period of 1975-2007. Correlation developed between suspended sediments with discharges for the above period as represented below in **Figure 5.8**.

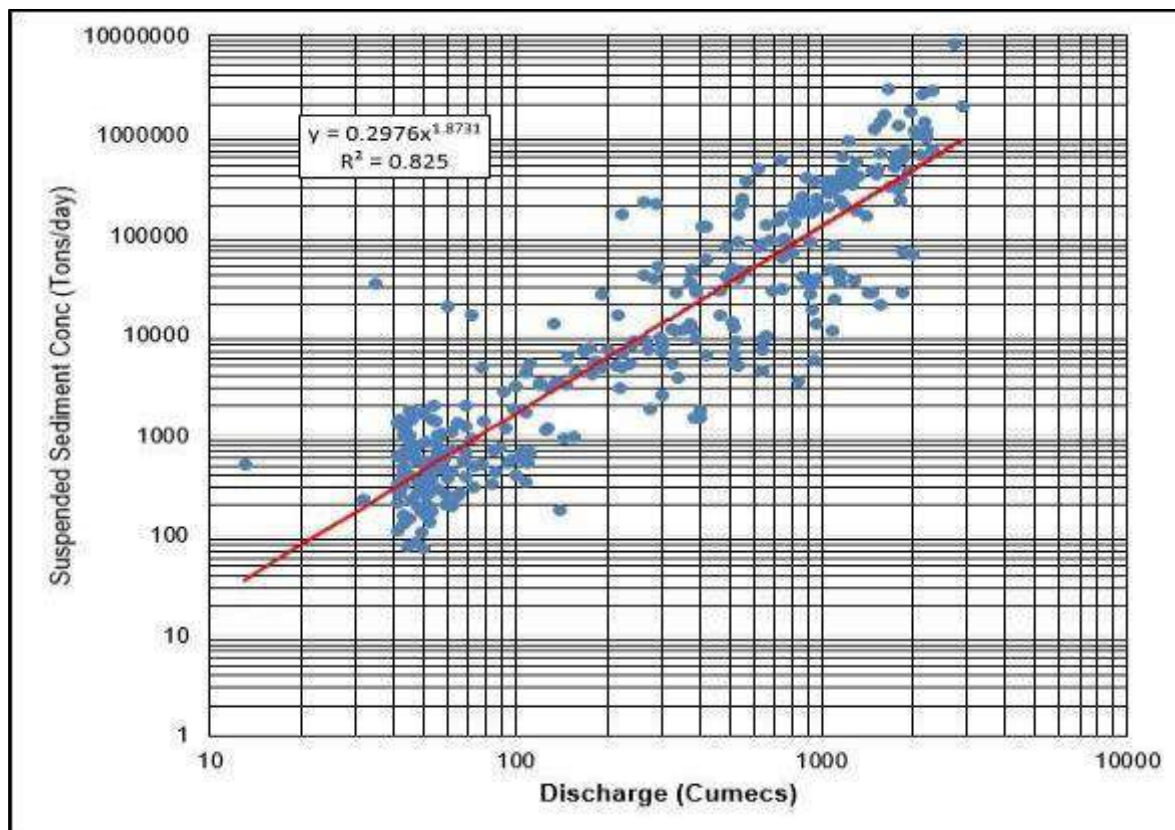


Figure 5.8: Suspended Sediment Vs Discharge–Yugo Station

The best fit relationship thus obtained was:

$$y = 0.2976 \times 1.8731$$

Putting the value of estimated available flows at weir site (x) in the above equation will give the suspended sediment (y) at Shatung weir for the period of 1973 to 2014. Average annual suspended sediment estimated with value of 10,222 Tons. Bed load taking 20% of sus sediment. The total sediment inflow at the proposed weir site is estimated as 12,226 Tons/year. As 1st approach by using suspended sediment with discharge correlation, estimated total sediment inflow at weir site with lower value of 12,226 Tons/year. So, for the safety of hydraulic structures and Project life, a regional method approach has been adopted for the estimation of the sediment load at proposed weir site. Sediment yield data available for some nearby catchments have been collected from SWHP, WAPDA.

Sediment inflow at proposed weir site is estimated as shown below in **Table 5.3**.

Table 5.3: Sediment Yield of Regional Major Rivers

TOTAL SEDIMENT INFLOW AT SHATUNG DIVERSION WEIR ON REGIONAL BASIS								
Sr. No	Station	River	Drainage Area	Period	Density	Avg Annual Sediment Yield		
			Sq. km		lbs/ c. ft	m.s.t	Ac. ft. per Sq. km	Tons per Sq.km
1	Kharmang	Indus	67,857.69	1983-2005	64.00	21.50	0.298	316.84
2	Yugo	Shyok	33,669.84	1973-2005	66.00	42.60	0.830	1265.23
3	Kachura	Indus	112664.48	1970-2005	67.00	85.39	0.467	757.91
4	Gilgit	Gilgit	12095.24	1963-2005	64.00	9.26	0.525	765.59
Average Annual Suspended Yield Per Sq.km							0.530	776.39
Catchment Area at Shatung Diversion Weir (Sq.km)								169.88
Annual Suspended Sediment Inflow at Diversion Shatung Weir (Ac. ft. per Year)								90.06
Annual Suspended Sediment Inflow at Diversion Shatung Weir (Tons per Year)								131891.51
Total Annual Sediment Inflow @20% bed Load							Ac. ft	108.07
							Cubic Meter	133297.57
							MCM	0.13

Average Annual sediment yields (0.53 Ac-ft/sq. km) or (776.39 Tons/Sq.km) in region is adopted. As catchment area of proposed weir is 169.88 Sq. km, the annual sediment inflow rate of 0.133 MCM or 108.07 Ac-ft per year was estimated.

5.5.5 Flood Estimated at Weir Site

Floods are estimated at proposed weir, by using relationships between specific flows with catchments of above eight stream gauging stations for different years of return periods. The relationship was generated over the last 5 years, which are shown below in **Figure 5.9**.

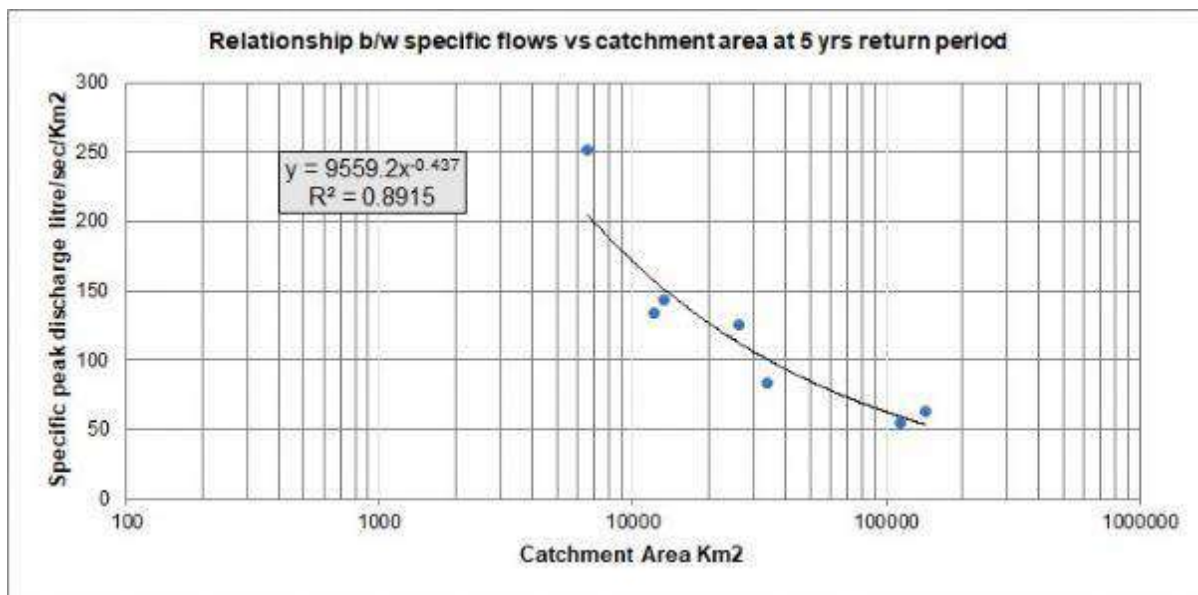


Figure 5.9: 5 Years Return Period Flood in the Region

Flood estimated at Shatung diversion weir with regional approach by using above equations as generated by relationship developed between specific peak discharges with catchment areas of stream gauging stations against different return periods. The flood at Shatung weir against different return periods are tabulated below in **Table 5.4**.

Table 5.4: Peak Flood at Shatung Diversion Weir against Return Periods

Peak Flood at Shatung Weir against Different Return Period						
Return Period (year)	1000	500	100	50	10	5
Peak Flood (m ³ /s)	538.8	497.2	403.5	362.8	268.3	172.2

For design flood at Shatung Diversion Weir, (Peak flood from nearby rivers – regional approach) is adopted. Recommended design flood at proposed weir is (403.5 m³/s) against return period of 100 years. However, the structures shall also be checked to be safe against return period of 1000 years for flood of 538.8 m³/s.

5.5.6 Environmental Flows

The Shatung Weir is designed to divert (10 m³/sec) flows as a design discharge. So, Ecological considerations for the Shatung nullah, downstream of water abstraction require reserved or minimum flow. The protection of aquatic environment is an important consideration in developing schemes for utilization of water resources. It is important to allow a certain share of water, generally referred to as environmental flows. This minimum discharge for ecological considerations has been computed by

using EF MONTANA method. The period September to June is a period of lean flow as given in the **Table 5.5**. According to this method 10% of lean month's average flow, which is (0.225 m³/sec) has been considered as environmental flow for bare survival of biota in vulnerable reach during this period. Water availability in the months from July and August are more than the designed flow of 10 m³/s. So, lean months consider as (September to June).

Table 5.5: Estimated Environmental Flows

Mean Monthly Flows (m ³ /s)		Design Discharge (m ³ /s)	Shortages and Lean Period			Lean Period (Sep to June)	
Month	Mean Monthly Flows		Shortage/ Overspill Flows (m ³ /s)	Lean Period	Month	Flows (m ³ /s)	
Jan	0.785	10	- 9.21	Shortage	Jan	Sep	6.632
Feb	0.721	10	- 9.27	Shortage	Feb	Oct	2.202
Mar	0.661	10	- 9.33	Shortage	Mar	Nov	1.310
Apr	0.710	10	- 9.29	Shortage	Apr	Dec	0.989
May	1.858	10	- 8.14	Shortage	May	Jan	0.785
Jun	6.592	10	- 3.40	Shortage	June	Feb	0.721
Jul	16.233	10	6.23	Overspill	Mar	0.661
Aug	17.727	10	7.72	Overspill	Apr	0.710
Sep	6.632	10	- 3.36	Shortage	Sep	May	1.858
Oct	2.202	10	- 7.79	Shortage	Oct	Jun	6.592
Nov	1.310	10	- 8.69	Shortage	Nov	TOTAL FLOW	22.459
Dec	0.989	10	- 9.01	Shortage	Dec	Average Flow	2.246
EF Montana Method for estimation of Environmental Flows						10% of Average Flow	0.225
						Environmental flows (m³/sec)	0.225

The net means monthly and net annual flows available for diverting flows to Satpara reservoir are given ahead in **Table 5.6** and are presented graphically in **Figure 5.9** Figure 5.10 & **Figure 5.10**, respectively. The net mean annual flows for diversion are available with value of 4.48 m³/sec.

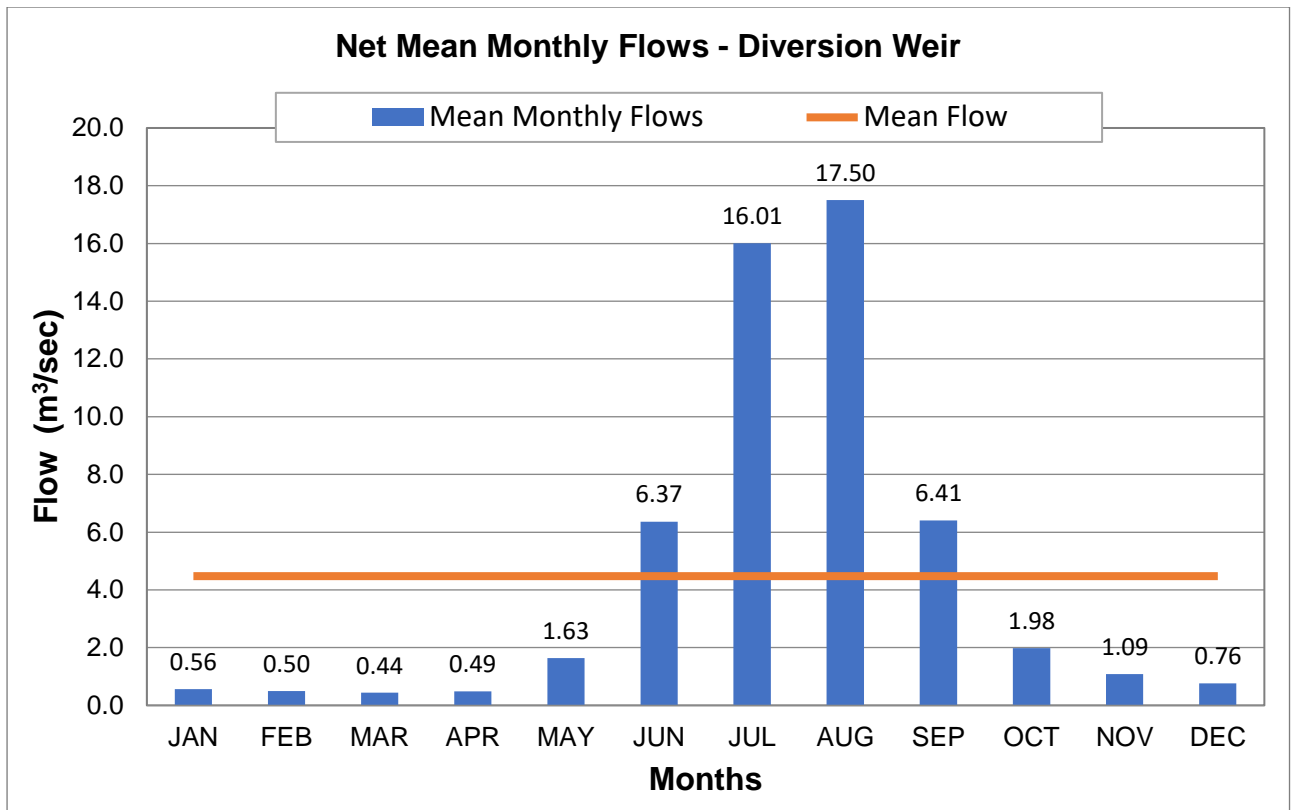


Figure 5.10: Net Mean Monthly Flows at Weir

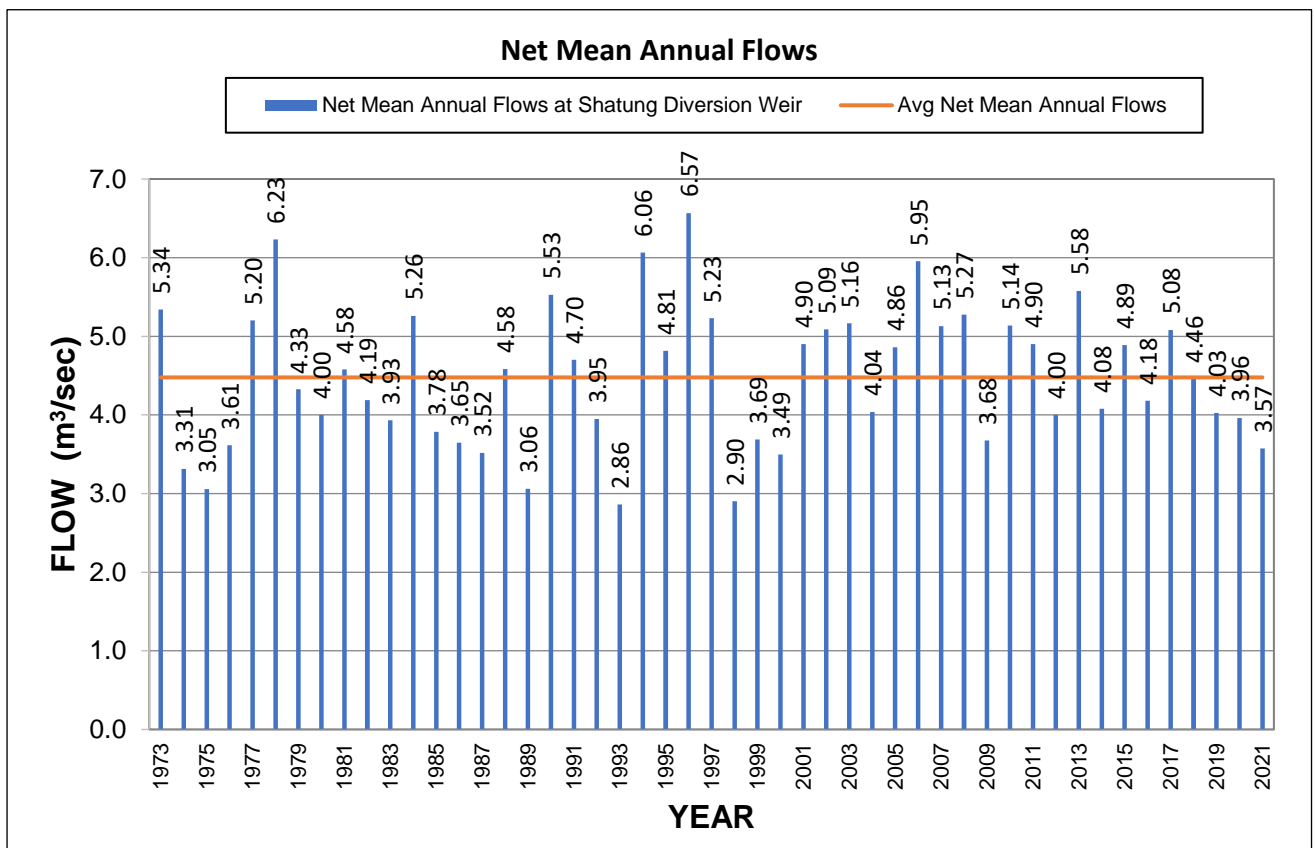


Figure 5.11: Net Mean Annual Flows at Weir

Table 5.6: Net Mean Monthly Flows at Weir

NET MEAN MONTHLY FLOWS													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean Annual
1973	0.44	0.38	0.31	0.35	1.09	9.14	23.08	16.82	8.54	2.01	1.10	0.81	5.34
1974	0.66	0.63	0.56	0.55	0.85	3.12	11.46	13.42	5.13	1.72	0.98	0.69	3.31
1975	0.50	0.44	0.37	0.32	0.58	4.49	7.33	14.74	4.49	1.82	0.97	0.60	3.05
1976	0.57	0.55	0.52	0.51	1.25	3.81	17.14	10.76	4.83	1.68	1.03	0.70	3.61
1977	0.60	0.58	0.43	0.53	0.83	6.11	23.85	18.95	6.43	2.04	1.26	0.79	5.20
1978	0.29	0.37	0.33	0.38	1.87	10.92	27.26	22.56	6.83	2.25	0.98	0.73	6.23
1979	0.59	0.53	0.48	0.51	0.66	6.05	16.06	18.77	5.34	1.50	0.83	0.59	4.33
1980	0.44	0.43	0.45	0.40	1.04	7.39	16.25	13.70	4.74	1.80	0.92	0.46	4.00
1981	0.45	0.46	0.34	0.43	2.26	5.15	18.56	19.35	4.63	1.77	0.91	0.63	4.58
1982	0.57	0.54	0.37	0.38	1.30	4.24	11.93	21.62	6.28	1.51	0.87	0.62	4.19
1983	0.46	0.33	0.31	0.34	1.01	3.02	9.70	18.37	10.06	1.85	1.05	0.67	3.93
1984	0.57	0.39	0.33	0.30	0.81	9.06	14.92	25.62	7.66	1.59	1.10	0.74	5.26
1985	0.51	0.47	0.37	0.39	0.80	4.09	12.07	16.27	6.88	1.77	1.11	0.68	3.78
1986	0.55	0.50	0.41	0.35	0.55	3.32	13.89	14.15	6.30	2.02	1.06	0.66	3.65
1987	0.51	0.46	0.36	0.38	0.59	3.73	11.00	13.37	7.98	2.02	1.01	0.79	3.52
1988	0.59	0.53	0.43	0.54	1.42	6.20	17.50	17.75	6.30	1.76	1.16	0.83	4.58
1989	0.61	0.49	0.44	0.42	0.90	3.59	11.42	10.13	4.99	2.08	1.00	0.65	3.06
1990	0.55	0.48	0.37	0.37	2.59	8.84	19.35	20.55	9.17	2.07	1.19	0.80	5.53
1991	0.61	0.55	0.47	0.41	0.81	8.09	16.41	15.37	10.39	1.44	1.10	0.76	4.70
1992	0.53	0.49	0.38	0.31	0.87	5.09	12.61	16.76	6.98	1.55	1.02	0.78	3.95
1993	0.54	0.45	0.40	0.51	0.96	4.13	8.93	9.35	5.99	1.52	0.90	0.67	2.86
1994	0.53	0.39	0.35	0.32	1.08	6.26	26.17	25.32	8.64	1.86	1.07	0.76	6.06
1995	0.21	0.22	0.37	0.51	0.80	3.61	28.34	17.11	3.54	1.28	0.83	0.94	4.81
1996	0.51	0.20	0.34	0.44	1.03	13.20	21.05	26.81	7.00	3.95	3.01	1.25	6.57
1997	0.51	0.29	0.64	0.79	1.14	14.05	23.60	11.84	5.21	1.40	1.35	1.93	5.23
1998	0.76	0.80	0.87	1.02	1.66	3.56	7.39	7.77	5.25	2.72	1.60	1.40	2.90
1999	1.10	1.16	1.32	1.54	4.43	12.98	10.39	6.98	2.77	1.16	0.25	0.18	3.69
2000	0.62	0.94	1.29	1.98	10.98	8.62	6.13	6.77	2.82	0.68	0.51	0.59	3.49
2001	0.48	0.44	0.33	0.29	1.88	8.03	20.95	17.17	5.33	2.25	1.10	0.57	4.90
2002	0.39	0.39	0.30	0.31	1.20	7.53	18.30	22.66	5.80	2.11	1.22	0.87	5.09
2003	0.66	0.59	0.42	0.55	2.50	10.33	19.59	16.34	7.17	1.96	1.03	0.83	5.16
2004	0.69	0.55	0.40	0.47	1.79	5.61	13.27	15.52	6.32	2.08	1.05	0.71	4.04
2005	0.52	0.44	0.22	0.27	0.97	6.07	18.17	17.14	9.39	2.76	1.49	0.89	4.86
2006	0.71	0.63	0.45	0.45	3.66	6.09	21.54	24.32	7.28	3.23	1.84	1.24	5.95
2007	0.91	0.73	0.63	1.05	3.62	7.63	15.51	19.16	9.13	1.94	0.69	0.55	5.13
2008	0.53	0.49	0.28	0.24	1.79	14.06	18.77	18.24	4.74	2.31	1.16	0.68	5.27
2009	0.54	0.48	0.37	0.26	1.06	4.50	10.34	16.88	5.27	2.70	1.06	0.68	3.68
2010	0.50	0.38	0.26	0.28	1.27	3.91	16.23	28.42	5.85	2.55	1.37	0.61	5.14
2011	0.52	0.56	0.48	0.56	2.40	8.30	15.45	16.74	10.17	1.97	1.02	0.62	4.90
2012	0.44	0.42	0.35	0.31	0.69	3.07	12.40	18.91	8.35	1.54	0.89	0.63	4.00

NET MEAN MONTHLY FLOWS													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean Annual
2013	0.43	0.39	0.30	0.28	0.97	8.82	18.64	25.53	7.48	2.74	0.76	0.59	5.58
2014	0.65	0.54	0.41	0.28	1.16	4.28	15.99	17.53	4.13	2.01	1.23	0.73	4.08
2015	0.55	0.45	0.35	0.41	1.42	2.81	20.61	24.12	4.73	1.57	0.93	0.69	4.89
2016	0.51	0.42	0.31	0.28	1.68	8.94	14.67	14.77	4.92	2.27	0.84	0.56	4.18
2017	0.50	0.37	0.29	0.36	2.44	6.39	21.24	20.01	4.67	2.34	1.39	0.94	5.08
2018	0.55	0.41	0.34	0.39	1.53	4.42	16.56	18.71	6.66	2.15	1.03	0.79	4.46
2019	0.61	0.52	0.37	0.45	0.92	1.76	13.86	17.61	8.48	2.05	0.94	0.75	4.03
2020	0.64	0.52	0.44	0.48	1.49	3.91	10.23	19.24	6.88	1.83	0.98	0.89	3.96
2021	0.69	0.55	0.48	0.52	1.43	3.63	8.33	17.62	6.04	1.71	0.98	0.92	3.57
Mean	0.56	0.50	0.44	0.49	1.63	6.37	16.01	17.50	6.41	1.98	1.09	0.76	4.48

It can be seen in the above table that the net means monthly flows vary from 0.44 m³/s to 17.50 m³/s with average of 4.48 m³/s. The 10 m³/s, selected as design discharge for diverting flows from Shutung Nullah to Satpara Lake.

5.5.7 Climatology

The climatic conditions in Skardu are mostly characterized by a frigid and moderate climate. In Skardu there is a lot of rain even in the driest month. The temperature here averages -1.2°C | 29.9 °F. The annual rainfall is 1203 mm | 47.4 inch.

The given location is in the northern hemisphere. Summer begins here at the end of June and ends in September. The months of summer are June, July, August and September. The climate is very cold during winter with scarce rainfall in summers as the monsoon cannot cross the Himalayan Mountains. The area is semi-arid with rugged mountain landscape. Precipitation and air temperature are the most important climatological parameters required for understanding the climate of the region. There are a number of climatic stations around the project area, which are operated by Pakistan Meteorological Department (PMD) and Surface Water Hydrology Project (SWHP) of WAPDA. Three weather stations (Kachura, Yugo and Dainyor) are in the vicinity of project area, which are all being operated by SWHP. In this study, the climatic data has been collected from PMD and SWHP. The following **Table 5.7** represent the PMD data average 1991 to 2021 for Precipitation, Temperature and Humidity.

Table 5.7: Data showing the: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

	January	February	March	April	May	June	July	August	September	October
Avg. Temperature °C (°F)	-13.7 °C (7.4) °F	-10.5 °C (13.1) °F	-7.6 °C (18.2) °F	-3.8 °C (25.2) °F	0.4 °C (32.8) °F	6.6 °C (43.8) °F	14.6 °C (58.3) °F	15 °C (59) °F	9 °C (48.3) °F	-1.8 °C (28.7) °F
Min. Temperature °C (°F)	-17.4 °C (0.6) °F	-14.2 °C (6.4) °F	-12.3 °C (9.8) °F	-8.8 °C (16.1) °F	-4.9 °C (23.1) °F	0.5 °C (32.8) °F	8.6 °C (47.4) °F	9.3 °C (48.7) °F	3 °C (37.3) °F	-8.4 °C (16.8) °F
Max. Temperature °C (°F)	-10.9 °C (12.4) °F	-7.7 °C (18.1) °F	-4 °C (24.7) °F	0.3 °C (32.5) °F	4.4 °C (39.8) °F	10.9 °C (51.7) °F	19.2 °C (66.6) °F	19.5 °C (67.1) °F	14 °C (57.2) °F	3.6 °C (38.5) °F
Precipitation / Rainfall mm (in)	81 (3)	106 (4)	119 (4)	114 (4)	93 (3)	88 (3)	152 (5)	142 (5)	118 (4)	65 (2)
Humidity(%)	63%	66%	67%	71%	75%	72%	67%	66%	69%	72%
Rainy days (d)	11	12	12	11	9	8	13	14	13	8
avg. Sun hours (hours)	7.0	7.5	8.9	9.7	9.9	9.9	8.8	8.3	7.8	8.0

5.5.7.1 Climatological Data – Pakistan Meteorological Department

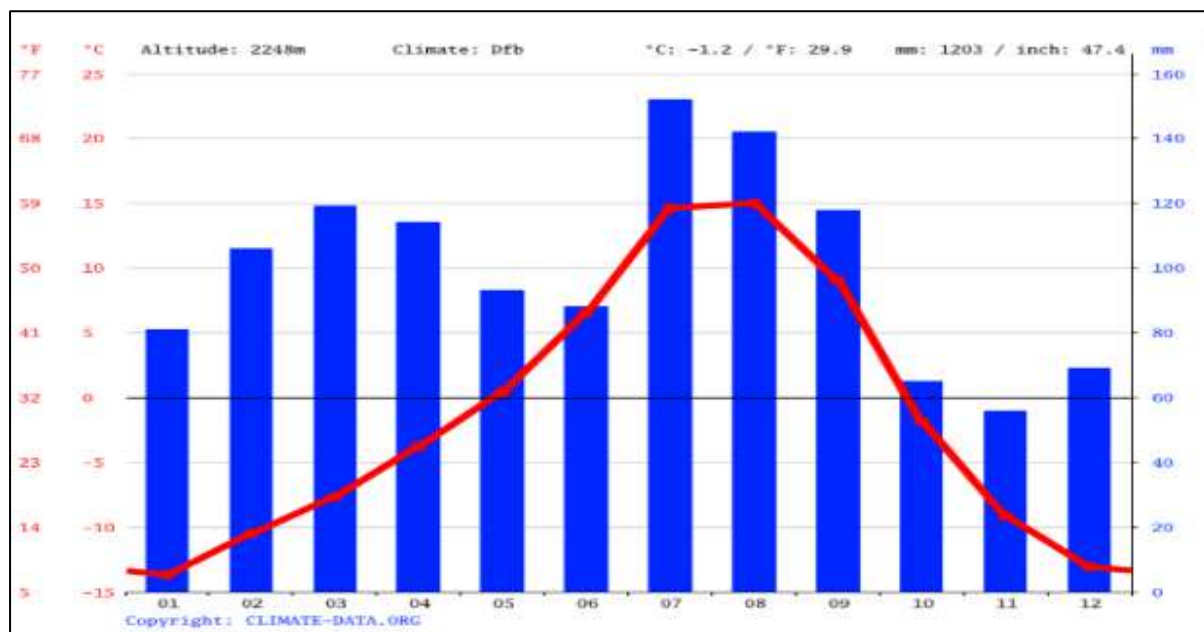


Figure 5.12: Average Temperature and rain fall in mm

The precipitation variance between the months with the lowest and highest levels of rainfall is 96 mm | 4 inches. The variation in temperatures throughout the year is 28.7°C | 51.7 °F. The average annual rainfall is 1203 mm/47.4 inches. The month with the highest relative humidity is May (74.87 %). The month with the lowest relative humidity is January (63.23 percent). The month with the rainiest days is August (18.87 days). The month with the fewest rainy days is November (9.40 days).

November, the precipitation level plummets to a mere 56 mm | 2.2 inch. This month holds the title for being exceptionally arid. The greatest amount of precipitation occurs in July, with an average of 152 mm | 6.0 inch. The month of highest temperature is August during which the average temperature reaches up to 15.0 °C | 59.0 °F. The lowest average temperatures in the year occur in January, when it is around -13.7 °C | 7.4 °F.

5.5.7.2 Overall Climatological Assessment

The annual cycle of temperature in Gilgit-Baltistan province reveals that July is the hottest month with mean monthly temperature of 27.2°C, mean monthly maximum temperature of 40°C, and mean monthly minimum temperature above 14 degrees Celsius. In January, the mean monthly temperature is 1.8°C, while the maximum temperature rises to 11.1°C, and the minimum temperature of -7.6°C and being a

coldest month of the area. After January, the graph shows rapid increase in temperature, till July and then decreases till December. The area recorded the mean monthly temperature of about 15°C, mean maximum temperature of 26.7°C and mean minimum temperature of 3.4°C. The mean daily range of temperature of the area is 12.7°C with 8.3°C mean daily minimum and 21°C mean daily maximum temperature. The ever-recorded maximum temperature of 48.1°C recorded on 1st August, 1983 at Chilas and ever minimum temperature of -21°C on 9th February, 1974 at Astore³⁰. Mean maximum, mean minimum and mean monthly temperatures (°C) of Gilgit Baltistan province has been plotted in **Figure 5.13**. ³⁰ Climate of the Gilgit-Baltistan Province, Pakistan by Khan *et al.* /Int.J.Econ.Environ.Geol. Vol. 11(3) 16-21, 2020 (accessed 21-Dec-2021)

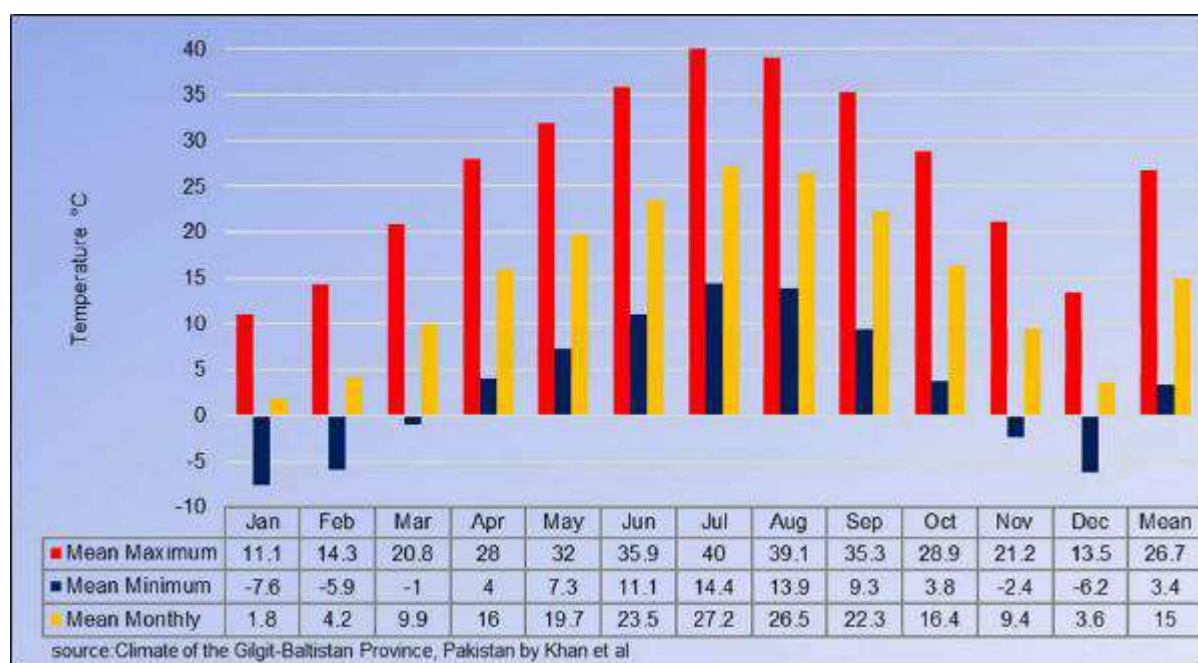


Figure 5.13: Mean Maximum, Mean Minimum and Mean Monthly Temperatures of Gilgit- Baltistan Province

a. Precipitation

The mean annual precipitation observed at Astore, Bunji, and Gilgit and Skardu observatories is about 20mm with a high of 40mm in April and lowest of 6mm in November. In April, the heaviest precipitation of 87mm recorded at Astore and the lowest of 2mm in November at Gilgit. Based on precipitation, the Astore observatory shows semi-arid climates, whereas the excluding areas fall in arid climates. However, due to perpetual snow and ice, the majority of the hill slopes fall in undifferentiated highland climates, where the temperature remains below the freezing point throughout

the year. **Figure 5.14** shows the mean monthly precipitation at Astore, Bunji, Gilgit and Skardu and **Figure 5-15** depicts the amount and frequency in surrounding of the project area.

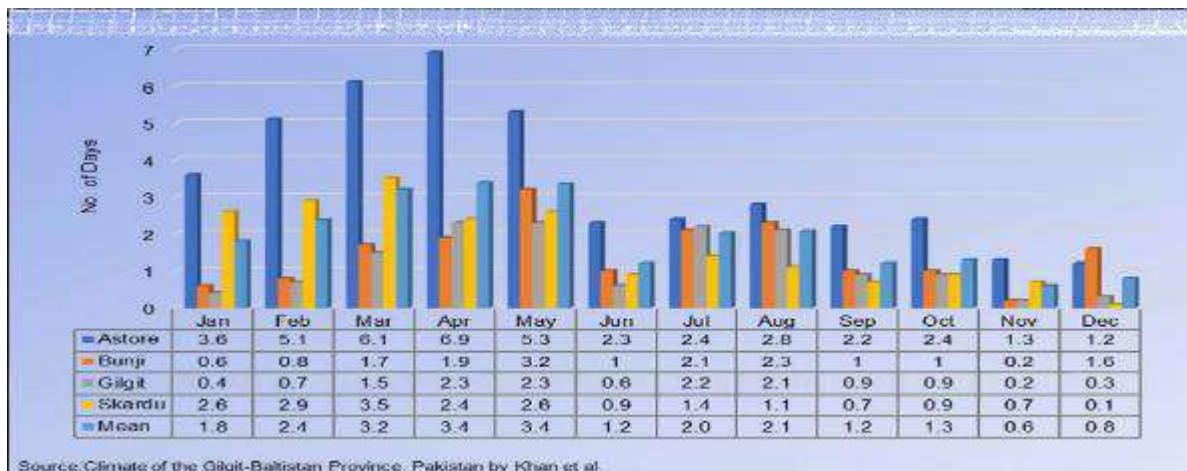


Figure 5.14: Average Number of Days of Rainfall per Month

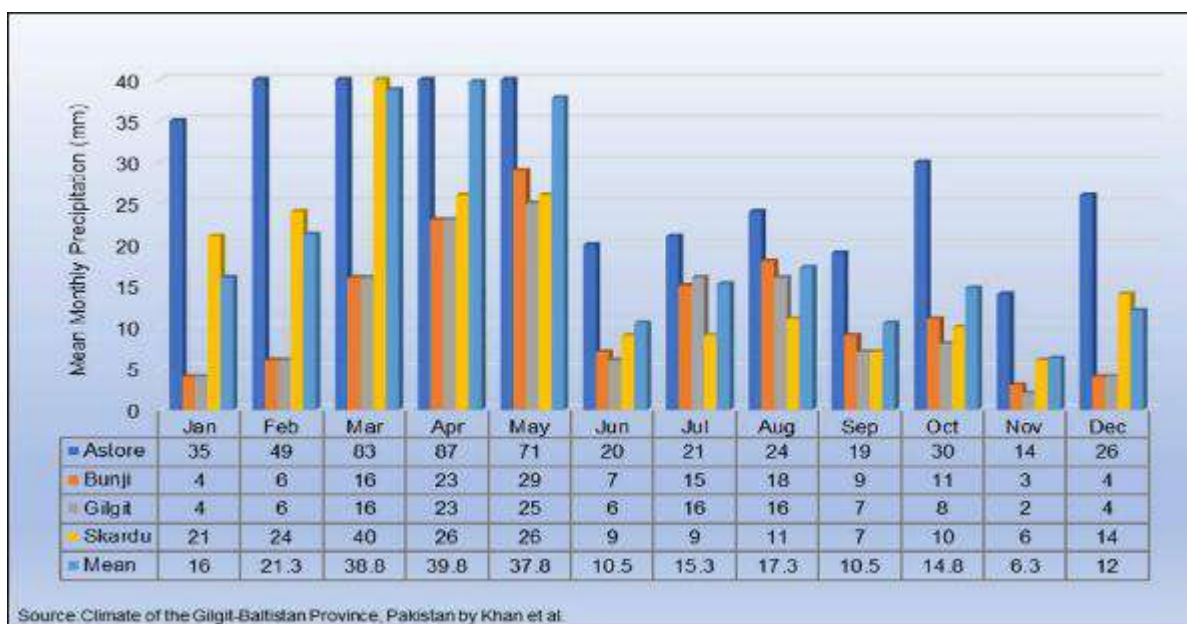


Figure 5.15: Mean Monthly Precipitation in surrounds of Project Area

b. Wind Speed and Pressure

The Bunji observatory recorded the highest wind speed of 3.1 knots in March and July, while the Skardu recorded low of 0.1 knots in Jan and December. The average annual wind speed of the project area is about 1.7 knots. Months of the year, having high wind speed indicates high temperature, while months, having low wind speed has the converse condition. The maximum wind speed of 2.4 knots observed at Bunji and the

minimum of 1.0 knots at Gilgit. **Figure 5.16** shows the mean monthly wind speed (knots) for each month of the year at Astore, Bunji, Gilgit and Skardu.

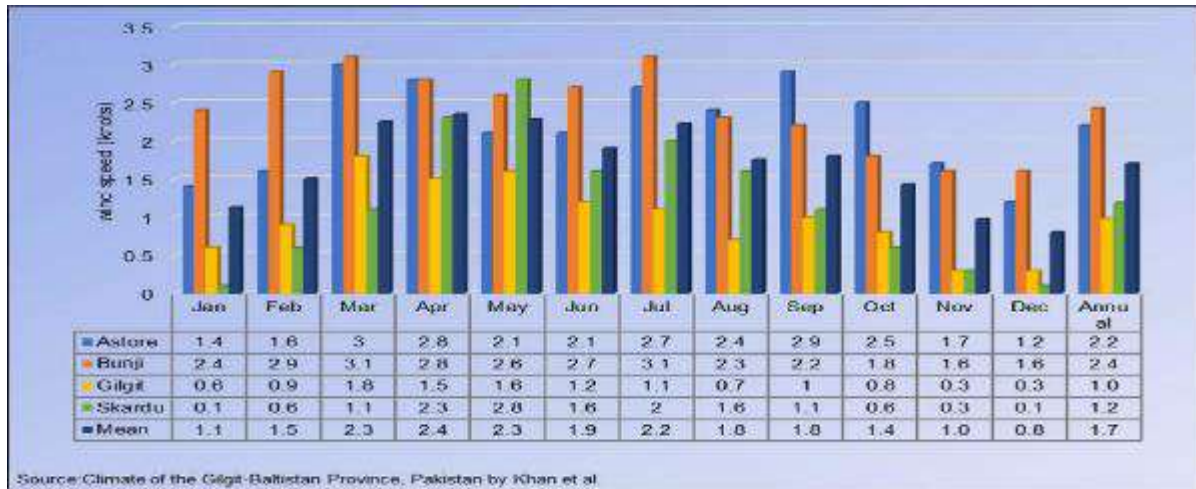


Figure 5.16: Average Wind Speed (km/h) per Month

c. Humidity

The relative humidity study area is above 40% and the average relative humidity of the area is 51% having a maximum of 56% in Gilgit and a minimum of 45% in Bunji. The annual trend of the relative humidity shows that it decreases from January to June (winter months) and increases onward till December (summer months). The maximum of 70% of relative humidity recorded at Gilgit and Skardu in January as well as December, whereas the low of 35% at Bunji in June. Mean monthly relative humidity (%) for each month of the year observed at Astore, Bunji, Gilgit and Skardu weather stations is provided in **Figure 5.17**.

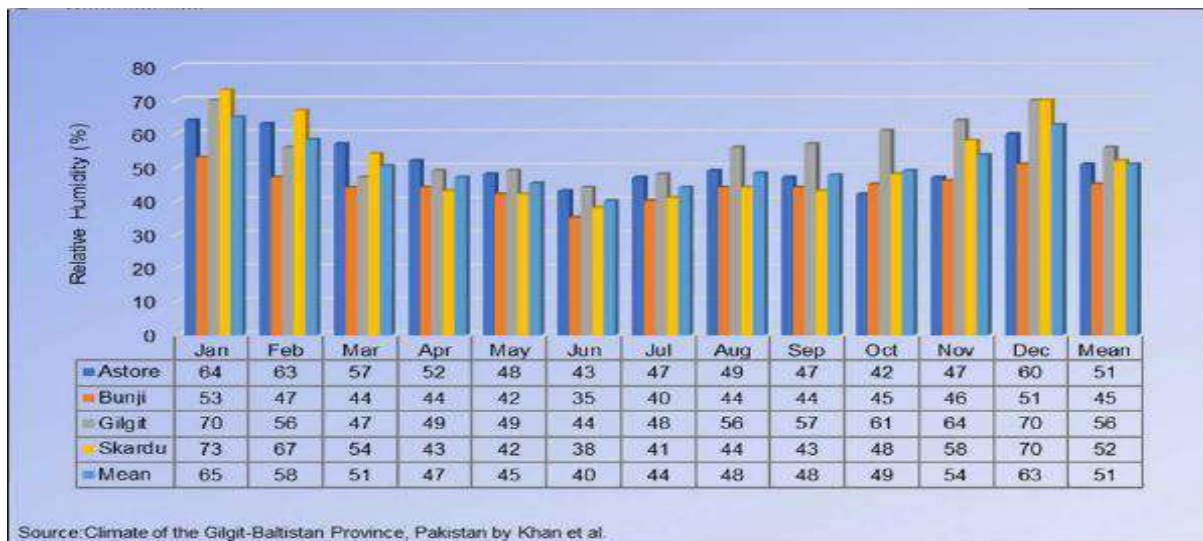


Figure 5.17: Mean Monthly Relative Humidity (%)

5.5.8 Environmental Instrumental Monitoring

5.5.8.1 Water Quality

The water quality was defined based on primary data collected during the field survey. Water samples from drinking sources and Shatung Nullah surface water were collected on 2nd and 3rd July, 2023 for analysis and establishing baseline conditions for groundwater.

Sampling and Methodology: The sample identification, geographic coordinates, general location and rationale is provided in **Table 5.8**.

Table 5.8: Description of water quality sampling location

Sample ID	Coordinates	Location	Rationale of Selection
1	75°34' 28.92" E & 35° 1' 28.49" N	Weir Site	Baseline conditions before construction in the local water source

Results and Analysis: The results of the surface water quality sampling are summarized in **Table 5.9**. The complete results are given in **Annex V**.

Key results are:

All parameters analyzed were within NEQS limits for drinking water except for bacterial contamination.

Table 5.9: Water Quality Sampling Results

Sr.No.	Parameters	NEQS Limits	Concentration	Method used	Remarks
A. Field Analysis.					
01	pH	6.5-8.5	7.73	Hanna Digital meter	
02	Temp	-	25 °C	Thermometer	
04	Turbidity	≤ 5NTU	< 5	2100 P HACH	
B. Lab. Analysis.					
05	E. Conductivity	NGVS	110	HI 98130 Combo Hanna	
06	TDS	1000 ppm	60	HI 98130 Combo Hanna	
07	Colour	< 15 TCU	< 5	Multiparameter Photometer	
08	ODor	Sensory evaluation	Acceptable		
09	Taste	Sensory evaluation	Acceptable		
10	Residual Chlorine	N.S	N.D	APHA 4500 Cl G	
11	Total Hardness	< 500 ppm	43	Titration method based	

Sr.No.	Parameters	NEQS Limits	Concentration	Method used	Remarks
12	Cyanide	≤ 0.05	N.D	APHA 4500 CN ⁻ E	
13	Phenolic Compound	N.S	N.D	APHA 5330 D	
14	Sodium	≤ 200 ppm	11.06	Meter	
15	Potassium	NGVS	N.D	Multiparameter Photometer	
16	Aluminium (Al)	≤ 0.2	N.D	APHA 3111 / 3120 B	
17	Chloride	≤ 250 ppm	07	Kit base method	
18	Nitrate	≤ 50 ppm	N.D	Multiparameter Photometer	
19	Nitrite	≤ 3 ppm	N.D	Multiparameter Photometer	
20	Antimony (Sb)	≤ 0.005	N.D	APHA 3111 / 3120 B	
21	Copper	≤ 2 ppm	N.D	Multiparameter Photometer	
22	Iron	≤ 2 ppm	N.D	Multiparameter Photometer	
23	Arsenic	≤ 0.01 ppm	N.D	Merckoquant Kit	
24	Barium (Ba)	0.7	N.D	APHA 3111 / 3120 B	
25	Boron (B)	0.3	N.D	APHA 3111 / 3120 B	
26	Cadmium (Cd)	0.01	N.D	APHA 3111 / 3120 B	
27	Chromium (Cr)	< 0.05	N.D	APHA 3111 / 3120 B	
28	Lead (Pb)	< 0.05	N.D	APHA 3111 / 3120 B	
29	Manganese (Mn)	< 0.5	N.D	APHA 3111 / 3120 B	
30	Mercury (Hg)	< 0.001	N.D	APHA 3112 / 3120 B	
31	Nickel (Ni)	< 0.02	N.D	APHA 3111 / 3120 B	
32	Zinc (Zn)	5.0	N.D	APHA 3111 / 3120 B	
33	Selenium (Se)	0.01	N.D	APHA 3111 / 3120 B	
34	E. Coli	0 CFU/100 ml	Absent	Compact Dry EC plates	
35	Faecal Coliform	0 CFU/100 ml	Absent	DelAgua Kit	
36	Total Coliform	Absent	Absent	APHA 9222 B	

5.5.8.2 Air Quality

There is no major anthropogenic source found in the proposed G/S area, other than local road and a few cooking stoves in villages. The agricultural land results in windblown dust in dry conditions. The pollutants selected for evaluation, based on the expected emissions from the Project activities and the level of risk to human health posed by these pollutants, are as follows:

- Respirable particulate matter—Coarse (PM₁₀)⁸, Fine (PM_{2.5})⁹, and Particulate Matter (PM Total)
- Sulfur dioxide (SO₂)

⁸ PM₁₀ is particulate matter 10 micrometers or less in diameter

⁹ PM_{2.5} is particulate matter 2.5 micrometers or less in diameter

- Oxides of Nitrogen (NOX)—Mainly Nitrogen dioxide (NO₂) and Nitric oxide (NO)
- Carbon Monoxide (CO)

Air quality sampling was carried out at Weir Site and Camp Site locations in the study area on 2nd and 3rd July, 2023. The sample identification, geographic coordinates, general location and rationale is provided in **Table 5.10**.

Table 5.10: Details of air quality sampling locations

Sample ID	Coordinates	Location	Pollutants Sampled	Rationale for Site Selection
1	E: 75°34' 28.92 N: 35° 1' 28.49"	Weir Site	CO, SO ₂ , NO ₂ , and NO, PM	Baseline conditions before the construction activities, which may affect the air quality in the surroundings.
2	E: 75° 33' 04.46" N: 35° 02' 23.08"	Camp Site	CO, SO ₂ , NO ₂ , and NO, PM	Baseline conditions before the construction activities, which may affect the air quality in the surroundings.

Results and Analysis: The results of the ambient quality sampling are summarized in **Table 5.11**. The complete results are given in **Annex V**, Key results are:

All parameters analyzed were within NEQS limits for ambient air.

Table 5.11: Ambient Air Quality Results

Sr.	Parameters	NEQS	Units	Results	Test Method
Weir Site					
1	PM _{2.5}	35	µg/m ₃	19.8	-β Ray Absorption method
2	PM ₁₀	150	µg/m ₃	53.4	-β Ray Absorption method
3	CO ₂	-	µg/m ₃	121	40 CFR Part 50, App. D (US-EPA)
4	CO	10	µg/m ₃	1.34	Non-Dispersive Infra-Red (NDIR) method
5	NO ₂	80	µg/m ₃	23.1	Gas Phase Chemiluminescence
6	SO ₂	120	µg/m ₃	12.01	UV fluorescence (UVF)

Sr.	Parameters	NEQS	Units	Results	Test Method
7	NO	40	µg/m ₃	26.19	Gas Phase Chemiluminescence
8	O ₃	180	µg/m ₃	0.00	Non dispersive UV absorption method
Camp Site					
1	PM _{2.5}	35	µg/m ₃	21.2	-β Ray Absorption method
2	PM ₁₀	150	µg/m ₃	35.1	-β Ray Absorption method
3	CO ₂	-	µg/m ₃	119	40 CFR Part 50, App. D (US-EPA)
4	CO	10	µg/m ₃	1.03	Non-Dispersive Infra-Red (NDIR) method
5	NO ₂	80	µg/m ₃	19.6	Gas Phase Chemiluminescence
6	SO ₂	120	µg/m ₃	9.01	UV fluorescence (UVF)
7	NO	40	µg/m ₃	22.12	Gas Phase Chemiluminescence
8	O ₃	180	µg/m ₃	0.00	Non dispersive UV absorption method

5.5.8.3 Noise

This section defines the baseline ambient noise levels in the Aoi in a manner that can be used for the assessment of the noise impact of the proposed project. Noise levels were measured at selected locations considered representative of the nearby receptors of possible noise disturbance from the project.

The following is a brief description of the terminology used in this assessment:

- Sound: A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone
- Noise: Sound that is loud, unpleasant, unexpected, or otherwise undesirable
- Decibel (dB): A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.

- A-Weighted Decibel (dB (A)): An overall frequency-weighted sound level in decibels, which approximates the frequency response of the human ear. The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts on people, an electronic filter is used that de-emphasizes certain frequencies in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies. All of the noise levels reported in this Section are A-weighted
- Equivalent Sound Level (Leq): The equivalent steady-state sound or vibration level, which is a stated period, typically one hour, would contain the same acoustical or vibration energy.

Sampling Methodology: Noise measurements were taken from Weir Site and Camp Site locations listed in **Table 5.12**. Noise readings were taken for 24 hours at each site.

Table 5.12: Noise sampling locations

ID	Location	Coordinates	Parameter	Description and Rationale for Selection
1	E: 75°34' 28.92 N: 35° 1' 28.49"	Weir Site	Noise	Baseline conditions before the construction activities, which may affect the noise levels in the surroundings.
2	E:75o 33' 04.46" N:35o 02' 23.08"	Camp Site	Noise	Baseline conditions before the construction activities, which may affect the noise levels in the surroundings.

The instrument was mounted on a tripod, to avoid interference from reflecting surfaces within the immediate neighborhood, and a windshield was used in all measurements.

Results and Analysis: A summary of the results is provided in **Table 5.13**. The complete data provided by the testing team are given in **Annex V**.

Key results are:

All parameters analyzed were within NEQS limits values for ambient noise levels in the daytime.

Table 5.13: Average noise levels during the survey

Sr.	Location	Parameters to be Analyzed	NEQS Day Time	Units	Results	Test Method
1	Weir Site	Noise	55	dB A	49.1	BS 7445:2003
2	Camp Site	Noise	55	dB A	40.9	BS 7445:2003

Note: Noise level is within NEQS limit.

5.6 Biological Environment

Deosai National Park is a place of rich biodiversity owing to its location, where two biogeographically located provinces in the Himalayan and Karakoram-Pamir highlands merge. Deosai National Park has outstanding universal value due to its biodiversity conservation role, not for one key species like the Brown Bear, but a general collection of fauna species.

The park's location in the western Himalayas, classified as an Endemic Bird Area by Birdlife International, is important as a resting and breeding ground of internationally important residential and migratory birds. Deosai hosts over one hundred types of resident and migratory birds. The park welcomes many migratory birds in summers like the gulls, geese, terns, plovers, shanks, sandpipers, Common Merganser and Horned Lark. Other birds in the park include The Goldfinch and Red-fronted Serin, the Turtle Dove, the Rock Bunting, the golden eagle, falcons, Eurasian sparrowhawk, griffon vulture, and snowcock, kestrels, and pheasants.

The waters of Deosai Plains are also home to the enormous-sized snow trout, which also serves as food for many migratory birds.

Like the fauna, the flora of Deosai is also brimming with variety and diversity. Hundreds of species of aromatic flowers growing here are a source of food for wildlife and have great medicinal value. In the spring and summer seasons, the entire area is covered with a cornucopia of wildflowers. You can witness an extensive variety of butterflies belonging to rare species hovering on the richly colored flowers.

In Deosai growth of around 342 plant species is reported. Some of the plant varieties are Golden Ragwort, Forget-Me-Nots, Pink Sedum, "Tumoro" (local name for wild

Thyme), Gentian, Asian Bell Flower, Geranium, Scabious, Thistle, Monkshood, and many more. Among many other plants used for medicinal value by locals, "Tumoro" is largely used as herbal tea in Skardu and Astore.

5.6.1 Fauna

Deosai is home to about 24 mammalian species. Predators other than Brown bear, like Snow leopard, Himalayan wolf and Tibetan Red fox and associated prey species mostly ungulates i.e., Himalayan ibex, Musk deer, and Golden marmot; in or around DNP play a significant role in maintaining the ecological balance and health of the park. Major Fauna species are given below:

5.6.1.1 Himalayan Brown Bear (*Ursus arctos isabellinus*)

The Himalayan Brown bear is a highly threatened species in Pakistan. Its population is sparse and scattered throughout the Gilgit-Baltistan, KPK and AJK. The largest population in South Asia has been recorded in the Deosai National Park which is more than 88 individuals, which indeed is quite below the minimum viable population size established by past researchers.

5.6.1.2 Himalayan Ibex (*Capra ibex sibirica*)

The habitat is degrading in lower areas due to presence of livestock and upper edges it is good for wildlife. The shepherds are taking care about the habitat of wildlife; they do not take livestock in the habitat of wildlife. Himalayan ibex mainly occupies peripheral hills of the park. A survey by DNP field staff shows overall 559 Himalayan ibexes were sighted during the survey period of 2019. Out of which 233 were male, 184 female, 93 yearlings and kids.

5.6.1.3 Golden Marmot (*Marmota caudata*)

The Golden marmot, seen widely across the whole of Deosai Plains, is the most common mammal living in colonies appearing as large earth mounds with multiple inlets. Marmot spends most of the summer by feeding and basking and then hibernates by mid-September until March.

5.6.1.4 Carnivores

Deosai National Park is not a well-preferred area for Snow leopards, mainly due to its landscape and geography. This species is reported to inhabit the steep high elevation

areas surrounding Deosai plateau including the slopes of Nanga Parbat, Skardu and Astore valley. Snow leopards, foxes and wolves were recorded.

5.6.1.5 Avifauna

A total of 130 species of birds have been recorded (Mirza, 2005, 2008) including 58 species¹⁰ of migratory waterfowls, from Deosai plains. These include passage migrants, vagrant, resident, breeding and irregular visitors. Many of the species breed in Deosai and are found over a large range. Commonly seen birds in Deosai include the Horned lark, Citrine wagtail, Mountain finch, Shy lark, Eastern swift, Crag martin, White capped redstart and Dippers. Waterfowls observed in Deosai include the Common teal, Shoveler, Merganser, Shanks, Curlew, Sandpiper and Great black-headed gull. A few rare species of raptor also occur in the area; these including Golden eagle, Booted eagle, Common kestrel, Long-legged buzzard and Northern hobby are also seen in the park area.

5.6.1.6 Fresh water Fish

The fresh water resources of Deosai harbor several fish species, which are predominantly Palaearctic with elements of central Asian Highlands and some mix of one species called *Diptychus pakistanicus* (Mirza & Khan, 1987). Three species have been reported from the water bodies of Deosai (Rafique, 2000, 2001) viz., High-Altitude Loach (*Triplophysa stoliczkae* Steindachner, 1866), Tibetan Snow Trout (*Diptychus maculatus* Steindachner, 1866), and Indus Snow Trout (*Ptychobarbus conirostris* Steindachner, 1866). The high- altitude Loach is abundant in Gultari River whereas, Tibetan Snow Trout and Indus Snow Trout are abundance in the waters of Deosai National Park (HWF, 2014).

5.6.1.7 Small Mammals

A total of 13 small mammals have been recorded from different areas of Deosai Plateau. They include *Sorex thibetanus*, *Crocidura pergrisea*, *Crocidura pullata*, *Mustela erminea*, *Ochotona roylei*, *Hyperacrius fertilis*, *Alticola royali*, *Sicista concolor*,

¹⁰ Base line survey feasibility studies of fauna, avifauna and flora of Deosai National Park, May 2018

Apodemus rusiges, Rattus turkestanicus, Marmota caudata, Eoglaucomys fimbriatus, and Pipistrellus pipistrellus (HWF, 2014).

5.6.1.8 Reptiles and Amphibians

Deosai has relatively fewer species of reptiles and amphibians than the lower mountains and plains. According to Woods et al. (1997), three species, including one amphibian namely Ladakh Toad (*Scutiger occidentalis*) and two lizards (skinks) viz., Himalayan Ground Skink (*Asymblepharus himalayanus*) and Ladakh Ground Skink (*Asymblepharus ladacensis ladacensis*) have been recorded from DNP.

5.6.1.9 Invertebrate Fauna

Invertebrates found in the Deosai are potential food source for Brown bear. According to HWP, survey (mid-June-mid-September 1999), a total of 43,751 specimens represented 4 classes, 13 orders and 102 families. Arthropods also represent a potential food source for Brown bear and contribute to all over functioning of the ecosystem of Deosai.

5.6.1.10 Faunal Species recoded during field Survey

Table 5.14 showing the Faunal Species recorded during field survey of the project area i.e. weir site, conduce channel and Tunnel site.

Table 5.14: Conservation Status of Faunal Species Reported/observed from the Project Area

Sr. No	Zoological Name	Common Name	Family	IUCN Status
Mammals				
1.	<i>Ursus arctos</i>	Brown Bear	Ursidae	Critically endangered
2.	<i>Canis lupus chanco</i>	Himalayan Wolf	Canidae	Least Concern
3.	<i>Marmota himalayana</i>	Himalayan Marmot	Sciuridae	Least Concern
4.	<i>Vulpes vulpes</i>	Red Fox	Canidae	Least Concern
Amphibians				
1.	<i>Scutiger nyingchiensis</i>	Alpine Toad	Megophrydae	Least Concern
Reptiles				
1.	<i>Asymblepharus himalayanus</i>	Himalayan Ground Skink	Scincidae	Least Concern
2.	<i>Asymblepharus ladacensis ladacensis</i>	Ladakh Ground Skink	Scincidae	Least Concern
Birds				
1.	<i>Motacilla citreola</i>	Citrine Wagtail	Motacillidae	Least Concern
2.	<i>Eremophila alpestris</i>	Horned Lark	Alaudidae	Least Concern
3.	<i>Phoenicurus erythrogastrus</i>	White-Winged Redstart	Muscicapidae	Least Concern
4.	<i>Phoenicurus leucocephalus</i>	White-capped Redstart	Muscicapidae	Least Concern
5.	<i>Pyrhacorax graculus</i>	Yellow-billed Cough	Corvidae	Least Concern

Sr. No	Zoological Name	Common Name	Family	IUCN Status
6.	<i>Galerida cristata</i>	Crested Lark	Alaudidae	Least Concern
7.	<i>Luscinia pectoralis</i>	Himalayan Rubythroat	Muscicapidae	Least Concern
8.	<i>Tichodroma muraria</i>	Wall Creeper	Tichodromidae	Least Concern
9.	<i>Tetraogallus himalayensis</i>	Himalayan Snowcock	Phasianidae	Least Concern
10.	<i>Alectoris chukor</i>	Chukor Partridge	Phasianidae	Least Concern
11.	<i>Motacilla citreola</i>	Citrine Wagtail	Motacillidae	Least Concern
12.	<i>Motacilla personata</i>	Masked Wagtail	Motacillidae	Least Concern
13.	<i>Anas acuta</i>	Northern Pintail	Anatidae	Least Concern
14.	<i>Anas crecca</i>	Common Teal	Anatidae	Least Concern
15.	<i>Anas platyrhynchos</i>	Mallard Duck	Anatidae	Least Concern
16.	<i>Anser anser</i>	Graylag Goose	Anatidae	Least Concern
17.	<i>Aquila chrysaetos</i>	Golden Eagle	Accipitridae	Least Concern
18.	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Scolopacidae	Least Concern
19.	<i>Ceryle rudis</i>	Pied Kingfisher	Alcedinidae	Least Concern
20.	<i>Cinclus cinclus</i>	White-throated Dipper	Cinclidae	Least Concern
21.	<i>Carduelis flavirostris</i>	Twite	Fringillidae	Least Concern
22.	<i>Columba leuconota</i>	Snow Pigeon	Columbidae	Least Concern
23.	<i>Ibidorhyncha struthersii</i>	Ibis Bill	Ibidorhynchidae	Least Concern
24.	<i>Himantopus himantopus</i>	Black-winged Stilt	Recurvirostridae	Least Concern
Fish				
1.	<i>Diptychus maculatus</i>	Tibetan Snow Trout	Cyprinidae	Least Concern
2.	<i>Ptychobarbus conirostris</i>	Indus Snow Trout	Cyprinidae	Least Concern
3.	<i>Triplophysa stoliczkae</i>	Tibetan Stone Loach	Nemacheilidae	Least Concern

5.6.2 Flora

The flora of the DNP includes highly valued medicinal plants, fruit plants, vegetation used as fuel wood and commercial purposes. Juniper, Blue pine, Birch, Willow, Artemisia, Ephedra, Wild Rose, Barberis, Sea Buckthorn and Stinging Nettle are among the trees, herbs and shrubs commonly found in the park. In the project area the Floral Species recorded during field survey is given in the below **Table 5.15**. At the project area, there is tree and shrubs are found.

Table 5.15: Plant Species Recorded from Different Locations of the Project Area

Sr. No.	Plant Species	Sampling Site					
		Dam Site	Reservoir Site	Channel (Conduit) Site	Tunnel Inlet Area	Tunnel Outlet Area	Spoil Dumping Site
1.	<i>Aconogonon tortuosum</i>	*	*				*
2.	<i>Ajuga genevensis</i>	*					
3.	<i>Anchusa officinalis</i>			*			
4.	<i>Androsace septentrionalis</i>			*	*	*	*

Sr. No.	Plant Species	Sampling Site					
		Dam Site	Reservoir Site	Channel (Conduit) Site	Tunnel Inlet Area	Tunnel Outlet Area	Spoil Dumping Site
5.	<i>Androsace villosa</i>	*	*	*	*	*	*
6.	<i>Antennaria pulchella</i>	*	*	*	*	*	
7.	<i>Aster alpinus</i>	*	*	*		*	*
8.	<i>Aster flaccidus</i>		*				
9.	<i>Astragalus exscapus</i>			*		*	
10.	<i>Bistorta affinis</i>		*			*	
11.	<i>Bistorta vivipara</i>	*					
12.	<i>Carex atrofusca</i>	*					
13.	<i>Carex breweri</i>	*	*	*	*		*
14.	<i>Carex kashmirensis</i>	*			*		
15.	<i>Carex melanantha</i>	*					
16.	<i>Cerastium alpinum</i>			*		*	*
17.	<i>Cotoneaster humilis</i>	*					
18.	<i>Dolomiaea souliei</i>	*		*			
19.	<i>Draba oreades</i>						
20.	<i>Dracocephalum nuristanicum</i>			*	*		
21.	<i>Erigeron uniflorus</i>			*			
22.	<i>Festuca ovina</i>	*	*	*	*	*	*
23.	<i>Gagea lutea</i>			*			
24.	<i>Galium boreale</i>			*			
25.	<i>Gentiana cachemirica</i>	*					
26.	<i>Geranium pratense</i>	*					
27.	<i>Heracleum candican</i>				*		
28.	<i>Leontodon crispus</i>			*	*		*
29.	<i>Myosotis lithospermifolia</i>			*			
30.	<i>Nepeta connata</i>	*	*	*	*	*	
31.	<i>Oxytropis amethystea</i>	*	*	*	*		*
32.	<i>Pedicularis bicarnuta</i>	*					
33.	<i>Pedicularis cheilanthifolia</i>						*
34.	<i>Pedicularis kashmiriana</i>		*	*	*		*

Sr. No.	Plant Species	Sampling Site					
		Dam Site	Reservoir Site	Channel (Conduit) Site	Tunnel Inlet Area	Tunnel Outlet Area	Spoil Dumping Site
35.	<i>Pedicularis verticillata</i>		*	*	*	*	*
36.	<i>Polygonum arenastrum</i>			*	*		
37.	<i>Potentilla grandiflora</i>						*
38.	<i>Potentilla nepalensis</i>		*			*	
39.	<i>Potentilla nivea</i>	*	*	*	*	*	
40.	<i>Primula microphyta</i>						*
41.	<i>Primula vulgaris</i>	*					
42.	<i>Pulsatilla wallichiana</i>	*	*		*	*	
43.	<i>Rheum emodii</i>	*					
44.	<i>Rhodiola tibetica</i>	*			*	*	
45.	<i>Rumex acetosellae</i>						*
46.	<i>Sassuria alpina</i>	*	*				*
47.	<i>Saxifraga flagellaris</i>			*	*	*	*
48.	<i>Sedum ewersii</i>					*	
49.	<i>Senecio chrysanthemoides</i>		*				
50.	<i>Senecio vulgaris</i>	*					
51.	<i>Sibbaldia cuneata</i>	*					
52.	<i>Silene uralensis</i>			*			
53.	<i>Tanacetum falconeri</i>				*	*	*
54.	<i>Taraxacum obovatum</i>						
55.	<i>Taraxacum tibeticum</i>						*
56.	<i>Teucrium chamaedrys</i>					*	*
57.	<i>Thelaspi perfoliatum</i>			*		*	*
58.	<i>Thelepogon elagans</i>						*
59.	<i>Thymus linearis</i>		*		*	*	

5.6.2.1. Medicinal Plants in the Project Area

The medicinal plants in the project area found during the field survey of the different components Shutang Nullah project in **Table 5.16**.

Table 5.16: Ethnobotanical of Plant Species Recorded from the Project Area

Sr. No.	Plant Species	Ethnobotanical Uses
1.	Aconogonon tortuosum	Treat bacterial and fungal skin diseases and rashes. The fresh herb is put on tumors, wounds, and skin ulcers. Controls painful urination.
2.	Ajuga genevensis	Remedy for rheumatic fever, dysentery, malaria, hypertension, diabetes, and gastrointestinal ailments, in addition to anti-inflammatory, astringent, diuretic, and antifungal activities
3.	Anchusa officinalis	Flowers and young leaves can be added to salads. A root decoction is given as a blood cleanser and expectorant for coughs. Powdered root rind is used to color hair and medicines. It can also be used as a fabric dye.
4.	Androsace septentrionalis	The plant is used for angina, heart diseases, epilepsy, gonorrhoea, and as a contraceptive.
5.	Androsace villosa	-
6.	Antennaria pulchella	-
7.	Aster alpinus	Cure headaches, cold, and muscle pains
8.	Aster flaccidus	Flowers are used against poisoning, epidemic fever, infectious cold and cough, spasms of tendons and ligaments.
9.	Astragalus exscapus	These invaluable plants are widely used as medicine, food, fodder, fuel and as ornamental plants in different ethnobotanical practices throughout the world.
10.	Bistorta affinis	It is used as antipyretic and anti-inflammatory. It treats fever, tonsillitis, cough, and cold.
11.	Bistorta vivipara	It is used in the treatment of abscesses, as a gargle to treat sore throats and spongy gums, and as a lotion for ulcers
12.	Carex atrofusca	An infusion has been used in the treatment of bronchitis and catarrhs, abdominal and stomach disorders, liver complaints, arthritis and rheumatism and skin conditions such as eczema and pruritus
13.	Carex breweri	-
14.	Carex kashmirensis	-
15.	Carex melanantha	-
16.	Cerastium alpinum	Its leaves are rich in tannins, which have astringent properties, making them useful in treating diarrhea, dysentery, and other gastrointestinal disorders. The plant has also been used to treat respiratory conditions such as coughs and colds
17.	Cotoneaster humilis	Medikus provides numerous species traditionally used in Asian medicine for the treatment of haemorrhoids, diabetes, and cardiovascular diseases.
18.	Dolomiaea souliei	The plant is cultivated as a medicinal plant. The essential oil obtained from the roots is used in perfumery, incenses, and in hair rinses
19.	Draba oreades	-
20.	Dracocephalum nuristanicum	The plant is reported to be a remedy for inflammatory pain, headaches, congestion, liver disorders, ulcer, fever, renal pain, dyspepsia, stomach ache, abdominal pain, joints pains, muscle spasm, congestion, bloating, and wound healing effects, among others.
21.	Erigeron uniflorus	-
22.	Festuca ovina	-
23.	Gagea lutea	It is harvested from the wild for local use as a food.
24.	Galium boreale	Used to treat a variety of ailments, including colds, coughs, and digestive issues.
25.	Gentiana cachemirica	Used for treatment of some disorders such as menstrual over-bleeding, conjunctivitis, vitiligo, animals venom poisoning, injuries, infected wounds, pain and swelling of liver, spleen, stomach and sprains of muscles.

Sr. No.	Plant Species	Ethnobotanical Uses
26.	<i>Geranium pratense</i>	It is Analgesic, anti-inflammatory and febrifuge, it is used in the treatment of fevers from influenza, inflammation of the lungs, pain and swellings of the limbs.
27.	<i>Heracleum candicans</i>	Used as antifungal in Pakistan and for snakebites in India
28.	<i>Leontodon crispus</i>	-
29.	<i>Myosotis lithospermifolia</i>	-
30.	<i>Nepeta connata</i>	<i>Nepeta</i> species are used traditionally as antispasmodic, diuretic, febrifuge, diaphoretic, antimicrobial and antiseptic agents.
31.	<i>Oxytropis amethystea</i>	-
32.	<i>Pedicularis bicornuta</i>	Inflorescence paste is used to treat vaginal and seminal discharges. Pulverized root tissue is used to relieve joint pain.
33.	<i>Pedicularis cheilanthifolia</i>	This medicinal herb is used in the treatment of leucorrhoea, fevers, sterility, rheumatism, general debility, collapse, and urinary problems
34.	<i>Pedicularis kashmiriana</i>	-
35.	<i>Pedicularis verticillata</i>	-
36.	<i>Polygonum arenastrum</i>	Widely used as an astringent both internally and externally in the treatment of wounds, bleeding, piles and diarrhoea. Its diuretic properties make it useful in removing stones
37.	<i>Potentilla grandiflora</i>	<i>Potentilla</i> species considered to be one of the safest astringents in the treatment of diarrhoea, dysentery and sore throat.
38.	<i>Potentilla nepalensis</i>	Decoction of leaves is used to treat diarrhea, arthritis, and kidney stones.
39.	<i>Potentilla nivea</i>	-
40.	<i>Primula microphyta</i>	Diseases of the digestive system, respiratory system, circulatory system, kidney and urinary system, musculoskeletal, diseases of neurological (insomnia, headache), Injury, poisoning and certain other consequences of external causes, ophthalmic and general and unspecified (cold fever, toothache) are treated with <i>Primula</i> sp.
41.	<i>Primula vulgaris</i>	Diseases of the digestive system, respiratory system, circulatory system, kidney and urinary system, musculoskeletal, diseases of neurological (insomnia, headache), Injury, poisoning and certain other consequences of external causes, ophthalmic and general and unspecified (cold fever, toothache) are treated with <i>Primula</i> sp.
42.	<i>Pulsatilla wallichiana</i>	<i>Pulsatilla</i> is a toxic plant. Misuse can lead to diarrhea, vomiting and convulsions, hypotension, and coma. It has been used as a medicine by Native Americans for centuries. Blackfoot Indians used it to induce abortions and childbirth. <i>Pulsatilla</i> should not be taken during pregnancy nor during lactation. Extracts of <i>Pulsatilla</i> have been used to treat reproductive problems such as premenstrual syndrome and epididymitis. Additional applications of plant extracts include uses as a sedative and for treating coughs.
43.	<i>Rheum emodii</i>	Used as diuretic, liver stimulant, purgative/cathartic, stomachic, anticholesterolaemic, antitumour, antiseptic and tonic
44.	<i>Rhodiola tibetica</i>	-
45.	<i>Rumex acetosella</i>	Traditionally been used to treat inflammation, cancer, diarrhea, scurvy and fever. A tea made from the stem and leaves can be made to act as a diuretic
46.	<i>Sassuria alpina</i>	it is used in treatment of paralysis of limbs and cerebral ischemia
47.	<i>Saxifraga flagellaris</i>	It is kept as such for 1-3 days and then used against fever.

Sr. No.	Plant Species	Ethnobotanical Uses
48.	<i>Sedum ewersii</i>	The plant is crushed and applied on forehead to provide cooling and soothing effect. This plant is given to milch cattle to increase milk production
49.	<i>Senecio chrysanthemoides</i>	Flowers are crushed and applied on wounds as antiseptic. Root powder is used against rheumatic pain
50.	<i>Senecio vulgaris</i>	It is often used as a poultice and is said to be useful in treating sickness of the stomach, whilst a weak infusion is used as a simple and easy purgative
51.	<i>Sibbaldia cuneata</i>	-
52.	<i>Silene uralensis</i>	A number of <i>Silene</i> species have been used in traditional medicine to treat inflammations, bronchitis, cold, and infections or as a diuretic
53.	<i>Tanacetum falconeri</i>	Same species has been reported to treat cardiac diseases, cancer and stomach ache
54.	<i>Taraxacum obovatum</i>	<i>Taraxacum</i> can be used as diuretics, antioxidants, bile agents, anti-inflammatory, analgesic, and anti-cancer agents
55.	<i>Taraxacum tibeticum</i>	Plants belonging to the genus Taraxacum have been used in traditional healthcare to treat infectious diseases including food-borne infections
56.	<i>Teucrium chamaedrys</i>	Used for the treatment of inflammations, gastrointestinal problems, rheumatoid arthritis, wounds, and uterus infections.
57.	<i>Thelaspis perfoliatum</i>	The seed contains 20 - 30% of a semi-drying oil, it is used for lighting
58.	<i>Thelepogon elegans</i>	-
59.	<i>Thymus linearis</i>	It is used to treat dropsy, pneumonia, appetite loss, asthma, chest infections, cold, cough, fever, flatulence, gastrointestinal problems, indigestion, menstrual disorders, stomachache, and menstrual disorders

5.6.2.2. Other Flora

Polygonum affine, *Thalictrum alpinum*, *Bromus oxyodon*, *Saxifraga flagellaris*, *Androsace mucronifolia*, *Aster flaccidus*, *Barbarea vulgaris*, *Agropyron longearistatum*, *Nepeta connate*, *Carex cruenta*, *Ranaculyus laetus*, *Arenaria neelgerrensis*, *Astrogalus leucophylla*, *Polygonum amplexinade*, *Echinop nivetus*, *Seria chrysanthenoides*, *Dracocephalum nutsus*, *Anapalas contorta*, *Chrysopogon echinulatus*, *Dianthus crinitus*.

5.7 Social Environment

5.7.1 Social Environment Gilgit Baltistan

Gilgit Baltistan presently has three divisions and 14 districts as shown in **Figure 5.18**. The allocation and distribution of districts to each of the three divisions is shown in **Table 5.19**.



Figure 5.18: Districts of Gilgit Baltistan since 2019



Figure 5.19: Districts of Gilgit Baltistan from 2016 to 2019

Table 5.17: Division and Districts of Gilgit Baltistan since 2019

	Gilgit	Baltistan	Diamer
Districts	Gilgit	Ganche	Diamer
	Ghizer	Shiger	Astore
	Hunza	Kharmang	Darel
	Nagar	Skardu	Tangir
	Gupis Yasin	Roundu	

The three divisions are Gilgit, Baltistan and Diamer with a large area of 72, 496 square kilometers. These three divisions are the administrative divisions also, and are further divided into 14 districts i.e., five districts in Baltistan, five in Gilgit, and Diamer division is divided into four districts Table 5.18. While Roundu is shown as a district in the updated maps headed by the Assistant Commissioner, but has not yet been functional as an administrative unit. The number of districts has changed time and again in the past ten years. Before 2012, there were only two divisions i.e., Gilgit and Baltistan with a total of 7 districts. In 2012, Diamer was given the status of division, further consisting of Diamer and Astore districts. Since 2012, these two divisions were already there in Gilgit, therefore the number of total districts remained same as 07 in total districts in Gilgit. The number of districts rose from 7 to 10 districts because two more districts of Shiger and Kharmang were further added to the Baltistan division, and in Gilgit Division, the previous Hunza-Nagar district was split into 02 districts.

Table 5.18: Division and Districts of Gilgit Baltistan from 2016 to 2019

Divisions	Gilgit	Baltistan	Diamer
Districts	Gilgit	Ganche	Diamer
	Ghizer	Shiger	Astore
	Hunza	Kharmang	
	Nagar	Skardu	

Skardu and Gilgit are the main administrative towns in the region. Skardu is the capital of Baltistan also. The region has snow-clad high mountains, rivers, nullahs and streams. River Indus flows through the whole region of Gilgit Baltistan. Four of the world highest mountain ranges- the Himalaya, Karakoram, Pamir and Hindukush lies

in this region and the height of the region is mostly above 03 thousand meters and communities are settled on it. The region is always located with a very complicated weather; yearly long and the access remains always disconnected to those communities, making it difficult to let the government aware of these problems under the prevailing contemporary circumstances. The population of Gilgit Baltistan is currently estimated at 1.3 million (HDI report, 2017). A large number of populations is rural i.e., 81.7% and a very small number of populations is allocated to urban locality (MICS 2016-2017). The population is dispersed in 20 different valleys and divided over 650 settlements. The Human Development Index (HDI) of the region is low in the three dimensions: education, health and standard of living.

5.7.1.1 Education

According to a literacy survey conducted in 2020, the total literacy rate of GB is around 53 % with an estimate of 66% in males and 42 % in females. There are 18 colleges in Gilgit District, while in Skardu district; there are 8 colleges for girls and 10 colleges for boys. There are 07-degree colleges; eight are intermediate colleges, while the remaining two are elementary colleges.¹¹

The higher educational institutional facilities in Gilgit Baltistan are very limited. There are only two universities which have few departments only. Alongside of these higher educational institutions, Gilgit Baltistan is still devoid of education in medical and engineering fields. The students used to travel to cities for studies which is of high cost for them and by no mean be afforded, so they drop out their studies. Due to less opportunities of education, there is no betterment in economic conditions of the people of Gilgit Baltistan. Government has announced time and again to establish or give opportunities to people to enlist with education, but their efforts have remained in vain all the time. Adding further fuel to fire, the government on contrary has reduced seats in medical colleges for students of Gilgit Baltistan.

5.7.1.2 Health

The Gilgit Baltistan Health department currently provides multi-health care to sparse population over harsh weather. The health department is operated with around 499 health facilities with the help of 248 medical officers and specialists. Health department

¹¹ https://en.wikipedia.org/wiki/Education_in_Gilgit-Baltistan

comprises of 3 district headquarter hospitals (DHQs) 37 civil hospitals (CHs), 22 Basic Health Units (BHUs) and 3 Rural Health Centers (RHCs) in the region. There are two types of dispensaries, 61 are A-Class and 242 are C-class dispensaries.¹²

According to data reported in 2020, many of pregnant women have shown iron deficiency i.e., 70 % of women suffering from anemia diseases. Children also face many health issues. About 36 % children are under the age of five and are lying short of their age, while 12.6 % are reported underweight for their age compositions. The health issues for both the people of Pakistan in general and Gilgit Baltistan in particular are very desperate.

Likewise, the status of women with respect to their empowerment is also very low. They are deprived from their right of education. Water sanitation and hygiene issues are also very rampant and have led to various health issues in the region. A public health facility assessment was conducted in all hospitals and health care centers to make government aware about the quality of health facilities and services in the region. It also further evaluates the infrastructure of the hospitals, provision of staff training, supervision, maternal care and delivery work coordination, disease control and monitor death rates. This has also further evaluated that all BHUs were unable to provide 8 hours a day service in 6 days a week in terms of preventive maternal, Neonatal and child Health (MNCH) services due to deficiency of one or more components of preventive MNCH services package.¹³

Similarly, the RHCs (Rural Health Centers) and CHs (Civil Hospitals) are examined for provision of 24 hours service (7 days in a week time) as additional complementary services, but none of them is found fully functional to provide a package of complete Basic Emergency Obstetrics and Newborn Care (EMONC) services. Same is shown in all DHQ (District Health Quarter) hospitals. There is a lack of one or more facilities, there has been hardly any hospital which has provided health service in 24/7 comprehensive (EMONC) services package. It is also reported that GB has a high maternal mortality i.e., 600/100,000 live births. Moreover, the increase in GB population has also demanded for an increase in availability of more drinking water

¹² Gilgit Baltistan Planning & Development Department 2020

¹³ HEALTHCARE CHALLENGES IN GILGIT BALTISTAN: THE WAYFORWARD
<https://www.pjph.org/index.php/pjph/article/download/47/35/73>

resources. However, there are reported that 60% have access to improved drinking water and 82% population have improved sanitation facilities. The National program for lady health workers has 1588 LHW and LHS against the sanctioned 1613 posts.

5.7.1.3 Governance

Gilgit Baltistan has a democratic system headed by a governor as the constitutional head of the province. Provincial Assembly elects Chief Minister as head of the provincial government to run the affairs of provincial government. The Gilgit Baltistan Assembly is unicameral and comprises of 33 seats with 24 elected seats, 6 reserved seats for women and there are 03 seats for technocrats and professionals. Last elections of the legislative Assembly in Gilgit Baltistan were held in 2020. Pakistan Peoples Party (PPP) had passed Local Government Act 2014, which is now fully functional and applied in Gilgit Baltistan. This act is very expedient to perform all political activities through the participation of population in local elections in the region. This act entails two types of structures i.e., being rural and urban in its nature. At rural level, it has three types of system functioning with districts, Tehsils and Union Councils levels¹⁴.

The administrative responsibilities are performed by civil servants, where the chief secretary is acted as the administrative head of the province. Other Bureaucratic structures are: Commissioners are heads of divisions; Districts are headed by Deputy Commissioners and Assistant Commissioners are the heads of the Tehsils levels.

5.7.2 Skardu District

Skardu is the main town city of the Baltistan Division. Skardu at the present is further divided into three Tehsils i.e., Gamba, Gultari and Skardu with the area of 15,000 km¹⁵ and population of 214,818¹⁶. Human development Index ranks at the lowest level in Skardu, it stands as 0.523¹⁷.

According to Pakistan National Human Development Report, 2017, it ranks 89th out of 140 districts of Pakistan in terms of infrastructure. Skardu district has a literacy rate

¹⁴ <http://www.the-local-government-system-in-gilgit-baltistan>

¹⁵ https://en.wikipedia.org/wiki/Skardu_District.

¹⁶ National Human Development Index Report 2017.

¹⁷ Gilgit Baltistan at a Glance 2020, Government of Gilgit Baltistan, Planning & Development. Department Statistical & Research Cell.

of 54% with a literacy ratio of 67% in males and 41% in females.¹⁸ There are about 227 primary, middle, high schools and elementary schools for both boys and girls (**Table 5.19**)¹⁹.

Table 5.19: Government Schools in Skardu district

Breakdown of Government Schools in Skardu District					
Boys' primary schools	Girls' primary schools	Boys' Middle schools	Girls' Middle schools	Boys High Schools	Girls High Schools
96	52	35	23	13	08

Skardu districts have 27 federal government schools, 70 Basic Education Community Schools and 10 Federal Community schools in Skardu district. There are three-degree colleges i.e., two for men and one for females, and there are also two boys and one intermediate college for girls in Skardu. There is one Vocational Technical Training College (VTTC) which is functional and taught with various 15 courses in different fields²⁰.

In health facilities, Skardu has one district hospital, 03 civil hospitals, 01 RHC, 07 dispensaries of A-class, 27 dispensaries of C-class, 25 MCH centers, 04 BHUs, 22 Sub-Health Centers, Government rural dispensaries are 58 and other 84 health services available in the district^{21&22}. Skardu also generates 19.89 Mega watts of electricity in summer season and 16.17 Mega watts in winters, but the demand for electricity is high in both of the seasons in Skardu from presently generating capacity and required the capacity of 50.60 Mega watts and 94.47 watts in the respective seasons. The shortfall is 34.6 megawatts for summers and 78.30 for winters²³. To fulfill the electricity needs of Skardu a Harpo hydropower project has been designed. From

¹⁸ District Education Department, Skardu.

¹⁹ BEC Schools are basic Education non formal Education system based in a single home based room at community level for class 1 to 5.

²⁰ Hospitality, Computer Graphics and Video Editing, Building Electrician and Solar PV Technician, General Electrician, Food Processing, Auto Cad, Computer Operator, Gems Cutting, Dress making, Motor Winding and Transformer Winding.

²¹ Information from District Health Office.

²² District Health Profile of Skardu District, <http://www.alhasn.com>

²³ GB Power Department 2020.

religious perspective most of the population belong to Shia sect i.e., 98% of the total population and 2% people are of Sunni sect²⁴.

The Skardu city has also seen a constant decrease in its water reservoirs in the last few years. The region is also devoid of other sources of water like the sources of water from wells and tube-wells due to the hilly terrain and existing geographical landscape of the region. The main available source of water in the region is the water from streams for both drinking and irrigation purposes.

The currently available capacity of water from Satpara dam does not fulfill the water requirements of the local population in Skardu city. The level of water in Satpara dam is constantly decreasing due to the low inflow of water from the main source of Satpara nullah. Moreover, there has also occurred a constant decrease in the snowfall due to climate change in the region which has further affected the melting capacity of glaciers to raise the water level in the dam. To fulfill the water requirements of the Skardu city, the government has currently proposed to initiate a project titled "Shatung Nullah Diversion Project Skardu". This diversion will help assisting in increasing the water level in dam to fulfill the dire need of water in Skardu city.

5.7.3 Project Area Social Environment

The proposed project (Shatung Nullah Diversion Project) is located at a distance of 57 km from Skardu city in Deosai plain. The pre-construction phase of the project is determined in two dimensions. The first phase of the project is related to the construction of a weir (small dam) on Shatung nullah at a distance of about 5 km from Deosai top, while the second phase is that Shatung Nullah will be diverted through tunnel from the weir site into Satpara nullah.

Although the government has changed the status of Deosai plain by being declared it as a national park in the region, but it is still acted as grazing land for Satpara village. Moreover, the Satpara nullah also passes through the Satpara village in the region; therefore, the impact on the locale cannot be ignored.

While sharing the information with the consultant's team, the local population showed their worries and concerns that the diversion might affect the status of the village by

²⁴ En.wikipedia.org District Skardu.

increasing the water level and further result into soil erosion, losing of land and assets. In this context, the consultant's team (MMP & PES socio-environmental team) visited time and again to the construction site and proposed affected areas of the Satpara village.

So, for the locale of the village, it is further comprising of five-villages i.e., Malpain, Miriaq, Dari, Satpara Bara (Chohar) village and Satpara Center (Skildrong) village, the first three villages are located at the north of Satpara Nullah, while the two Satpara Bara and Satpara Center (Skildrong) villages are located to the south across the Nullah. These villages can be accessed through a Skardu- Deosai metallic road. The status of the road is poor, always vulnerable to land-sliding in winter seasons. The entrance spot from Skardu-Deosai road to Satpara villages is located at a distance of 08 Km from Skardu city. Access from the entrance spot to these villages is difficult; one has to even go cross over the Satpara nullah to reach these villages.

Moreover, all the five villages are sparsely populated. Each one of these holds a respective village profile. Being the main village in the region, the Satpara Bara (Chohar) village has a total of 150 households with 1650 inhabitants are living in the village²⁵. While in other four villages (Satpara Center (Skildrong), Malpain, Miriaq and Dari), there are 140, 65, 80 and 130 households with a total of 1450, 770, 880 and 1380 inhabitants are living in their respective areas²⁶.

The local population is living in joint family system. The size of average family household is comprised of 8-10 persons. All the population is Muslims with a similar ethnic background of Devout Shia sect. The local people speak Shina and Balti languages. They can also easily speak and understand Urdu language, where women are hesitated as compared to men and always feel at large to speak their native language.

The people always prefer to follow the local tradition of intra-tribal marriages. They tend to keep these tribal traditions alive all the time. There has hardly been a person who has been remained in co-operating on an issue with the people of another village, when needed. The population growth rate in Satpara region is 3%. In case of a conflict among the people of a village/ or with the people of another village, the issues are

²⁵ 2020 local census by the village committee.

²⁶ October 2021 local village committee estimation.

always preferred to be resolved with the Jirga system rather than the local police or a judicial system. However, the two villages Satpara Bara (Chohar) village and Satpara Center (Skildrong) village share a common union council Shigri Khurd-02, while Malpain, Miriaq and Dari villages have their own respective union council of Shigri Khurd-01²⁷.

The social wellbeing of the Satpara villages is very desperate. Every village is almost devoid of the basic educational facilities. The government has not yet constructed a separate primary or middle school for boys and girls. Currently, there are three primary schools (one each) in Satpara Bara village, Malpain and Dari village for both boys and girls. All the primary schools are under the supervision of a local based NGO (AKRSP) and are functional in the proposed project area (Table 5.20).

Table 5.20: Schools of Satpara villages

Village	Primary school (Boys & Girls)	Girls Primary School	BMS (Boys & Girls)	GMS	BHS
Satpara Bara (Chohar) Village	1	-	-	-	1
Satpara Center (Skildrong) Village	-	-	-	-	-
Malpain village	1	-	-	-	-
Miriaq village	-	-	-	-	-
Dari village	1	-	1	-	-

The health services in all the Satpara five villages are null. There is one C-class dispensary in the main Satpara Bara village. It always remains dysfunctional and does not fulfill the health requirements. There is only one lady health worker for all villages. It was also reported during the consultation process that the local people have to take their patients to Skardu or Gilgit city when there is a critical condition or an emergency during pregnancies.

5.7.3.1 Social Baseline Data

The consultant's socio-environmental team conducted a social baseline survey in order to collect qualitative and quantitative information of the local population in 2023. This survey was conducted from July to September, 2023. This was a questionnaire-based survey which was conducted mainly with the heads of the households likely to be affected by the activities of the proposed project. In addition to the quantitative tool,

²⁷ The Local Government System in Gilgit Baltistan is based on the Legislative Bill 2014 passed by the Legislative Assembly.

some of the qualitative tools like FGDs and Key Informant interviews tools were also adopted for data collection from relevant respondents. There were conducted three focus group discussions (one each) with a group of household heads, business group and youth in five villages. Key informant interviews were also conducted with teachers and health workers for data collection. The results are summarized and presented in the following tables, while a detailed scenario is also presented in a socio-economic baseline survey report.

The total number of interviews conducted with the households in all five-villages is given in the **Table 5.21**:

Table 5.21: Numbers of Socio-economic Household interviews conducted

Household place of Residents	No of households per group
Satpara Bara (Chohar) Village	87
Satpara center/ Skildrong village	73
Malpain Village	37
Miriah	43
Dari village	67
Total	307

Age and gender distribution: Table 5.22 shows that the male ratio is less as compared to female ratio in all the population. The age wise distribution of population groups is also shown. About 37 % of the population comprises of children with age of 0-14 years, while the population with the age of over 65 years is 8%, whereas the population of 15-65 years makes up 57% in the region.

Table 5.22: Gender Distribution

Household place of Residence	No. of Households answering	Total No. of household members	Male household members		Female Household members	
			No.	%	No.	%
Satpara Bara (Chohar village)	87	913	438	48%	475	52%
Satpara Center (Skildrong) village	73	780	382	49%	398	51%
Malpain Village	37	403	201	50%	202	50%
Miriah Village	43	472	227	48%	245	52%
Dari village	67	735	360	49%	375	51%
Total	307	3,303	1,608	49%	1,695	51%

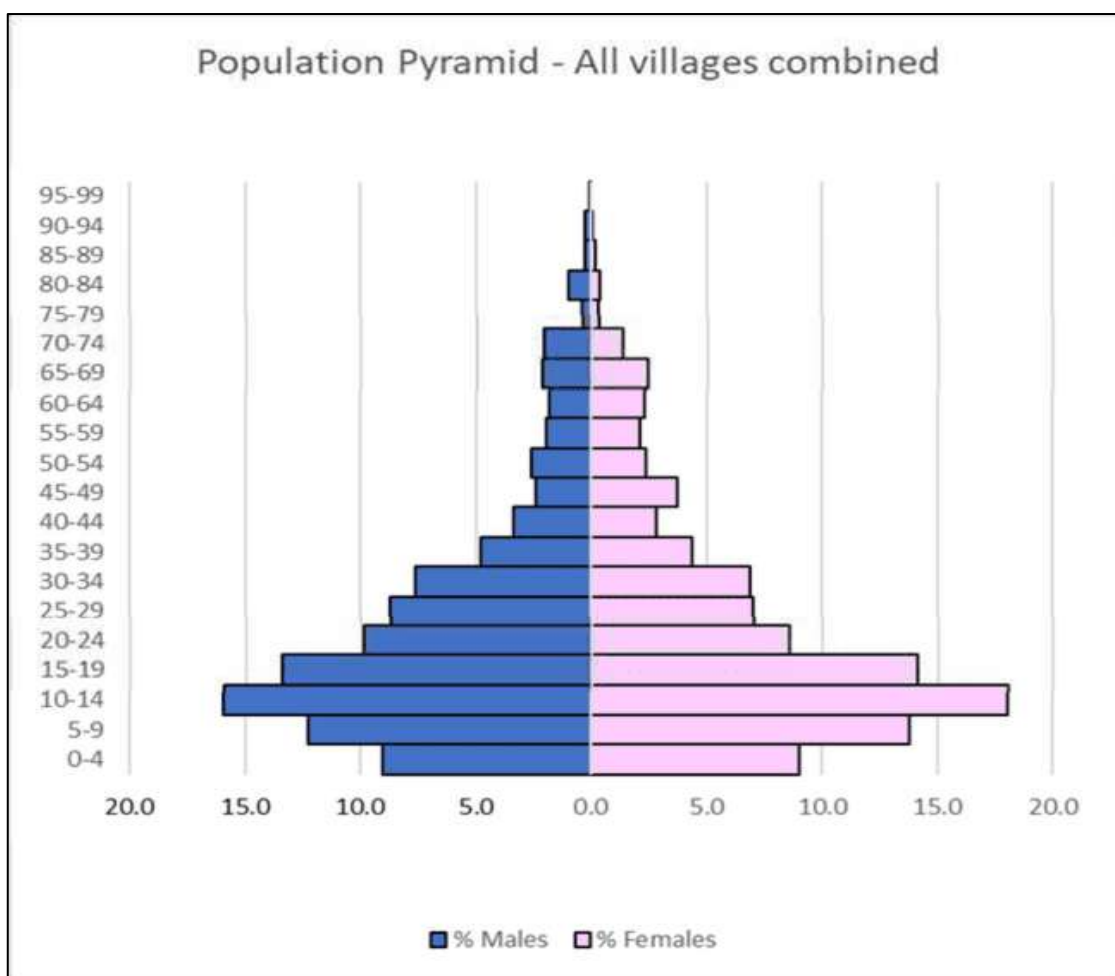


Figure 5.20: Population pyramid all Satpara villages combined

Housing: The sizes of the households are large in the region (**Table 5.23**). There are 10-11 persons on average in every household of the Satpara. About 475 (95%) of the total households are living at the place of their origin, while 25 households (5%) of the population hold second place for living in other places.

Table 5.23: Household sizes

Household place Residence	No. of Household answering	Average	No. of Household members	
			Max.	Min.
Satpara Bara (Chohar village)	87	10.5	24	5
Satpara Center (Skildrong) village	73	10.7	22	4
Malpain Village	37	10.9	19	4
Miriah Village	43	11.0	21	4
Dari village	67	10.97	23	5
Total	307	10.8	22	4

Table 5.24: House Sizes

Household place of Residence	No. of Household answering	No. of rooms per household		
		Average	Max.	Min.
Satpara Bara (Chohar) Village	83	7.47	11	4
Satpara Center (Skildrong) village	68	7.12	10	3
Malpain Village	33	6.43	8	3
Miriahq Village	38	6.97	7	3
Dhari village	62	7.33	9	3
Total	284	7.06	10	3

Education: Table 5.25 shows the literacy rate of the adult population (those 18 years old or above). In total, about 61 % of the whole population is literate. There is also found a large difference in literacy rate among the population with a literacy rate of 76% in males and 42% in females. The information also revealed that only 10 % of the total adult population has reached to secondary or higher level with the ratio of 35% in men and 20 % in women.

Table 5.25: Adult Literacy

	Number of persons with 18 years or above				Total (1)	
	Literate		Illiterate			
	No	%	No.	%	No.	%
Satpara Bara (Chohar) village-Total	276	65%	148	35%	424	100%
Male	215	78%	33	22%	248	100%
Female	61	42%	115	58%	176	100%
Satpara Center (Skildrong) village - total	234	61%	150	39%	384	100%
Male	175	75%	37	25%	212	100%
Female	59	41%	113	59%	172	100%
Malpain Village-Total	79	59%	55	41%	134	100%
Male	58	74%	14	26%	72	100%
Female	21	43%	41	57%	62	100%
Miriahq Village	105	60%	70	40%	175	100%
Male	79	76%	17	24%	96	100%
Female	26	43%	53	57%	79	100%
Dari Village-Total	165	62%	101	38%	266	100%
Male	130	79%	21	21%	151	100%
Female	35	44%	80	56%	116	100%
5 Villages-Total	859	61%	524	39%	1383	100%
Male	653	76%	126	24%	779	100%
Female	206	42%	398	65%	604	100%
(1) persons where literacy information is missing are not included						

Occupation: About 53% adults (who are 18 years old or above) of the combined five-villages is identified as unemployed. The data has also indicated in-terms of gender that 42% males and 65% females are not working. So, for the reasons of women being unemployed are reported that majority of the women (60%) are working as household wives, 20% are students, while a portion of the population i.e., 10 % are old to work. The statistics has also shown that reasons of males for not being working are: about 29% are students, while 29 % are being unable to find a job; therefore, working is avoided, while 20% are found too old to work. (While the data regarding women occupation is exempted from the study)

The following data on primary occupation was recorded from 307 households of all villages: The major occupation is livestock rearing which is about 32 % of the total population; where as 5 % of the population was recorded as farm laborer or livestock herder. Other than farming, 22% was recorded for skilled and unskilled labor in sectors where for women only 2% was related to working in other sectors. Around 12% of the population is reported as merchants, drivers and teachers.

The 45 males of 150 households were recorded to have secondary occupation. The secondary occupation is mostly related with the subsistence work following by 19 % working in offices. Only 285 (57%) adult households have provided their information relating to their employers and work placements. About 20% of the people recorded the importance of working in offices because the majority of the people were working unpaid on their family farms or businesses (**Table 5.26**).

Table 5.26: Annual income of the households from all sources

HH-Place of Residence	No. of HH answering	Sum of total income of all HH in a year (PKR)	Annual income per HH from all sources (PKR)			
			Aver.	Max.	Min.	Standard Deviation
Satpara Bara (Chagogrong) Village	87	23,961,975	275, 425	990,000	90,000	1073981.08
Satpara Center (Skildrong) Village	73	16,808,323	230, 251	875,000	85,000	866965.75
Malpain Village	30	6,450,000	215,000	550,000	83,000	443,410.43
Mirraq village	35	78,86,375	225,325	645,000	65,000	246,657.56
Dari Village	53	14,075,422	265,574	890,000	85,000	270,603.42
Total	278	69,182,995	248,859	990,000	85,000	319,868.89

Household incomes: The absolute amounts of household incomes in PKR are hereby presented in this section of the study. The total income from all sources is

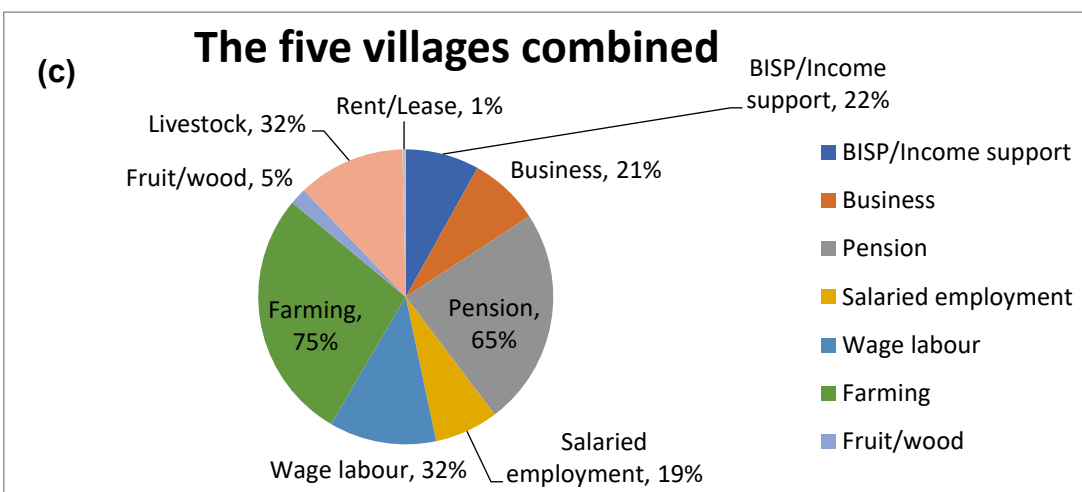
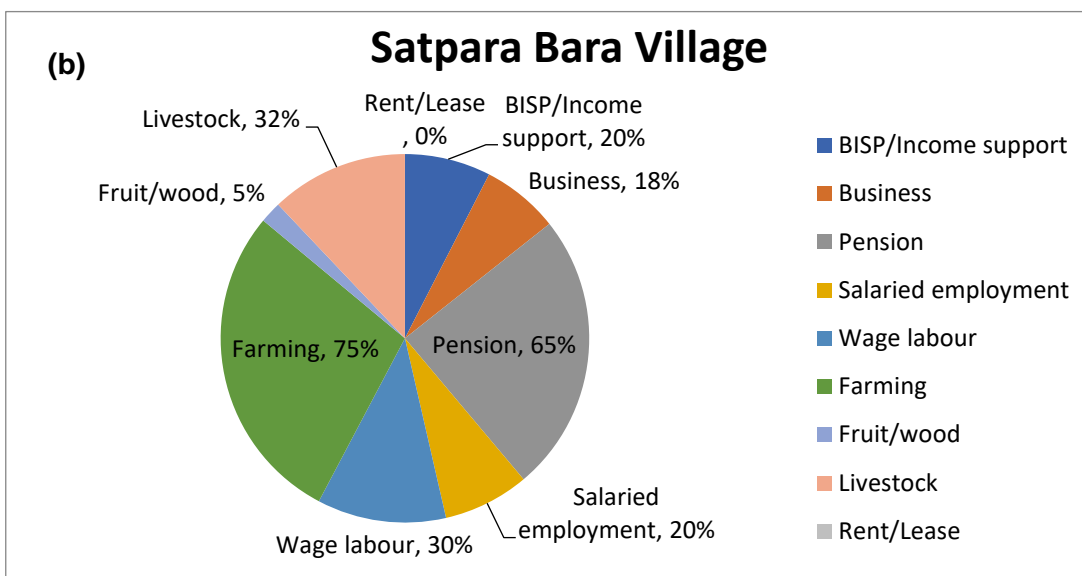
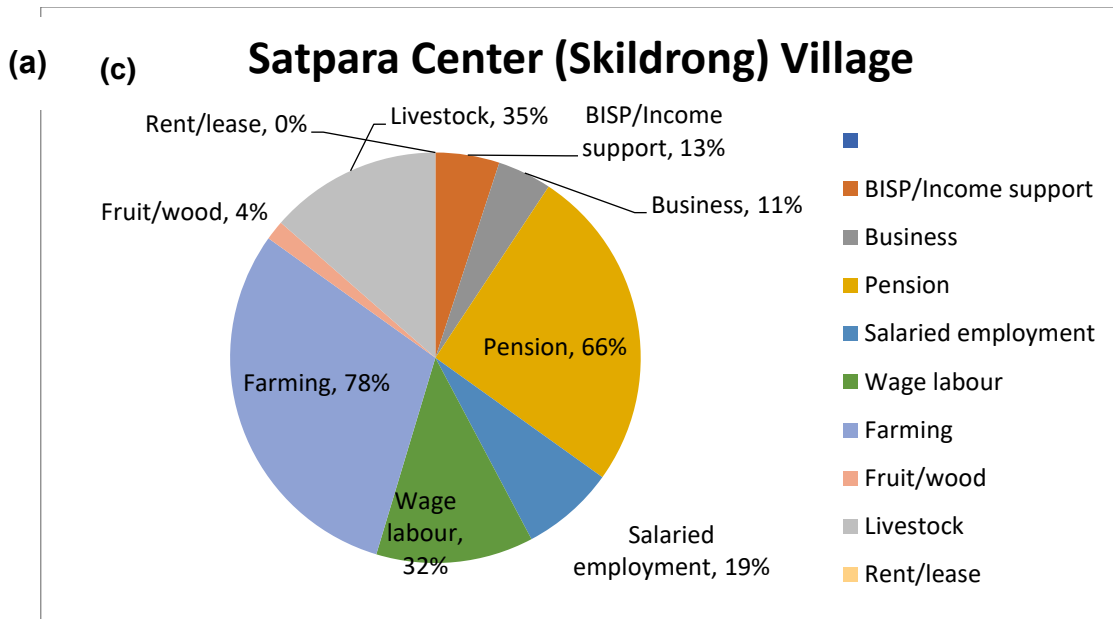
presented in following tables. The average annual income of a household received in PKR from all resources and localities of all five villages is reported as 248,859. This income does not include the amount received from the subsistence farming, while the revenue generated from the sales of the farm products is given below. Difference in terms of income among the households in the social baseline survey was also noted. This difference for income was recorded with respect to the sizes and per capita income of each household is shown in the **Table 5.27**.

Table 5.27: Per capita income of the households from all sources

HH-Place of Residence	No. of HH answering	Sum Total Income (PKR)	Total No. of HH members	Annual per capita income		
				Average	Max.	Min.
Satpara Bara (Chohar) Village	87	23,961,975	913	26,245	250,000	5,000
Satpara Center / Skildrong Village	73	16,808,323	780	21,549	195,000	3,275
Malpain Village	30	6,450,000	327	19,724	130,000	2,385
Miriahq village	35	7,886,375	385	20,484	175,000	2,225
Dari Village	53	14,075,422	581	24,226	235,000	3,375
Total	278	69,182,995	2,986	23,169	250,000	2,225

Figures shows the shares of each village in different income sources cumulatively generated. The total incomes of these villages include the income which is generated from the sales of the products of livestock, farming, fruit/wood etc. While the monetary value generated from a product on an individual capacity by a household is not included.

The 60 % income of each household comes from salaried employment (19%) and wage labor (32%) monthly. While the income generated from the sources of Livestock, agriculture and trees is noted 32%. The revenues generated from other sources like business 21%, pensions 65% and other sources like rent / lease as 2%. None of the household has benefited from any bank loan facility; however, there were few respondents who reported their debts owing to shopkeepers and relatives which is about 25 % and 10 % of the debts recorded in five villages.



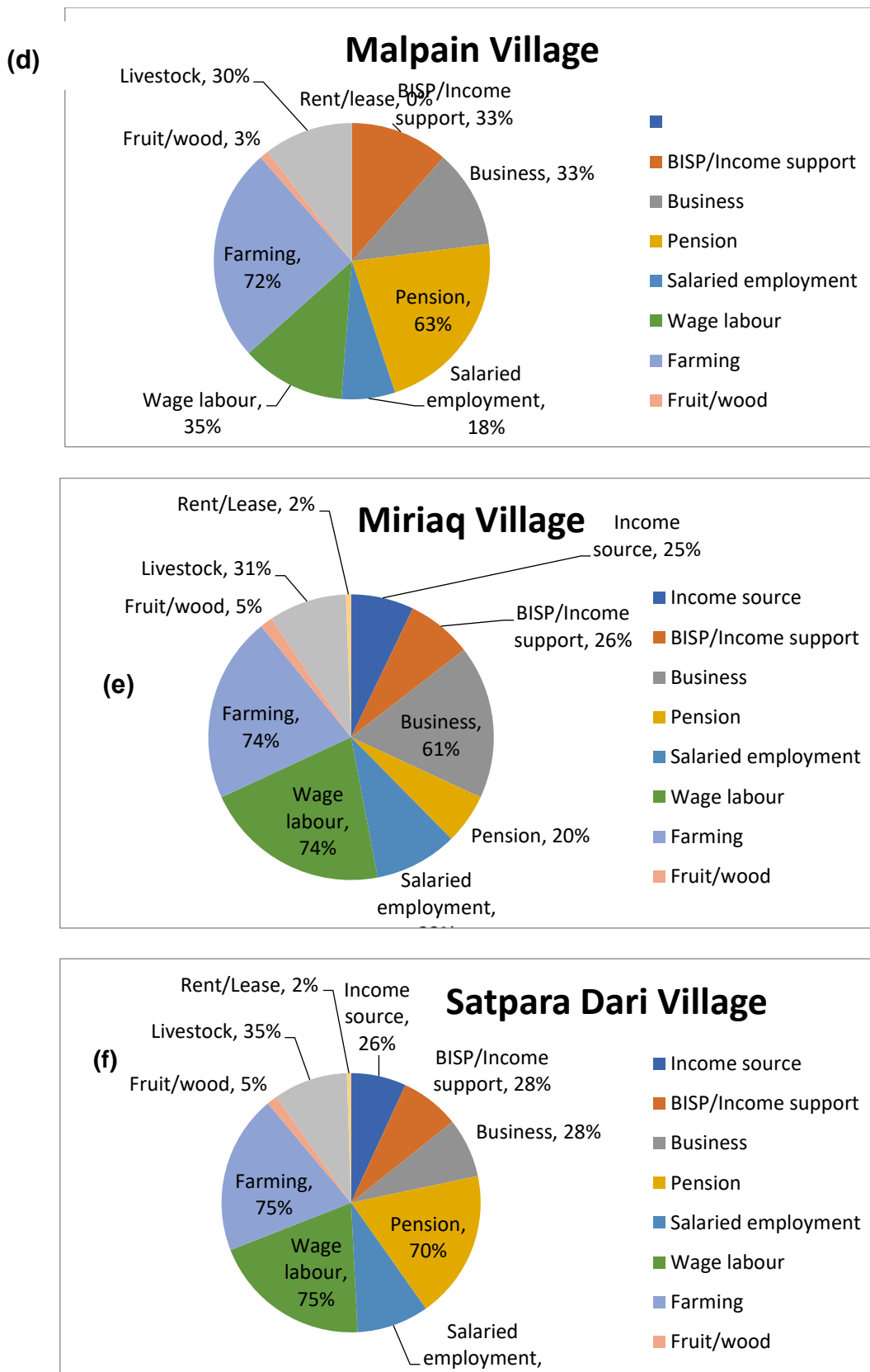


Figure 5.21 Share of income sources in the total income (subsistence value of farming not included) (a) Combined Villages (b) Satpara Bara Village (c) Satpara Center (Skildrong Village) (d) Malpain Village (e) Miriaq Village (f) Satpara Dari Village.

The **Table 5.28** shows the household hold income reported from various sources time to time. The frequency of income sources for the households is greater than the number of the households, because the income is generated from several sources for many households. The major source of income of a household is farming (75%) following by other sources of income generated from livestock (32%), wage labor (32%) and employment (19%) respectively.

Table 5.28: Frequency of the households reporting income from the various sources

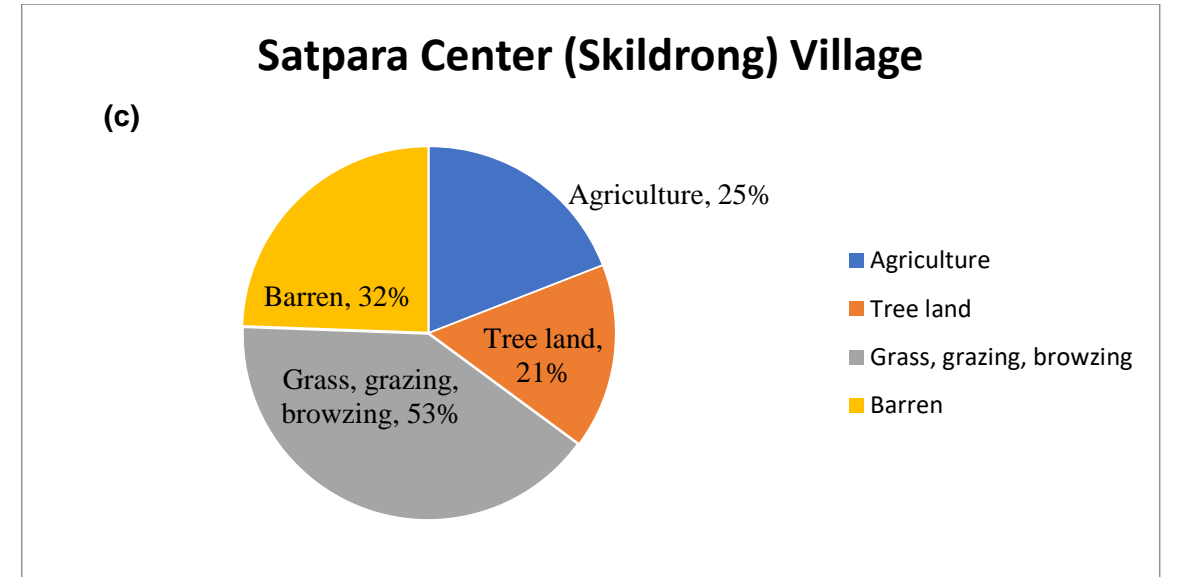
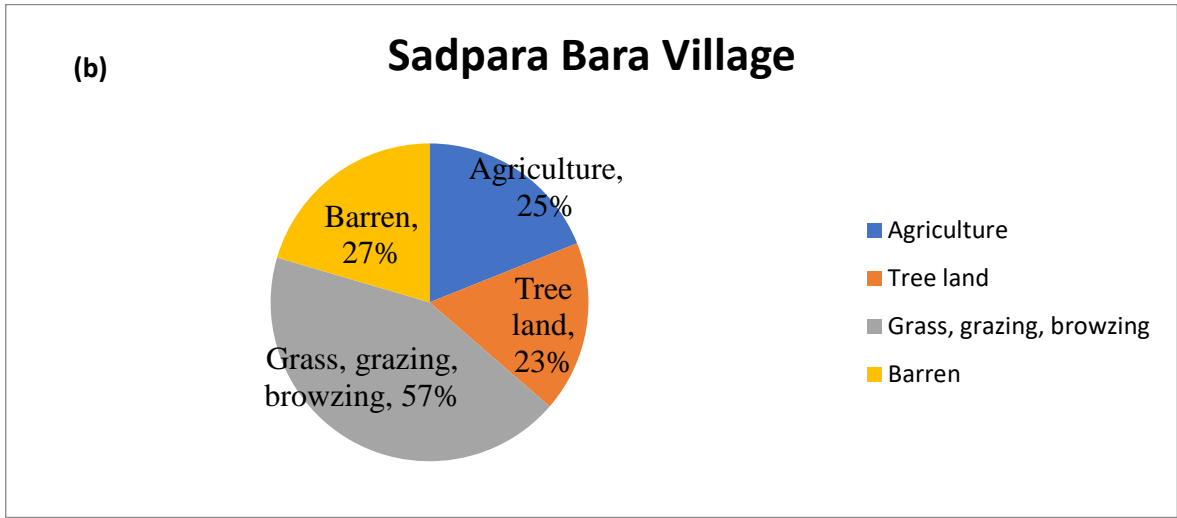
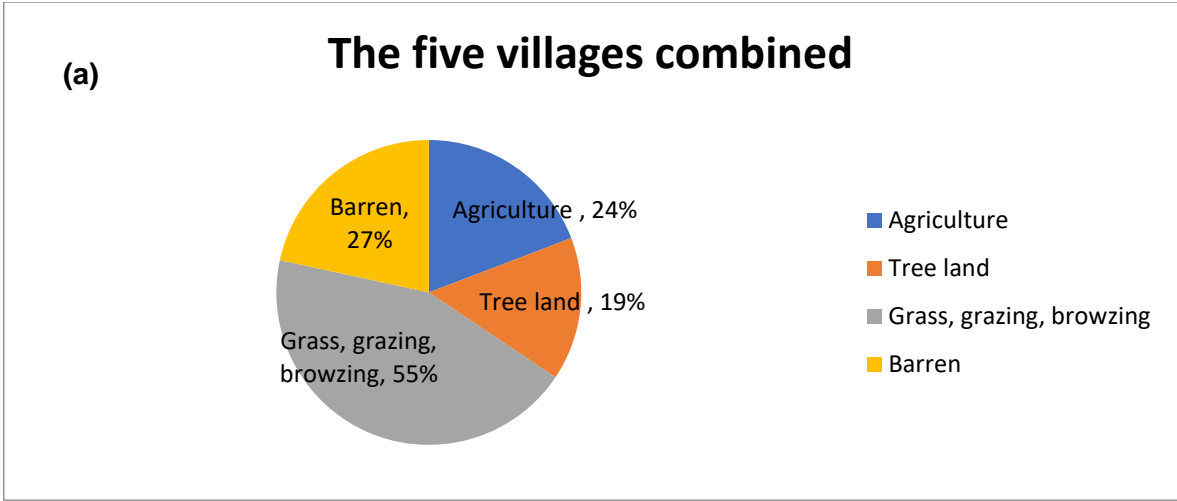
HH-Place of Residence	Satpara Bara (Chohar) village		Satpara Center (Skildrong) village		Malpain village		Miriaq village		Dari village		Total for the five villages	
No. of HH answering	87		73		30		35		53		278	
Income source	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
BISP/Income support	18	20%	10	13%	10	33%	09	25%	14	26%	61	22%
Business	16	18%	8	11%	10	33%	09	26%	15	28%	58	21%
Pension	56	65%	48	66%	19	63%	21	61%	37	70%	181	65%
Salaried employment	17	20%	14	19%	5	18%	7	20%	11	21%	54	19%
Wage labor	26	30%	23	32%	10	35%	11	33%	18	34%	88	32%
Farming	65	75%	57	78%	22	72%	26	74%	40	75%	210	75%
Fruit/wood	4	5%	3	4%	1	3%	2	5%	3	5%	13	5%
Livestock	27	32%	25	35%	9	30%	11	31%	18	35%	90	32%
Rent/Lease	0	0%	0	0%	0	0%	2	2%	2	2%	4	1%

Households' landholdings: All types of land in the Satpara region are privately owned. At least each of the households has possessed a piece of land varying in terms of measurement from household to household. The shares of land for each of the village of total households are shown in figure given for Share of land types in the total landholdings (**Table 5.29**).

The average amount of land in terms of farmland, grazing land, and land with tress possessing by each household is about 34 Kanals. The difference in terms of possessing a larger amount of land was relatively recorded for the village of Dari and Satpara Bara (Chohar) village as compared to Malpain being the small village in terms of land holding to other four villages.

Table 5.29: Land holding sizes by type of land (in m²)

HH-Place of residence/ No. of HH answering	Type of Land	Total land held by the HHs [Kanals]	Land per HH [Kanals]			
			Average	Max.	Min.	Standard deviation
Satpara Bara (Chohar) Village 87	Agriculture	870	10	50	04	8.18
	Tree Land	783	09	15	01	4.82
	Grass, grazing, browsing	1740	20	30	10	6.35
	Subtotal productive	3,393	13	50	01	23.91
	Barren	957	11	100	07	32.59
Satpara Center (Skildrong) Village 73	Agriculture	584	08	35	03	8.11
	Tree Land	511	07	13	02	7.34
	Grass, grazing, browsing	1241	17	25	08	17.44
	Subtotal productive	2,326	11	35	02	11.45
	Barren	730	10	90	05	10.66
Malpain Village 37	Agriculture	222	06	20	04	6.33
	Tree Land	148	04	10	01	4.98
	Grass, grazing, browsing	555	15	21	06	15.33
	Subtotal productive	925	08	21	01	8.44
	Barren	259	07	70	04	7.33
Miriahq Village 43	Agriculture	344	08	23	03	8.44
	Tree Land	215	05	12	02	5.44
	Grass, grazing, browsing	817	19	25	07	19.22
	Subtotal productive	1376	11	25	02	11.98
	Barren	387	09	80	07	9.28
Dari Village 67	Agriculture	670	10	25	08	10.12
	Tree Land	469	07	10	01	7.33
	Grass, grazing, browsing	1,740	20	26	08	20.11
	Subtotal productive	2,879	12	26	01	12.33
	Barren	670	10	90	08	10.34
Total 307	Agriculture	2,690	8	27	04	8.11
	Tree Land	2,126	7	12	01	7.33
	Grass, grazing, browsing	6,093	19	25	8	19.22
	Subtotal productive	10,909	34	27	01	34.22
	Barren	3,003	09	86	6	9.16



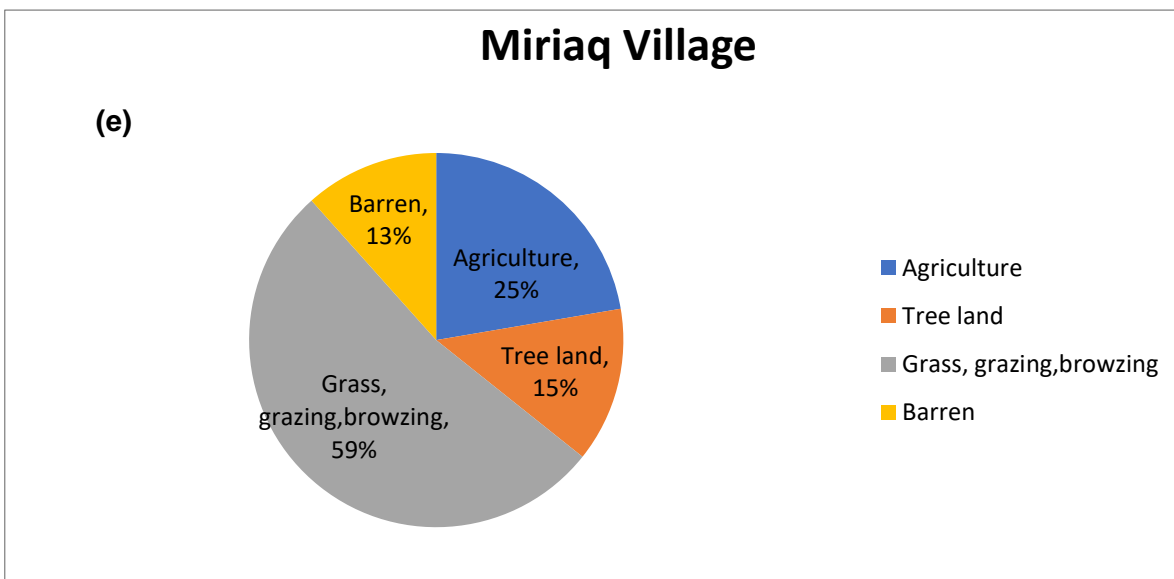
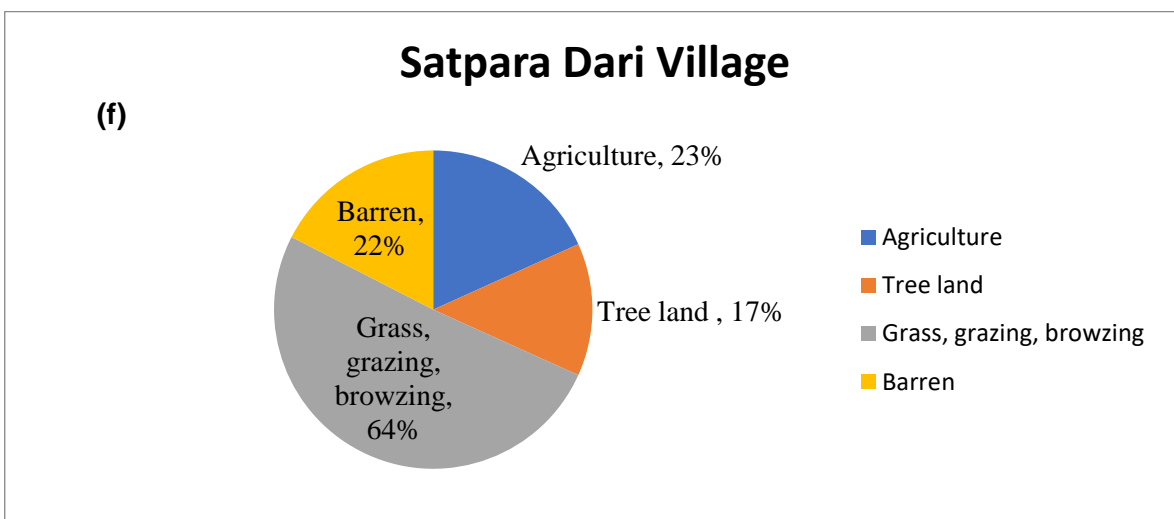
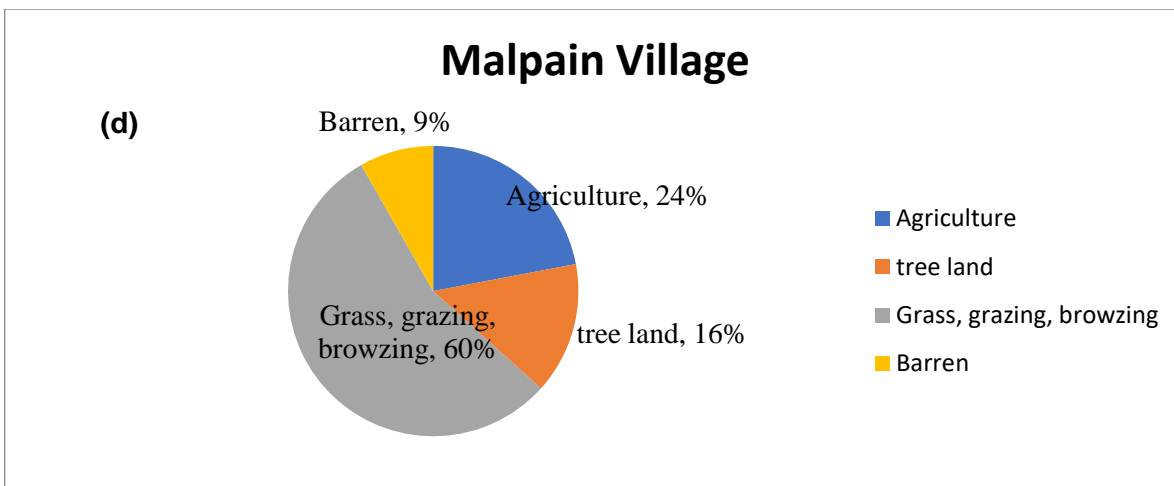


Figure 5.22: Shares of land types in the total landholdings (a) Combined Villages (b) Satpara Bara Village (c) Satpara Center (Skildrong Village) (d) Malpain Village (e) Miriaq Village (f) Satpara Dari Village.

Production from the land: Annual field crops: The annual field crops in the Satpara region are given in the **Table 5.30**. The maize is the main crop and it is also used as a staple food. The average production of maize crop from one Kanal for each of the five villages is: Satpara Bara (Chohar) village: 300 kg Satpara Center (Skildrong) village: 290kg, Malpain village: 260 kg, Miriaq village: 280 kg and Dari village: 270 kg. A large part of the maize crop is used for own consumption: Satpara Bara village- 95%, Satpara center (Skildrong) village-90%, Malpain village-85%, Miriaq-86% and Dhari village 98%.

Another main food is potato which is also used as a cash producing crop in the area. The average annual yield of potato production from one Kanal in five villages is reported as: Satpara Bara village: 1200 kg, Satpara center (Skildrong) village: 1150 kg, Malpain village: 1180 kg, Miriaq village: 1190 kg and Dari village: 1200kg. About 15% of potato yield production is used for own consumption by the households: Satpara Bara village- 95%, Satpara center (Skildrong) village 90%, Malpain village- 85% Miriaq village-85% and Dari village 98%.

In other crops, the mostly growing are the barley and vegetables in the project area. Cultivation of pulses and oil seeds was also reported in few households. There were reported 325 households who are regularly growing animal fodder in their fields.

Table 5.30: Crop productions amounts and HH's own consumption

No. of HH answering (combined data for all villages)	Crop	Total land cultivated [Kanals]	Total production [KG]	Part used for HH's own consumption	
				[KG]	[%]
200	Maize	2,000	600,000	450,000	75%
165	Potatoes	1,650	1,980,000	297,000	15%
120	Vegetables	1,200	240,000	187,200	78%

Table 5.31 shows the self-sufficiency of field crops and food consumption in each of the villages. About 29 % of the households have shown self-sufficiency for food requirements and their own consumption all year around. While 20 % of the total households have shown self-sufficiency for a period of more than six months lasting from the time of harvesting to crop production season. The household surveys also indicate that Satpara Bara and Dari villages have relatively longer self-sufficiency

duration in comparison to Malpain and Skildrong villages with the shortest self-sufficient duration.

Table 5.31: Duration of crop self-sufficiency in Satpara villages

For how long the own crop production is enough fir the HH's own food needs?	Bara (Chohar) Village Nos 75		Center (Skildrong) Village Nos 65		Malpain Village Nos 25		Miriaq Village No 35		Dari Village No 55		Total all villages No 255	
	No	%	No.	%	No	%	No	%	No	%	No	%
0 to 3 months	22	29%	23	35%	10	40%	16	45%	25	46%	96	38%
4 to 6 months	25	34%	22	34%	11	45%	16	46%	24	45%	98	38%
7 to 9 months	13	18%	13	20%	2	8%	9	25%	14	25%	51	20%
10 to 12 months	21	28%	12	18%	3	12%	4	13%	7	12%	47	18%

Fruit trees: Harvesting of fruit trees is an important asset in the particular area. There has hardly been a household left where a fruit tree has not grown. Only five (05%) of the households shared the information with the consultant's socio-environmental team that they have not grown fruits trees inside or out-side of their houses. There is a total of 1000 fruit trees which have so far been reported in 500 households with an average of 200 trees in each of the five villages.

The main types of fruit trees that have been shown in **Figure 5.21** are walnut, cherry, apple, almond, mulberry trees in the project area. The production of these fruit trees is mostly used for own consumption by the households whereas the production of the almond has been sold for revenue generation.

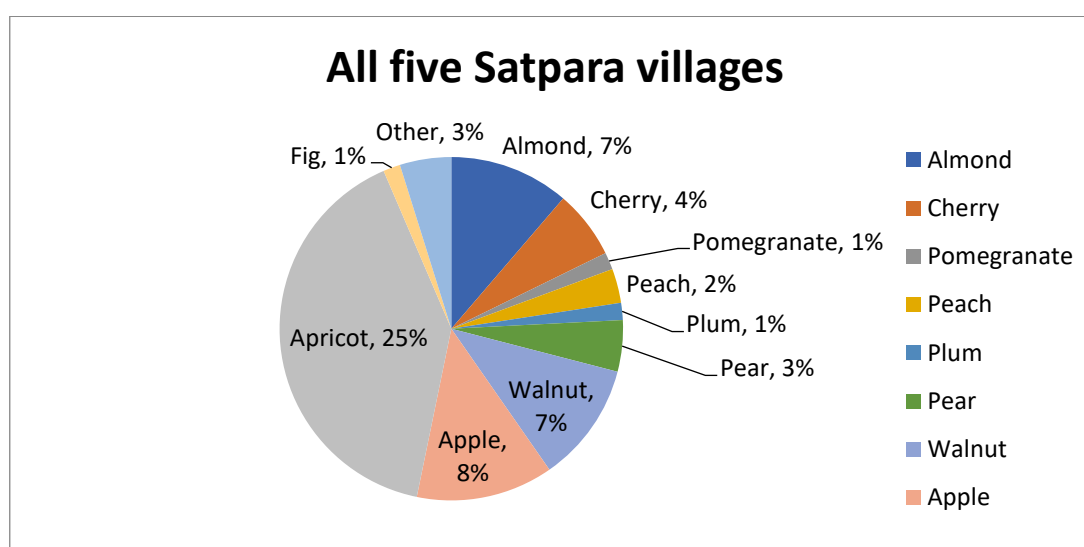


Figure 5.23: Distribution of types of fruit tress-all villages combined

Livestock: Livestock is owned and almost existed in each of the households. The types, numbers and distribution of livestock in households of all five villages are given in **Table 5.32**.

Table 5.32: Households' Livestock Ownership

Types of Livestock	No. of HH/No. of animals	Satpara Bara (Chohar village)	Satpara Center (Skildrong) Village	Malpain Village	Miriahq Village	Dari Village	All villages
Cattle	No. of households with cattle	52	49	25	35	45	206
	No. of Cattle	197	171	90	136	175	769
	Average cattle/HH	3.8	3.5	3.6	3.9	3.9	3.7
Sheep	No. of HH with sheep	40	39	18	25	38	160
	No. of sheep	408	385	155	223	376	1547
	Average sheep/HH	10.2	9.87	8.6	8.9	9.9	9.4
Goat	No. of HH with Goat	48	45	25	35	43	196
	No. of Goats	418	391	152	248	314	1523
	Average goats/HH	8.7	8.7	6.1	7.1	7.3	7.5
Cow	No. of HH with Goat	38	35	18	20	33	144
	No. of Goats	80	56	27	36	63	262
	Average goats/HH	2.1	1.6	1.5	1.8	1.9	1.7
Yolk	No. of HH with Yolk	30	28	14	16	26	114
	No. of Yolks	75	56	35	40	73	279
	Average yolks/HH	2.5	2.0	1.9	2.5	2.8	2.3
Chicken	No. of HH with chickens	52	49	25	35	45	206
	No. of chickens	515	436	187	297	427	1862
	Average chickens/HH	9.9	8.9	7.5	8.5	9.5	8.8
Other	No. of HH with other (ducks, pigeons)	10	9	6	7	8	40
	No. of animals	142	123	55	82	100	502
	Average other animals/HH	14.2	13.7	9.2	11.7	12.5	12.2

Household Expenditures: The annual expenditures of households are shown in the **Table 5.33**. The annual estimated expenditures of total households in all villages are 251,23 PKR. However, the difference in terms of income sources from all the locations and items among the villages with the Satpara Bara (Chohar) village being possessed the highest average expenditures in comparison to Malpain and Skildrong.

The information also revealed that the total expenses of all the households reported doubled than the income sources of the five villages. The difference in the expenditures of the households is evident because the income from subsistence farming has not yet been fully reflected in data for revenue generation, while the cost of livestock and agriculture inputs have been included in the expenditures of households. However, the expenditures are 1.5 times high than the total income of the households.

Table 5.33: Total annual expenditures of the HHs

HH-Place of Residence	No. of HH answering	Sum of total expenditures of all households in a year [PKR]	Total annual expenditures per HH [PKR]			
			Average	Maximum	Minimum	Standard Deviation
Satpara Bara (Chohar village)	87	30,728,400	353,200	6,742,000	100,000	919,320.63
Satpara Center/Skildrong village	73	20,075,000	275,000	5,89000	90,000	705,141.83
Malpain village	30	4,062,900	135,430	4,90000	65,678	262,379.38
Miriahq village	35	1,560,335	156,030	5,853000	75,648	286,521.35
Dari village	53	17,834,500	336,500	5,745000	85,639	838,763.98
Total	278	74261135	251,232	6,742,000	65,678	594,148.03

The shares of the total households in various items of all villages are shown in the following **Figure 5.22**. The cost of consumption of food items is used for measurement of poverty existence. The data further revealed that the total cost of food consumption is 38%. In addition to the cost of food consumption, 15 % and 12 % of their expenditures is allocated to the inputs of the livestock and farming respectively. Since the households are relying on the production of own food, therefore, a large part of these productions is also sold in market in order to fulfill the needs from outer resources. The other shares in expenditures/ consumptions of items are reported as: 15 % for education, 8 % for clothing, and 30% for health. These are the main shares in their annual income for total expenditures. Moreover, a small part of their total income i.e., about 6% is also allocated to the expenditures of other obligations like

marrriages and funeral ceremonies, charity and gifts etc. along with 4% allocation for electricity charges.

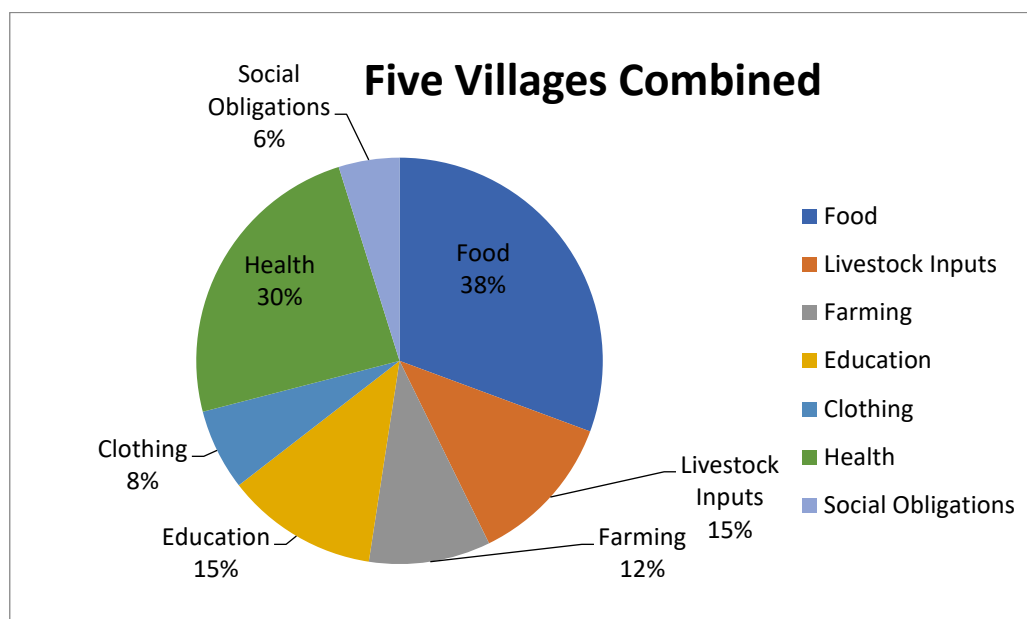


Figure 5.24: Total annual expenditures of the five villages combined

Ownership of Movable Assets: The possession of movable assets such as appliances and transport equipment are one of the major indicators of living standards of the project area. It is reported that 25 % of households possess a television while 60 % have sewing machines. Moreover, they also possess electrical appliances such as water heaters, room heater, fan and iron are also available in majority of the households. However, there are reported that 25 %, 15 % and 30 % households possess the ownership of washing machines, refrigerators and a computer respectively.

There are about 25 respondents who have reported about their ownership of cars or minibuses, and about 8 % are reported as owners of trucks or a pick-up. The tractors owners in the households are relatively few (only 10 households (5%) have reported one tractor only). While 10 households (5%) have mentioned that they are the owners of animal carts. There have not been mentioned any other farm machinery.

Water supply: The major source of water in the area is spring water. About 95 % of the households use springs water and stored it at a place and then supplied to households for washing, cleaning, and bathing, livestock watering and drinking purposes. The local people also shared information about the distribution of water that there are five streams in the region; the water of these streams is evenly distributed

among the five villages. The patterns and distribution of these water streams to each of the five villages are shown in a map of a local resident (the map is attached). Moreover, about 85 % households also use the water of Satpara Nullah for other than cooking and drinking purposes as well. There is not any other source of water other than these five streams.

The Households' Perceptions:

Water Volume: The local people were happy with the volume of water and supply from the spring source for all the households in the villages. However, a large number of households mentioned that there shall be built proper channels for distribution of water in the villages in order to protect against misuse of water, if any in the area. Moreover, they also shared the information that the water should also be evenly distributed to each of the households.

Water Quality: There was not any issue with the quality of water in the area. The villagers reported that the quality of water is good and used with natural hygiene in the area. It was also found free from any bacterial or pathogenic issues. There was no issue of hardness or taste in water, it was neither muddy nor found with sandy elements. It was rather coming all the time through filtration.

Energy: Electricity is the main source of energy in Satpara. The dependency level of households for electricity use is 100 %. Wood is also frequently used as a source of fuel in specific areas. Wood is mainly used for burning purposes, while the purchase of woods was also reported in some of the households. Besides, Dung use is also common and it is used as a main source of energy as well. The majority of households were not satisfied with the energy sources in the region. They were complaining all the time about the issues of electricity short fall, load shedding and low voltage. They were also found worried about the decreasing of the fuel wood due to its massive use and deforestation. They also reported that a large amount is spent on purchasing wood which is beyond their income source. Moreover, they have to also pay heavily on bringing LPG from the market as a source of fuel. It was also reported that dung source causes smell, inconvenience and is also the leading cause of many diseases in the area.

Sanitation: An open drainage system was observed in the villages of the Satpara region. There were a few areas where the sewerage system was not found at all. Pit

latrines and the use of pour flushing toilets was commonly observed. Around 30 % households seem to have no use of latrines and were found using fields for the disposal of waste products. All the households were found almost satisfied with the sewerage system in the area, except there were few households which showed concerns over sanitation system by indicating towards the problems of smells from the open drains and pit latrines, while there were some of the drains which were found linked with water channels and were further causing the issues of water pollution and diseases in the proposed affected area of the project.

One of the most commonly used method for the disposal of the garbage was either to throw the garbage out of the houses or to burn it out. The households shared a mixed view over the disposal of garbage and recorded their concerns about the sanitation system. About 45 % households were without complaints, while 20 % were those who showed a little concern by sharing the information with the consultant's team that there has not been any proper garbage disposal system and they have to throw almost all the garbage into the water sanitation system. Moreover, some complaints were made about the throwing of garbage into the open which causes breathing problems, smell, air pollution, blockage of water channels and drains in the streets, the blockage of streets is also seemed mounted when the garbage is further eaten by the animals in the streets.

Communication: The mobile and internet service are the two main available telecommunication means and services in the area. About 95 % of households use these two services. The telephone landline service was not found in any of the Satpara villages. An overall view about communication services is recorded: 80% of the total population of Satpara villages was not satisfied with the above-mentioned services, while 20% showed a little concern. About 50 % of the households complained about the major issues of telecommunication. The complaints were made about weak signals, slow internet, and low network coverage. Moreover, the specific issue was the non-availability of the 3G/4G service with the hold of one available communication service being monopolized in the proposed project impacted area.

Social Backgrounds: The surveyed population is the long-term inhabitants of their respective villages. About 95% of the total households (475 out of 500 households) comprise those who have been living in the villages for the last forty years. While the remaining 28 households are reported to have been settled in their respective villages

with 14 households in Satpara Bara village, 05 in Dari, 03 in Malpain and (3 each) in Satpara Center (Skildrong) village respectively. The most frequent forms of familial patterns are joint family system, nuclear or extended family system in the region. About (57%) of the households live in a joint family system. About 40 % are living with the pattern of nuclear system, while a small number of households i.e., 3% of the total household (about 15 households) of all villages are living with the pattern of extended family system. The households of Satpara villages have come from a similar ethnic background, however, there are also existed some sub-tribes, of which Balti is with 60%, the main tribal association. Despite of the 60% Balti population, the Balti language is spoken by 95% of the area.

A measurement scale for the satisfaction of respondents with a pattern of (very satisfied to very dissatisfied) was followed to ask with respect to the satisfaction of their welfare in various areas of social life. In response, the respondents were found somewhat satisfied with respect to average scale. They were found agreed with the safety measures and housing services in their social life. Whereas, the households were mostly observed dissatisfied with respect to the provision of education and healthcare issues/services. The households also shared information with respect to their financial outcomes. A major part of the total 500 households i.e., about 360 households responded that they have not enough financial resources to live with, while 140 households have shown their concern always being destitute.

5.7.4 Gender Issues

There has not been conducted any gender survey in the proposed project area. However, the households shared their information about the women education, the ownership rights and women health related issues with the socio-environmental team.

Education and Literacy Status of Women in the Project Area: According to the information of the households, about 65% women in the total households are illiterate, while the remaining 42% are literate. Out of the total 42% literate women, 500 (10%) are having only primary education, 8% (400) are with middle, 6 % (300) are having secondary level and 1% (50) are those who have hardly reached to the intermediate level/or have passed their graduation in all Satpara five villages. It was also reported that among women who have passed their intermediate or graduation were living outside of their villages at Skardu or Gilgit regions.

Education Status of Girls in the Households: During the interviews, the male respondents shared their information that 75 % of the population (households) is having girls within the age of varying stipulated range. About 90 % of the women within the range of stipulated age i.e., 7-15 years of the entire households are those who are attending their primary schools, while the remaining 25% are those who have been deprived of attending the schools.

Adult Women in the Households: The male respondents also shared information with the socio-environmental team that women would certainly prefer to educate themselves at the respective village levels than to be educated in outer regions.

Ownership of Assets: The information about the socio-cultural status of women was also shared with the team. It was also further confirmed that the shares of women in inheritance are properly acknowledged and accepted in villages. These shares in assets are allocated to women by two ways.

- Women inherit assets/land through documented legal transfer, the women where they have no brothers, will inherit all the ownership and property rights of assets and land after the death of fathers.
- The second way of inheriting land by women is their share in inherited assets and land according to the properly determined rules and laws of Islamic-Sharia. However, it was also reported during data collection that there have been some women (sisters) who have given-up their property and ownership rights of land/assets in favor of their brothers.

The male respondents also enlisted the socio-environmental team with the information that about 35% of the women in the total households have their shares in ownership and property rights of land and assets. They further reported that the share of 7% of these women does not mount than five Kanals of land. The high percentage of women in sharing of land is about 38 %; they are reported to have been inherited 4-6 Kanals at the maximum. Similarly, the ownership rights for housing are also reported in the villages. The ownership rights for each of the five villages are reported as: 8% in Satpara Bara Village, 5% in Satpara Center (Skildrong) village, Malpain 4%, Miriaq and Dari are the second largest with possessing of high percentage of 7% of house holding/or ownership rights in the Satpara region. So, for their ownership of women rights in livestock, was not reported with as much gravity and importance as being

reported in shares of land and assets because of not being purchased in written or owned as followed in case of house or/ land.

Health Facilities Availability: A low health profile of Satpara villages is clear and reflected in the socio-baseline survey. The villagers were found all the time complaining about the scarcity and availability of health facilities/services in their respective villages. There are insufficient Basic Health Unit (BHU) services but only one dispensary is currently functional for all Satpara five villages. The most available and nearest health service to the local population is the Skardu city hospital, which is at 15 kms from Satpara. This distance is covered by travelling a half metallic road, lying all the time uneven with bumpy track and blocked due to land sliding in winter season. The local people also face numerable issues such as they must take their patients on the shoulders, particularly when the road is blocked/ or unavailable for driving in any of the above-mentioned conditions at the time of critical emergencies.

Common Diseases: stomach related problems were the most reported health related issues in Satpara villages. However, a large number of respondents also reported about the other types of diseases, specifically about cold, fever, pain in knees, backache, flu, cough, typhoid etc. in the proposed impacted area of the project.

Women Hospital Visits: Women travelling or visits to hospitals outside of villages is not allowed, therefore, they have to take their males (husbands and brothers) with themselves to take the patients to the nearest available health service spot i.e., to the Skardu hospital.

Services Available During Pregnancies: There is only one available Dai (Lady Health Worker) for women health-related issues in all Satpara five villages; the respondents shared the information that there has been a total lack of health services at the time of critical health conditions/or emergencies in the project area. The information also revealed that about 75 % of deliveries are reported at homes. Moreover, it was also reported that the rate of immunization of children in the Satpara villages is also far below than the rate of immunization at Skardu district which is 72%.

Need for Women's Health Services at Village Level: Almost 100% of all the households during the interviews confirmed the need for providing services like health centers, skilled birth attendance, well equipped and trained lady health workers and health sessions shall be arranged all the times by health departments at village levels.

5.7.5 Roles and Activities of Women;

Decision Making: The respondents also shared the information with respect to the women empowerment in different aspects of their social life. They reported that women feel at large and face no hesitation in decisions making with respect to the households planning, marrying of daughters, schooling of their children/ or any other issue relating to their socio-cultural wellbeing within the households. During interviews, the quantum for the decision making of women with an approximate value for all the households in all Satpara villages are reported as: 55% in marriages, 65% in planning, 50% regarding schooling of children, while 69% of the decisions are related to social functions. However, the women are not so much properly graded with respect to their decision making in the purchase of livestock and land which is recorded 25% and 15 % respectively.

Household Work: The participation of women in many other social activities is recorded as: 92% in family caring, 85% in caring and rearing of children, and 95% in cleaning and housekeeping. The 96% of women are reported to prepare food for their household members. While a low percentage of women engagement is allocated to house management and budget allocation and preparation which stands about 35% of the households.

Farming Activities: Women participation is also evident in different farming activities. A high participation of women i.e., about 94 % was observed in activities of milking of animals, while 92 % of women were found engaged in the activities of fields harvesting. A large part of womenfolk (91%) was seen engaged in cultivation of vegetation and harvesting.

Other Activities: Besides, the farming activities, the participation of women in religious and educational matters is also evident. Likewise, their share of involvement in generating revenue in the project impacted area is not too high, however a productive role on the part of women at socio-cultural level cannot be overlooked/or ignored in the proposed impacted area

6. RESETTLEMENT ACTION PLAN

This land acquisition and resettlement Assessment is being prepared, taking into account recently completed feasibility design and tenement list. It is based on land acquisition and resettlement survey (LARS), socioeconomic survey, record collected of the affected land and stakeholder consultations conducted by the social safeguard experts of the project feasibility consultant.

Design Components Which Involve Land Acquisition

The Shatung Nullah Project involves construction of the weir and Reservoir Area, Water Channel, offices/colony area and Access Road. All construction work will be within the right of way (ROW) of the project. The land under all the components is uncultivable/Range land. The total affected land is 18 acres shown in below **Table 6.1**.

Table 6.1: Shatung Diversion Project-Land Acquisition Area

Sr. #	Components	Area	Units	
1	Weir + Under Sluice+ Intake	4704	m ²	
2	Divide Wall	264	m ²	
3	Fish Ladder	156.6	m ²	
4	Connecting Channel	750	m ²	
5	Buried Conduit	18290	m ²	
6	Saddle DAM	5387	m ²	
7	Desander	2178	m ²	
8	3 Spoil Banks	9600+6200+6200 = 22000	m ²	
9	Storage Yard	2500	m ²	
10	2 Batching Plants	2500 + 2500 =5000	m ²	
11	Crushing Plant	2500	m ²	
12	Control Room	625	m ²	
13	Coffer DAMS	Stage -1	4832	m ²
14		Stage -2	3724	m ²
	Total Area	72910 (18 Acres)	m²	

6.1 Scope of Land Acquisition and Resettlement

The LARP includes identification, evaluation and compensation of land (no infrastructure and/or land-based assets are going to be impacted), and collection of census data linked with impacts to determine impact significance and compensation entitlement against land lost including measures to rehabilitate and restore APs' living standard at pre-project level.

6.2 Significance of Socio-Cultural Impacts

Based on WB/ADB indigenous peoples' safeguards, a development intervention has impact on IPs when it: (i) affects customary rights of use and access to land and natural resources; (ii) changes socioeconomic and/or cultural integrity;(iii) affects health, education, livelihood, and social security status; and (iv) causes impacts that may alter or undermine the recognition of indigenous knowledge. Each of these points is discussed below:

- **Customary Rights of Use and Access to Land and Natural Resources:** Although, plots occupied by affected households will have to be acquired through mutually agreed lease rate and compensated, the APs customary rights on land use and access in the remaining communal land will not be changed and as long as this land right change does not happen the land will remain under control of the maliks (tribal elders) and any change will have to be negotiated between them and the local Administration. To make sure that the terms of the "deal" negotiated between land owners and District Administration are documented transparently & the compensation program carried as agreed, this LARP was prepared.
- **Change in Socioeconomic Status or Cultural Integrity:** The APs are not isolated tribes living in a state of pristine isolation rather they are invariably embedded in the broader Pakistani reality, and they have relations with the surrounding political and economic world. Besides the people keep moving in and out tribal areas to improve their business links and access better civic amenities available in urban centers of Pakistan and with this their culture is continuously changing.
- **Health, Education, and Social Security Status:** The infrastructure projects will lead to improve the economic conditions in the region and it is expected that APs access to basic civic amenities will increase with passage of time. Further expected

development facilities will increase the socio-economic activity and improved economy will help to boost expenditure on social security, meanwhile the reduced idling-stay of truckers due to improved processing facilities will also minimize social security risks for the local community.

- **Indigenous Knowledge:** The APs belonging to local tribe are not isolated people oriented by an isolated culture rather they are fully embedded in the Baltistan Culture of the mainstream population region wide. Execution of the project will do nothing to implicate the information & their indigenous knowledge.

Based on the above there are clear elements to indicate that the implementation of the Project will not impact on the local administrative, legal and traditional system of the region. Hence, it will not trigger the IP impact benchmarks as detailed by WB OPs 4.01, 4.10 & 4.12. However, keeping in view the customary land management system, and the recognition of the local dispute resolution system, the LARP is prepared in a manner that is fully reflective of local customs, land management practices and grievance resolution mechanisms in the area.

6.3 Archeological, Historical and Religious Sites


No archaeological and historical sites were found within the project boundary or in the vicinity of the project site.

6.4 Impact on Vulnerable People

Displaced poor and other groups disproportionately affected by land acquisition for execution of the project including landless elderly, disabled and female headed households are termed as vulnerable. As per census no vulnerable persons were identified in the project area.

6.5 Resettlement Action Plan (Shatung Nullah Project)

The Shatung Nullah project, there is no requirement of Preparation of Resettlement Action Plan, as all the Deosai Plan land ownership is Government of Gilgit & Baltistan Wildlife Department. This land declared as Protected Area, as per below notification.



 GOVERNMENT OF PAKISTAN
 Chief Commissioner Northern Areas

Gilgit, dated the 4th December, 1993.

CERTIFICATION.

Whereas it has become expedient to protect the flora, fauna and other natural resources in Deosai area, I, in exercise of the powers conferred by Section-5 of the Northern Areas Wildlife Preservation Act 1975 as in force in the Northern Areas, declare the area consisting of 1400 sq. miles approximately as a National Park hereinafter called Deosai National Park (Wilderness Park) with immediate effect. The specific boundaries of this National Park are fixed as follows:

1. North: The Northern boundary traces the Watershed of the Tributary nullahs and passes through the water partings and drains into Deosai nullah through the highest peak of Allimulk pass touching the Satpara Game Sanctuary, Skardu.
2. East: The Eastern boundary passes through the water partings of nullahs draining into Borbatar and finally joins Brawal nullah at the confluence of small Deosai nullah.
3. South: The Southern boundary traces the water partings of the Southern tributary nullahs and drains into small Deosai nullah.
4. West: The Western boundary is the administrative boundary between Astore Sub-Division and Skardu.


 (SHAKIL DURRANI)
 Chief Commissioner Northern Areas

DISTRIBUTION.

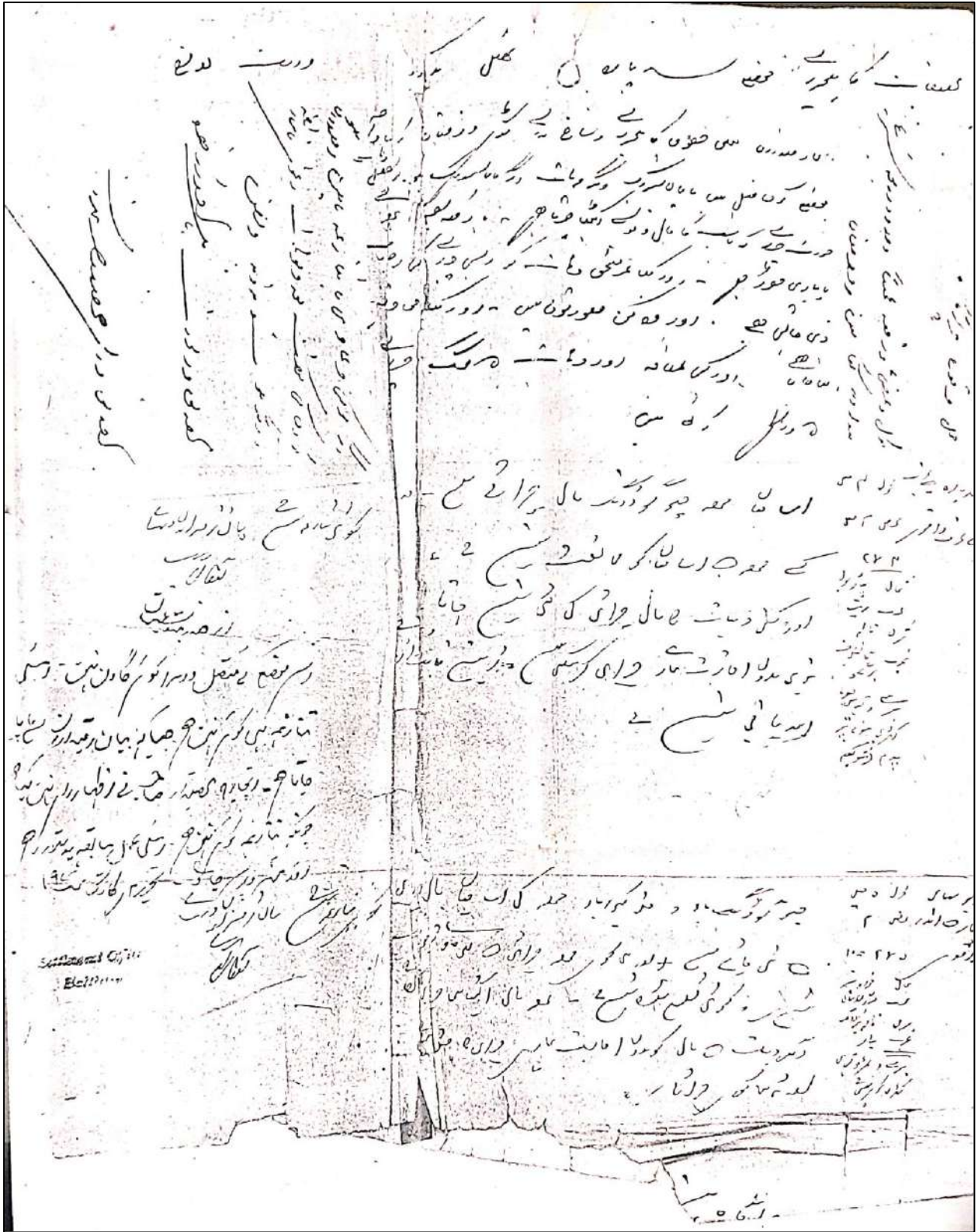
1. The Inspector General of Forests/Additional Secretary, Ministry of Food, Agriculture and Cooperatives, Islamabad.
2. The KA & NA Division Islamabad.
3. The Conservator of Forests, Northern Areas Gilgit.
4. The Director Khunjerab National Park, Gilgit.
5. The Deputy Commissioner Skardu.
6. The Deputy Commissioner Diamir.

Project Impacts

1. The project comprises of a diversion weir, a small open channel about 610 Meters and 6.5 Km long tunnel and outfall structure discharging into Raghichan Nullah.
2. All the land under these components owned by GB Government in custody of GB Wildlife Department Skardu District.
3. The open area to be utilized will be 10-meter x 1000 meter, have no structure and even trees. Only grass exists in the area. The rest of the project water channel passes through the tunnel.
4. The only nearby village is Satpara, comprising of scattered population at 2 Km radius at the start of Raghichan Nullah and the toe of Deosai Plan.
5. In the field visit and consultation with the local, no one have claimed any rights, resettlement or any other ownership in the project area.
6. The upper portion/surface area of project tunnel also comprises of barren land without trees and other structures, except grasses.
7. During Stakeholders workshop in October, 2022 a question was raised by Additional Commissioner that Satpara and nearby population have some legal rights. In this respect, The Resettlement team visited in the offices of Deputy Commissioner to sort out the legal Document. I found the following attached scan copy of documents. The document reveals that the Satpara village and nearby population have only right to be used as range land, without having any ownership in the Deosai Plan at the radius of 2 km x 5 Km (10 Square Km) area.

نقل و حرکت تحقیقاتی کے لیے حوالہ دی گئی ہے

مختار	نام حوضہ	محل وقوع حوضہ	طول و عرض	تعلق و زمینداران تعلق حقوق کے حوالہ	اگر کوئی تنازعہ	تعمیراتی اور دیگر کاموں کے لیے
۲	سواتیوں پہاڑ ہے۔	دوسرائی پہاڑ کے اندر واقع ہے۔	طول 5 میل عرض 2 میل 10 = 2x5 چلو	ہاگن زمینداران تعلق حقوق کے حوالہ علاقہ گوردنگ کا ۷ من گھوڑا ملک کے زمینداران مال حوضہ کو یہ جگہ ہے اور میں کوئی حوضہ کے میناوسے تو حالت نہیں ہے۔ کوئی تقسیم شدہ نہیں ہے۔ نہ مال کھٹا میں حوضہ کے تعلق ہے۔ دیگر رعایت کے مال کو بدون اجازت ہماری حوضہ کے حق نہیں ہے۔ اور نہ میں کوئی حوضہ ہے۔	کوئی تنازعہ نہیں ہے۔	بہتر زمینداران درست ہے۔



از دفتر تحصیلہ اسکردو

TEH.CO.5(12)/2022 زیر نمبری 114

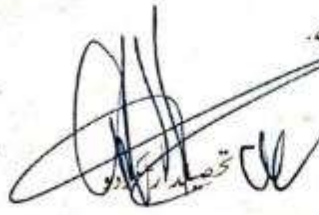
موری 25 اگست 2022

بخدمت جناب اسسٹنٹ کمشنر صاحب سکردو

مضمون: حقوق بابت دیوسائی نیشنل پارک

معاملہ عنوان بالا میں حسب التحکم جناب والا نسبت حقوق بابت دیوسائی نیشنل پارک بذریعہ عملہ ماتحت حسب ضابطہ رپورٹ لی گئی۔ جس سے پایا جاتا ہے کہ مطابق موضع سد پارہ کی چار چراگا وہے موضع سد پارہ کے جنوب میں پڑالوں چراہوگاہ واقع ہے جسکی کاغذات مال میں طول 5 میل ارض 2 میل درج ہے اور یہ چراگاہ موسومہ پڑالوں موضع سد پارہ کے ٹاپ کے ارد گرد واقع ہے اس چراگاہ میں دونالے دیوسائی کی جانب سے سد پارہ کی طرف بہتے ہیں ہر دونالے میں محلہ جات چوگر ونگ اور من کھور کے آب و اجداد سے بھری کولمیان موجود ہے اور اسامیان دھ اس چراگاہ کو گرمیوں میں مال مویشی چرانے کے لیے استعمال کرتے ہیں اور ہر دو محلہ جات اس چراگاہ سے مفاد حاصل کرتے ہیں اس وقت محلہ چوگر ونگ میں تقریباً 80 گھرانے موجود ہیں آبادی تقریباً 450 کے قریب ہے اور محلہ من کھور میں کل 30 گھرانے ہیں آبادی تقریباً 200 افراد پر مشتمل ہے مذکورہ چراگاہ کی خاک دستی بھی بغرض ملاحظہ لطف ہذا ہے

لہذا رپورٹ، مراد ملاحظہ و کاروائی مذید اپیش خدمت ہے۔



AC OFFICE SKARDU

No. 530

Date: 29-8-22

Diarist

Branch ADIC

AC

6.6 Grievance Redress Mechanism

Grievance Redress Mechanism is given in section 8.16.

6.7 Legal and Policy Framework

6.7.1 Land Acquisition Act

The Pakistan law governing land acquisition is the LAA of 1894 and successive amendments. The LAA regulates the land acquisition process and enables the provincial government to acquire private land for public purposes. Land acquisition is a provincial responsibility and provinces have also their own province specific implementation rules. The LAA and its Implementation Rules require that, following an impact identification and valuation exercise, land and crops are compensated in cash at the current market rate to titled landowners. The LAA mandates that land valuation is to be based on the last 3 to 5 years average registered land-sale rates. However, in several recent cases, the median rate over the past 1 year, or even the current rates, have been applied with an added 15% Compulsory Acquisition Surcharge according to the provision of the law. The displaced persons, if not satisfied, can go to the Court of Law to contest the compensation award of the Land Acquisition Collector (LAC).

The various sections relating to the land acquisition are briefly discussed.

- Section 4 refers to the publication of preliminary notification and power for conducting surveys. Section 5 relates to the formal notification of land for a public purpose and 5 (a) covers the need for inquiry. Section 6 refers to the Government making a more formal declaration of intent to acquire land.
- Section 7 indicates that the Land Commissioner shall direct the Land Acquisition Collector (LAC) to take order for the acquisition of land. The LAC has then to direct that the land required to be physically marked out measured and planned under Section 8.
- Section 9 allows the LAC to give notice to all APs that the Government intends to take possession of the land. If they have any claims for compensation then these claims are to be made to him at an appointed time, while the Section-10 delegates power to the LAC to record statements of APs in the land to be acquired or any part thereof as co-proprietor, sub-proprietor, mortgagee, and tenant or otherwise.

- Section 11 enables the Collector to make inquiries into the measurements, value and claim and issue the final "award". The award includes the land's marked area and the valuation of compensation and the LAC has made an award under Section 11, LAC will then take possession and the land shall thereupon vest absolutely in the Government, free from all encumbrances. The section 18 reveals that in case of dissatisfaction with the award, APs may request the LAC to refer the case onward to the court for a decision.
- Section 23 refers to the award of compensation for the owners for acquired land is determined at its market value plus 15% in view of the compulsory nature of the acquisition for public purposes, while the Section-28 relates to the determination of compensation values and interest premium for land acquisition.
- Section 31 provides that the LAC can, instead of awarding cash compensation in respect of any land, make any arrangement with a person having an interest in such land, including the grant of other lands in exchange.
- Section 35 refers to the temporary occupation of arable or waste land subject to the provision of Part VII of the Act. The provincial government may direct the Collector to procure the occupation and use of the same for such term as it shall think fit, not exceeding three years from the commencement of such occupation.
- Section 36 provides information relating to the power to enter and take possession, and compensation on restoration. On the payment of such compensation, or on executing such agreement or on making a reference under Section 35, the Collector may enter upon and take possession of the land and use or permit the use thereof in accordance with the terms of the said notice.

6.7.2 Word Bank's Operational Policies and Resettlement Principles

When land other than government owned land is to be acquired then a Land Acquisition and Resettlement Plan (LARP) is required. The Objective of IR Safeguard is to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring sub-project and design alternatives; to enhance, or at least

restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The involuntary resettlement safeguards cover physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) because of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

The major Policy Principles are briefly discussed as under:

- a.** Screen the project early on to identify past, present, and future involuntary resettlement impacts and risks. Determine the scope of resettlement planning through a survey and/or census of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks.
- b.** Carry out meaningful consultations with displaced persons, host communities, and concerned non- government organizations. Inform all displaced persons of their entitlements and resettlement options; and also pay particular attention to the needs of vulnerable groups, especially those below the poverty line. Specific safeguards cover Indigenous People, including those without statutory title to land, including those having communal rights. Establish a grievance redress mechanism to receive and facilitate resolution of the displaced persons' concerns.
- c.** Improve, or at least restore, the livelihoods of all displaced persons through (i) land-based resettlement strategies when affected livelihoods are land based, and where it is possible to give cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where these are possible.
- d.** Provide physically and economically displaced persons, with needed assistance, including the following: (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons

- economically and socially into their host communities, and extension of sub-project benefits to host communities; (ii) transitional support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.
- e. Improve the standards of living of the displaced poor and other vulnerable groups, including women, to at least national minimum standards. In rural areas provide them with legal and affordable access to land and resources and in urban areas provide them with appropriate income sources and legal and affordable access to adequate housing.
 - f. Develop procedures in a transparent, consistent, and equitable manner if land acquisition is through negotiated settlement to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status.
 - g. Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for resettlement assistance and compensation for loss of non-land assets.
 - h. Prepare a resettlement plan elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.
 - i. Disclose a draft resettlement plan, including documentation of the consultation process in a timely manner, before sub-project appraisal, in an accessible place a form and language(s) understandable to displaced persons and other stakeholders. Disclose the resettlement plan and its updates to displaced persons.
 - j. Conceive and execute involuntary resettlement as part of a development sub-project or program. Include the full costs of resettlement in the presentation of sub-project's costs and benefits. For a sub-project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the sub-project as a stand-alone operation.

- k. Pay compensation and provide other resettlement entitlements before physical or economic displacement. Implement the resettlement plan under close supervision throughout sub-project implementation.
- l. Monitor and assess resettlement outcomes, their impacts on the standards of living of displaced persons and whether the objectives of the resettlement plan have been achieved by considering the baseline conditions and the results of the resettlement monitoring.
- m. Disclose monitoring reports.

6.7.3 Comparison of LAA and WB Policy Principles and Practices

- The review of land acquisition act and WB policy principles has been done to identify the differences and gaps between the WB assessment procedures and the requirements of the government of Pakistan.
- Comparison of Pakistan's Land Acquisition Acts (1894) and WB OP 4.10 & 4.12
- Only titled landowners or customary rights holders are recognized for compensation.
- Lack of title should not be a bar to compensation. Requires equal treatment of those without clear land titles (e.g., squatters or other informal settlers) in terms of their entitlements for resettlement assistance and compensation for the loss of non-land assets.
- Only titled landowners or customary rights holders are recognized for compensation.
- Lack of title should not be a bar to compensation. Requires equal treatment of those without clear land titles (e.g., squatters or other informal settlers) in terms of their entitlements for resettlement assistance and compensation for the loss of non-land assets.
- Only registered landowners, sharecroppers and leaseholders are eligible for compensation of crop losses.
- Crop compensation is to be provided irrespective of the land registration status of the affected farmers/share croppers. Crops for two seasons, Rabi

- (winter) and Kharif (summer) for full one year are to be compensated based on existing market rates and average farm produce per unit area.
- Tree losses are compensated based on outdated officially fixed rates by the relevant forest and agriculture departments.
 - Tree losses are to be compensated according to market rates based on productive age or wood volume, depending on tree type. All the removed trees will remain the property of the owner for them to salvage.
 - Land valuation is based on the median registered land transfer rate over the 3 years prior to Section 4 of the LAA being invoked. 15% compulsory acquisition charges are paid over and above the assessed compensation. However, recent practice is that prices based on the average over the last one year prior to acquisition commencing is applied.
 - Land valuation is to be based on current replacement (market) value with an additional payment of 15%. The valuation for the acquired housing land and other assets is the full replacement costs keeping in view the fair market values, transaction costs and other applicable payments that may be required.
 - The valuation of structures is based on official rates, with depreciation deducted from gross value of the structure and also 15% of the value of salvaged materials,
 - The valuation of built-up structures is based on current market value but with consideration of the cost of new construction of the structure, with no deduction for depreciation. The APs can salvage any of their material free of cost and irrespective of compensation payments having been paid.
 - The decisions regarding land acquisition and the amounts of compensation to be paid are published in the official Gazette and notified in accessible places so that the people affected are well informed,
 - Information related to the quantification and valuation of land, structures other immovable assets, entitlements and amounts of compensation and financial assistance are to be disclosed to the displaced persons prior to the

sub-project appraisal period. This is to ensure that stakeholders are treated in a fair, transparent and efficient manner.

- There are no provisions for income and livelihood rehabilitation measures. There are also no special allowances for vulnerable displaced persons including vulnerable groups such as women headed households. There are no requirements to assess opportunities for benefit sharing.
- The WB policy requires rehabilitation for lost income and special AP expenses during the relocation process. There are also provisions to be made for transitional period costs, and livelihood restoration.
- Particular attention must be paid to the poor and vulnerable groups, including women. A guiding principle is that APs should at least be able to reach a defined minimum livelihood standard. In rural areas, APs should be provided with legal access to replacement land and resources to the defined minimum livelihood level. In urban areas, provision should be made for appropriate income sources and legal and affordable access to adequate housing.
- Prepare and disclose resettlement plans (RPs) - there is no law or policy that requires preparation of RPs.
- Resettlement plans are prepared in English and disclosed to the displaced peoples in local language (Urdu).
- Grievance redress is established through the formal land acquisition process at a point in time or through appeals to the court.
- Provide continuous mechanisms/ set-up that are accessible locally and available throughout sub-project implementation.
- Only compensation is paid but not resettlement allowances, there is no mechanism to ensure payment is made before displacement.
- All compensation and allowances to be paid prior to physical or economic dislocation.
- No requirements to prepare and disclose monitoring reports. •
- Prepare and disclose monitoring reports.

6.7.4 Reconciliation between Pakistan's Acts and WB OPs

To reconcile the differences between the LAA (1894) and WB policy, the SNP (EA) has prepared this LARP, ensuring that compensation to be provided at replacement cost basis for all direct and indirect losses, so that no one could be worsen-off because of the project. The provision of subsidies or allowances will also need to be given for affected households (AHs) that may be relocated, suffer business losses, or may be vulnerable.

In this context, the following are the WB Safeguard principles to reconcile the differences:

- the need to screen the sub-project early on in the planning stage
- carry out meaningful consultations
- at the minimum restore livelihood levels to what they were before the sub-project, improve the livelihoods of affected vulnerable groups
- prompt compensation at full replacement cost is to be paid
- provide affected people with adequate assistance
- ensure that affected people who have no statutory rights to the land that they are working and eligible for resettlement assistance and compensation for the loss of non-land assets; and
- Disclose all reports.

6.7.5 Legislation relevant to Land Classification

In terms of implementation of this LARP, identifying the type of land affected will be an important step in determining eligibility for compensation for land. Jurisdiction rather than use classifies land. Rural land includes irrigated land and un-irrigated land and is governed by the Land Revenue Act (1967) which must be read in conjunction with the LAA 1894 and other legislation that may apply, including the Colonization of Government Lands Act (1912) and the various Land Reform Regulations. Rural land falls under the jurisdiction of revenue districts.

Land, other than rural land, is urban and including all permutations there-under such as residential, commercial, built upon and buildable, and is governed by various regulations and ordinances including the People's Local Government Ordinance

(1972) for each province, Cantonments Act (1924), and Land Control Act (1952). Urban land falls under the jurisdiction of Municipal and Local Government Authorities. While there are broad definitions of rural and urban land in the People's Local Government Ordinances, such classifications are not immutable and have been, and are, changed by the Collector of Revenues and provincial governments over time. In general, it is either the People's Local Government Ordinances or the Land Revenue Act that determines the classification of land, however there are some cases where both applies and other cases where different legislation altogether can indicate jurisdiction and classification over land. Hence there is neither a universal classification nor legislation pertaining to the land that will be potentially affected under the sub-project.

Therefore, during the field survey for the preparation of this LARP, the identification of land ownership was done with the assistance of local people/ village elders/ Patwari.

6.8 Resettlement Budget

This section provides the indicative compensation cost for land acquisition, (if any) building structures and rehabilitation of the affected. For this purpose, concerned Government of GB District Departments i.e. Building Sub-Division official, Forest Department Skardu District, Revenue Department were involved. Efforts were made to work out realistic cost estimates/values that are applicable for fair compensation to the affectees on replacement cost basis for affected communal and private land with other assets. For this reason, local Jirga authorities & concerned government departments were consulted and market surveys were carried out to evaluate and apply unit rates based on the ground realities.

6.8.1 Components of the Cost Estimates

Compensation costs (CC) includes the cost of land and commercial structure, wood and fruit trees, crops, transitional period assistance and shifting charges for the affectees falling within the project area. Quantification of all these items has been made based on the data collected through physical measurements conducted in the field. The affected structures have been categorized based on construction material used. Quantities and costs have been developed in consultation with local authorities. As all the Project affected land is owned by Govt of Gilgit Baltistan, therefore no land acquisition assessment will be required, the Deputy Commissioner Skardu will issue

NoC for the land to be used and under control by Project proponent. This land will be without cost, as per below DC Skardu letter.

6.9 Letter of Deputy Commissioner

It is further mentioned, that all the land is Pasture/Range land and Riverian Land. The affected land under the different components of the project will be about 18 Acres. No trees, building or other infrastructures will be affected. Therefore, no cost has been estimated and the Resettlement budget will be zero. There are many times meetings were carried out with the Commissioner, Deputy Commissioner and Tehsildar Skardu District in this respect. They were fully aware the project and during the discussion, it was decided to move an application to Deputy Commissioner for NoC/execution of the project without application of any cost of land. The letter to Deputy Commissioner is given below:



Pakistan Water and Power Development Authority

Ph: 92-57-2640628
Fax 92-57-2640629
E.mail: gmpna01@gmail.com

General Manager/ PD (Projects) NA
GBHP Colony, G.T. Road, Hattian,
District Attock

No.GMP(NA)/SADP/699-96

Dated: 20 October, 2023.

The Deputy Commissioner
District Skardu,
Government of Gilgit Baltistan

Subject: NoC for Use of Government of Gilgit Baltistan land (free of cost) for Shatung Nullah Diversion Project in Deosai Plains, Skardu

The Shatung Nullah Diversion Project is being implemented by Pakistan Water & Power Development Authority (WAPDA). Funding of the Project is being made through the Public Sector Development Program (PSDP). PC-II for the Project was approved by DDWP on May 21, 2022, for an amount of PKR 259.460 million. Feasibility studies of the Project are being carried out by a Joint Venture of PES, BARQAAB and MMP Consultants, which are scheduled to be completed during December 2023.

The Project includes diversion of the Shatung Nullah, which is a left tributary of the river Indus. The Project is located in Deosai Plains at an average altitude of around 4,000 m.a.s.l (13,000 ft.) and is about 27 km from the Sadpara Dam, which is about 6 km south of Skardu Town. An overall layout map of project components is attached with this letter.


The Project aims to augment the flow availability of Sadpara Dam Project throughout the year. This will be supplementing the Sadpara Dam reservoir to increase water availability for power generation, for domestic water supplies as well as for irrigation supplies during crop sowing season. Main features of the Project are given below:

1. The project comprises of a diversion weir, a buried conduit of about 2 Km length and a 5.2 Km long diversion tunnel with its outfall structure discharging into Raghichan Nullah, leading the flows to Sadpara Dam through Sadpara Nullah.
2. All the land under these components is owned by the Government of Gilgit Baltistan (GB), and is in custody of Wildlife Department, District Skardu.
3. The area to be utilized for buried conduit will be about 10-meter wide, which shall be backfilled and restored to its original after construction. The land required for this construction has no built-up structures and no trees. Only grasses (pastures) exist in this area, which shall be affected during construction period of about 4-5 years only.

4. The rest of the diversion from Shatung to Sadpara Nullah shall be achieved through a tunnel. Surplus excavation material from construction of tunnel shall be dumped and dressed to designed levels at three locations. First is near the tunnel inlet (100m x 100m), second is near tunnel outlet (125m x 50m) and the third is in between (100m x 62m).
5. The nearest village to Project site is Sadpara, which comprises of scattered population at about 14 Km from the confluence of Raghichan Nullah with Sadpara Nullah (outlet of diversion tunnel area).
6. During the field visits and consultations with the locals, no one has claimed any rights regarding resettlement or land ownership in the project area.

The whole land required for construction of the Project components is owned by the Government of Gilgit Baltistan, which is declared as protected area (national park). WAPDA conducted a Workshop (Feasibility Framework) during last year on September 19, 2022, wherein, all the Project stakeholders participated. All stakeholders have a common understanding that in the given conditions, the project is extremely essential to mitigate the shortages of electricity, drinking and irrigation water supplies and is of utmost importance for whole of Skardu city and its surroundings.

In view of the above, it is requested to allow and issue "No Objection Letter" for use of land (free of cost) for the construction of Shatung Nullah Diversion Project in Deosai plains, district Skardu.


(Engr. Abdul Razzaq)

General Manager/ PD (Projects) NA

Copy to:

1. PSO to Chairman WAPDA
2. Member (Water) WAPDA
3. CE (HQ) Northern Area, WAPDA, Hattian.
4. Project Manager, Consultants, Lahore

MIF

7. POTENTIAL SIGNIFICANT IMPACTS & MITIGATION MEASURES

This Chapter assesses the project for key environmental and social aspects, identifies significant potential impacts that may be caused by the project activities, and proposes appropriate mitigation and preventive measures to address these impacts.

The identification of impacts is based on a matrix method. First, the environmental hazards (sources of potential environmental effects) associated with the construction and operational activities of the proposed project are identified based on the project description (presented in Chapter 3). Combining this information with the detailed environmental description/baseline of the project site (presented in Chapter 5), the environmental hazards and sensitivities are identified. These hazards and sensitivities are listed on a matrix to check whether an interaction exists between two elements. Wherever such interactions exist, they are further analyzed for significance and thus the potential environmental impacts are identified.

7.1 IMPACT ASSESSMENT METHODOLOGY

Qualitative predictive techniques are mainly used for the evaluation of the potential impacts as the exact amounts of materials and resources to be used that may impact the environment are not yet decided upon.

The significance of potential impacts was assessed using assessment methodology that considers impact likelihood and consequence of receptors, described below:

7.1.1 Likelihood and Consequence of Impact

The impact assessment requires assigning a value for both the likelihood and probability of an outcome occurring and the consequence or severity of a potential outcome. Based on the preassigned values, a matrix format is used to place the specific hazard within a specific location of the matrix. This location can then be used to determine impact score for that activity.

The likelihood or probability is given the following types and number:

Sr. #	Likelihood	Definition
1	Certain	Immediate danger to environment, the health and safety of the public, staff, resources, or property; occurs frequently or continuously.
2	Likely	Probably will occur in time if not corrected, or probably will occur one or more times during the life of the project.
3	Unlikely	Possible to occur in time if not corrected.
4	Rare	Will occur rarely and can be negligible.

Next is the Consequence or severity, presented below:

Sr. No.	Consequence	Definition
A	Catastrophic	Permanent, severe impact/s to land, biodiversity, ecosystem. Complete breakdown of social order. Widespread desecration of items of global cultural significance. Company directly responsible or complicit in severe and widespread long-term impacts on human rights.
B	Major	Significant impact/s land, biodiversity, ecosystem services, water resources or air. A breakdown of social order. Widespread damage to items of global cultural significance. Highly offensive infringements of cultural heritage. Company directly responsible or complicit in severe, long-term impacts on human rights.0
C	Moderate	Moderate impact/s land, biodiversity, ecosystem services, water resources or air. Moderate medium-term social impacts or frequent social issues. Moderate damage to structures/items of local cultural heritage significance/sacred locations. Moderate, temporary human rights impacts.
D	Low	Low level impact/s to land, biodiversity, ecosystem services, water resources or air. Low-level social impacts. Low-level infringement of cultural heritage or minimal disturbance to heritage structures. Minimal impact on human rights.

7.1.2 Impact = Likelihood x Consequence

Based on the above classification, an impact analysis matrix has been developed and presented in Table 7.1.

Table 7.1: Impact Analysis Matrix

Likelihood	Consequence			
	Catastrophic	Major	Moderate	Low
Value (Likelihood x Consequence)				
Certain	Very High	High	Medium	Low
Likely	High	Medium	Medium	Low
Unlikely	Medium	Medium	Low	Low
Rare	Low	Low	Low	Low

Based on the related values in **Table 7.1**, the following impact categories are identified.

- **Very High Impact:** Requires more intensive mitigation measures
- **High Impact:** Requires intensive mitigation measures
- **Medium Impact:** Requires comparatively less mitigation measures
- **Low Impact:** Professional judgment

7.1.3 Impact Assessment Matrix

The Impact assessment matrix is presented below. This matrix helps the team to prioritize impacts by identifying them as high, medium, and low. The impacts which are identified as high will require the most stringent controls and may even demand the cancelation of such impact causing activities from the project. Specific workplace controls can also be applied to control the associated impacts more effectively, which will result in a revised assessment category to a more acceptable level. Note that the box at the bottom indicates that if we can remove the impact (such as, incorporating engineering design into a process), the impact will no longer exist and therefore, is mitigated through controlled measures.

7.2 Impact Assessment Matrix for the Project

The project's potential impacts and their significance have been assessed using the methodology described in **Section 7.1**. A summary of these impacts and their significance along with the mitigation measures is presented in **Table 7.2**.

Table 7.2: Impact Assessment Matrix

Activity	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Design Phase				
Technical Design and Layout Planning	Likely	Major	Medium	Low
Land Acquisition	Unlikely	Low	Low	Low
Seismicity	Certain	Major	High	Low
Loss of vegetation	likely	Moderate	Medium	Low
Biodiversity Conservation	Certain	Catastrophic	Ver High	Medium
Construction Phase				
Soil Erosion and Contamination	Likely	Major	Medium	Low
Borrow Area	Likely	Moderate	Medium	Low
Batching Plant & asphalt plant	Likely	Major	Medium	Low
Construction Camps/Camp site	Certain	Maor	High	Medium
Wastewater Generation at Construction Camp	Likely	Moderate	Medium	Low

Activity	Likelihood	Consequence	Impact (Consequence x likelihood)	Residual Impact
Solid Waste (Construction, Municipal and Hazardous Waste)	Likely	Major	Medium	Low
Ambient Air Quality	Certain	Major	High	Low
Noise	Likely	Moderate	Medium	Low
Biological Resources	Certain	Catastrophic	Ver High	Medium
Traffic	Certain	Moderate	Medium	Low
Occupational Health and Safety	Certain	Major	High	Low
Community safety	Likely	Major	Low	Low
Influx of Labor	Certain	Major	Medium	Low
Communicable Diseases	Likely	Moderate	Medium	Low
Gender Based Violence	Likely	Moderate	Low	Low
Operation Phase				
Degradation of terrestrial ecology	Likely	Moderate	High	Low
Reduction in downstream flow	Likely	Moderate	Medium	Low
Cumulative Impacts	-	-	-	Positive Impact

The issues from **Table 7.2** and other issues identified as good practices are discussed in the following sections in detail.

7.3 Design Phase Impacts

Proper planning during project design can significantly reduce the future negative impacts at the time of construction and operation. Understandably, the potential environmental impacts, in a physical sense, of the design stage are quite low. The various surveys carried out at the planning level may result in short term impacts on air and soil quality. If the design is carried out without regard to the environmental considerations, it will lead to long term negative implications for local flora, fauna, water quality, water resources, land acquisition etc.

The aspects that can affect the design phase include:

7.3.1 Technical Design and Layout Planning

Potential Impacts

Improper weir design and route selection for the drainage of Shatung nullah into Satpara lake could lead to economic and environmental issues. Incompatible layout plan and engineering design of the project's structures can undermine the overall aesthetic beauty and ambience of the project area. Also designing the structures

without considering the prospective and futuristic needs can result in structures with low social acceptability and functionality.

Impact:			
<ul style="list-style-type: none"> Economic and environmental issues due to improper route selection Impact on aesthetic beauty and ambience of the project area due to Incompatible layout plan and engineering design 			
Applicable Project Phase		<i>Design</i>	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Major	Medium
Mitigation Measures, Offsets and Recommendations			
<ul style="list-style-type: none"> The technical design of the proposed Project must consider all the factors (i.e., social issues due to resettlement/ relocation of assets and displacement of people and design impact on overall aesthetic beauty and ambience of the project area at final design and should meet all the local and international standards. The proponent has reviewed and validated all the design considering the possible impacts (as mentioned) before the start of construction of the proposed Project. So significant economic and environmental impacts have been minimized by the design team after proper survey of the project area. The design of the weir and tunnel may also be considered to maintain the aesthetics of the national park. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.3.2 Land Acquisition.

During the census inventory and resettlement survey the data was collected to assess the project impacts on land, residential structures, commercial structures, graveyard, fixture, crops, fruit and non-fruit trees, petrol pump, farm houses, mosques, schools, fish farm, poultry farm etc.

As the project area lies in a designated national park which does not have any residential or commercial areas. So, there will be no social impacts regarding land acquisition and resettlement of the proposed project.

Impacts: Land Acquisition			
Applicable Project Phase		<i>Design</i>	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	unlikely	Low	Low

7.3.3 Seismicity

According to the seismic zoning map of Pakistan, the project area lies in moderate to severe damage zone as shown in **subsection heading 5.5.2**. A moderate intensity earthquake impacting the project site can adversely impact the development. This factor requires special consideration of the designers as project structures may be affected negatively in case of earthquake tremors and the significance of damage depends upon the severity of earthquake.

Impacts:			
<ul style="list-style-type: none"> Structural damage due to no seismic analysis 			
Applicable Project Phase		<i>Design</i>	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Major	High
Mitigation Measures, Offsets and Recommendations			
<ul style="list-style-type: none"> The proposed structures will be designed and constructed as per Seismic Building Code of Pakistan 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures. Geotechnical investigations will be carried out prior to the construction keeping in view the seismic hazards of the Project Area. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.3.4 Loss of Vegetation

During the pre-construction phase, sites will be selected for activities such as installation of construction camps, construction of temporary roads & mobility of construction staff which will damage the local vegetation/trees. Also, the installation of heavy machinery and camps will require the removal of available vegetation. This impact is site-specific and medium significant that needs to be encountered prior to the start of construction stage.

Impacts: Vegetation removal			
Applicable Project Phase		<i>Design</i>	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	likely	Moderate	Medium
Mitigation Measures			
The mitigation measures described below will be implemented while completing the final design of the Project.			
<ul style="list-style-type: none"> The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover. 			

<ul style="list-style-type: none"> • It is recommended to establish the construction camps where no or minimum vegetation exists. • Similarly, the alternate routes for roads and points for camps are recommended where no loss of vegetation is expected; and • The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Moderate	Low

7.3.5 Biodiversity Conservation

During the pre-construction phase, this factor requires special consideration of the designers as project structures may negatively affect the biodiversity of the national park. The following points to be considered.

- Habitat destruction
- Disturbance of the tranquility of the fauna
- Risks of poaching (sampling).
- Destruction of wildlife following the movement of gear
- Destruction of vegetation
- Disruption of photosynthesis following pollutant emissions

Impacts: Loss of Biodiversity			
Applicable Project Phase		<i>Design</i>	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Catastrophic	Very High
Mitigation Measures			
<p>The mitigation measures described below will be implemented while completing the final design of the Project.</p> <ul style="list-style-type: none"> • Incorporate technical design measures to minimize removal of trees and plan for compensatory planting for more trees against each fallen tree of similar floral function. • Disallow introduction of invasive/ exotic species and native species should be recommended for plantation • Provision of animal corridors for the free movement of faunal species, especially, near the attractive sites such as grazing lands and water bodies. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	likely	Major	Medium

7.4 CONSTRUCTION PHASE IMPACTS

7.4.1 Soil Erosion and Contamination

Construction will require excavation for the tunnel and other project facilities. These activities will result in loss of soil. Erosion of soil can also occur from removal of vegetation cover, runoff from unprotected excavated areas, muck disposal sites and quarry sites. Excavations on slopes would also decrease its stability. Given the topography of the area, unprotected excavations on sloping grounds may lead to landslides, especially during the rainy season. Major landslides will disturb the slopes of the area and may cause soil erosion.

Impact: Soil Erosion and Contamination			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Major	Medium
<p>Mitigation Measures:</p> <ul style="list-style-type: none"> • The Contractors will be required to instruct and train their workforce in the storage handling and management of materials and chemicals that can potentially cause soil contamination. • Material Safety Data Sheets (MSDS) will be strictly followed during handling and storage of chemicals. • Provision of impervious platform with oil and grease trap for collection of spillages during equipment and vehicle maintenance. • All spoils shall be disposed of safely and the site shall be restored back to its original condition. • In areas with strong sheet flow, high embankments will be provided with chutes and drains/culverts to minimize soil erosion. Stone pitching and retaining walls will be made at high embankments in critical areas. • As applicable and needed, plantation of grasses and shrubs will be done for slope protection. • Productive land or land adjacent to agricultural / irrigated land may not be preferred for excavation. • Non-productive, barren lands in broken terrain and nullahs should be given preference for borrowing materials. • The aggregate required for construction procured from quarries and river beds will need approval from authorities. • Solid waste generated at the camp sites will be properly treated and safely disposed of only in the demarcated waste disposal sites/areas. • If any contaminated soil is found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned. • Use of modern, well-maintained machinery and vehicles by the contractor to avoid leakages; and • Soils removed during construction would be stockpiled for reuse where possible. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.2 Borrow Areas

If the contractor desires to excavate the soil than approval must be obtained from the concerned Environmental Specialist (the implementing body). The excavating activities could have adverse environmental impacts including soil erosion, drainage problem and impact the health and safety of the workers.

Borrow/ Open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the project area.

Impact: Improper location and Mismanagement of borrow areas will lead to Soil erosion; Loss of fertile soil; obstruction in natural drainage and dust pollution			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Moderate	Medium
Mitigation Measures:			
<ul style="list-style-type: none"> ▪ Contractor will excavate the material from the specified and demarcated borrow area and restricted to specified depth. ▪ Contractor will maintain photographic record of the site before and after the restoration of the borrow site and, contractor will get approval from the concerned department. ▪ Contractor will ensure that the surface drainage is provided to control the surface run off. ▪ Contractor will ensure that the movement of earth moving machinery is limited to the work area. ▪ Contractor will ensure that erosion protection measures are taken, such as retaining wall (if required), avoidance of steep cut. ▪ Contractor will level the borrow area and the edges of the pits will be given flat slopes as far as possible. ▪ Contractor will maintain the complete documentation for the borrow areas i.e., volume excavated, date of excavation, leveling date after completion of excavation. ▪ Contractor will carry out regular water sprinkling during executing of excavation to mitigate the dust pollution. ▪ The Contractor will prepare Borrow Area Restoration Plan 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Rarely	Low	Low

7.4.3 Installation and operation of batching plant, Asphalt Plant

Concrete and asphalt have limited usable life, after which they become waste. If not used within the time span, their wastage will have major financial implications. Further, their disposal will become very difficult because of the large quantities involved. Contractor may establish the batching plant & asphalt Plant on private land or close to

villages of the project area that will lead to social issues. Land may be contaminated from the batching plant, during transportation and dumping of the waste fresh concrete. If Raw material is not stocked at designated area, it may block surface drainage.

Impact: Social issues, land contamination and blockage of surface drainage during installation and operation of Batching plant and Asphalt plant			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Major	Medium
Mitigation Measures			
<ul style="list-style-type: none"> • Preferably no private land is used to establish the batching plant & asphalt Plant. Contractor needs to get approval from SC and WEC if he uses any private land for this purpose. • Contractor will pay for the use of private land • The location of the batching plant & Asphalt plant needs to be at least 500 m from the villages (main settlement) and out of phase with the prevailing wind direction. If the selected location is less than 500m from the residential area, then it has to be emission-controlled plant i.e., equipped with wet scrubber. • Contractor will ensure that land contamination from the batching plant, during transportation and dumping of the waste fresh concrete is controlled through careful working of the contractor's crews to avoid spillage of concrete and dumping of waste concrete on private land. • Carry fresh concrete in mobile concrete drums only • Contractor will maintain leak / spill record for each incident of spill or damaged vehicles. Damaged / defective vehicles will not be operated unless repaired • Contractor will ensure that the material is stock piled at the designated area only. • Contractor will ensure that surface drainage is not blocked due to the piling of the raw material • Contractor will store material on site with care and suggestions provided in EIA, in order to minimize the risk of spill or leakage into the river or control water body 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Rarely	Low	Low

7.4.4 Construction Camps/Camp Sites

As the project lies in the designated national park so there will be no social impacts regarding cultural differences, behavior of construction workers towards locals etc. However, improper construction camp location and mismanagement of construction camp activities can lead to various environmental and social impacts including soil degradation, loss of vegetation, solid waste and water pollution, health and safety of workers, vehicular access etc. This impact is temporary and moderate negative in nature.

Impacts: Health and safety of workers, Soil degradation, vegetation loss, solid waste and water pollution			
Applicable Project Phase			Construction
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Major	High
Mitigation Measures:			
<ul style="list-style-type: none"> • The Contractor will seek to avoid sitting camps where their presence might contribute to any conflicts with locals. • A comprehensive safety and security plan for the camps will be prepared which will comprise of a training manual, use of safety equipment and emergency preparedness. • Training will be provided to all staff in camp management rules and overall discipline and cultural awareness. • A waste Management Plan will be implemented to ensure safe handling, storage, collection and disposal of construction waste and the training of employees who handle waste. • Individual trees and shrubs of high conservation value will be marked and preserved wherever possible or transplanted if the root conditions are suitable for such an operation. • Site for construction camp will be selected to minimize the removal of existing macro- plants at camp site. • Photographical and botanical inventory of vegetation before clearing the site will be maintained. • Compensatory plantation to be done when construction work is near to end. • The contractor(s) shall ensure the removal & rehabilitation of site upon completion. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	likely	Moderate	Medium

7.4.5 Wastewater Generation at Construction Camps

Wastewater will be generated at the construction camp by the workers. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources apart from soil contamination. This impact can be categorized as direct, moderate, site-specific, short term, temporary, medium probability and reversible.

Impact: Water pollution due to improper treatment or disposing of wastewater			
Applicable Project Phase			Construction
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Moderate	Medium
Mitigation Measures:			
<p>To dispose the liquid waste generated from the construction activities, the following steps will be taken by the Contractor:</p> <ul style="list-style-type: none"> • Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e., septic tanks. • Proper monitoring to check the compliance of NEQS will be carried out. 			

<ul style="list-style-type: none"> Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit. The Contactor(s) will be responsible to submit details of site-specific wastewater management plan along with details of wastewater collection, transportation and its disposal. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.6 Solid Waste (Construction, Municipal and Hazardous Waste)

Different type of waste is likely to be generated during the construction phase of the project. The municipal waste will be in the form of food, cans, paper etc. Construction waste will include excavated soil, sand, gravel, rocks, pieces of concrete, bricks, wood and metal pieces. Whereas, hazardous waste can be comprised of paints and construction chemicals. All these, if left unattended, can become a source of nuisance and environmental pollution in the project area.

Insecure and unhygienic disposal of the solid wastes particularly garbage and trash may cause degradation of soil and land. Insecurely disposed of heaps of wastes containing kitchen garbage and food waste can serve as breeding grounds for the disease spreading vectors and rodents. Throwing away of solid wastes into streams/Nullahs can result into choking of the latter.

Impact: Mismanagement of solid waste will result in water pollution, soil degradation, health issues and choking of nullahs of the project area			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Major	Medium
<ul style="list-style-type: none"> The demolition waste and excavated material’s disposal site will be selected with the consent of Supervision Consultant and Contractor. The site will be marked before starting the work. Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan. Training to the work force regarding the storage and handling of hazardous materials and chemicals will be given. Also, they will be educated to practice waste minimization, reuse and recycling to reduce the quantity of waste generation. Proper labelling of containers, including the identification and quantity of the material, hazard contact information etc. will be done. Waste disposal plan must be reviewed during the entire construction phase in the light of changing weather conditions. Emergency Response Plan shall be prepared to address the accidental spillage of fuels and hazardous goods. 			

<ul style="list-style-type: none"> • Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate techniques. • Reusing bitumen spillage; and disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5 m). • Used oil shall be collected in separate containers, stored on impervious platform with restricted access and sold to a licensed contractor. Also, the burning of waste oil shall be strictly restricted. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.7 Ambient Air Quality

A vast variety of construction plants and machinery including but not limited to bulldozers, dumpers, generators, batching plant and vehicles will be used during the construction phase. These construction activities will generate dust, smoke and other potential pollutants in the air. Workers may burn wood as fuel. Burning special waste (clinical waste, packing waste etc.) may emit poisons or hazardous emissions.

Impact: Increase in ambient and ground level concentration of air pollutants from construction activities and vehicular movement			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Major	High
<p>Mitigation Measures:</p> <p>Dust, smoke and other potential pollutants from Plants & equipment's</p> <ul style="list-style-type: none"> • All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions. • If the selected site for batching plant is closer than 500m from the build-up area than ensure that zero emission plant is installed. • Ensure that dust emissions due to vehicular traffic are minimized by reducing speed, vehicular traffic minimized through good journey management and water sprinkling on un-metaleed road when required. • Ensure that periodic Ambient air quality is monitoring to assess the concentration of Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2) and Particulate Matter / (PM10) in the atmosphere, <p>Smoke from burning of waste material or burning of firewood in the labor camp</p> <ul style="list-style-type: none"> • It is obligatory for the contractor to provide gas, as a clean source of energy, at the camp and not allow them to use wood as fuel. • Ensure that all the combustible non-hazardous waste material should be burnt in the burn pit only. • Ensure that the quantity of waste burnt at one time is managed to minimize smoke emission. • Control fuel consumption and minimize its waste or leakage by regular monitoring. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.8 Noise and Vibration

Sources of vibration and noise includes construction equipment movement, pile driving, compaction, hammering (hydraulic or pneumatic), operation of Batching plant, Asphalt plant and generators. Another source of vibration will be the blasting to be undertaken for tunneling. The propagation of vibration from construction activities are different in nature from the vibration from blasting. The construction activities are undertaken essentially on ground surface and spreads basically as two-dimensional waves. In contrast, the tunneling is undertaken below the surface and spreads in three-dimension. For this reason, the impact of the two is assessed separately.

The cumulative effects from several machines can be significant and may cause significant nuisances. However, these increased noise levels will prevail only for a short duration during the preconstruction and construction phase.

The likely impacts due to noise and vibration are:

- Psychological effects include distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels.
- Noisy settings and higher background levels can cause temporary threshold shift.
- Moreover, vibrations from machinery and equipment such as handheld compactors and concrete vibrators can produce easy fatigability and generalized aches in the persons operating these machines.

Impact: Project vehicles, plants and construction equipment can generate significant noise and vibration which may create nuisance for wildlife and visiting tourists			
Applicable Project Phase			Construction
Initial Impact Rating	Likelihood	Consequence	Risk
	Likely	Moderate	Medium
Mitigation Measures:			
<ul style="list-style-type: none"> • Noise will be controlled by monitoring while following the NEQS of 45 dB (A). • Move static plant and equipment as far as possible from sensitive boundaries, as work allows. A distance of four times further away lowers the noise by 12 dBA. A reduction of 10 dBA will sound half as loud • Sound attenuation measures should be used for plant and equipment such as baffles and specialized mufflers, acoustic enclosures or partial enclosure housings. 			

- Reduce workers' exposure to high noise levels by keeping moving workers away from the noise source; restricting access to areas; rotating workers performing noisy tasks; and shutting down noisy equipment when not needed
- It is recommended that construction should not be allowed during nighttime (9 PM to 6 AM).
- Vibration from the operation of batching plant, asphalt plant, hammering or compaction activities may have a significant impact but this will be for a short duration. Where vibration could become a major consideration (within say 100m of socially sensitive receptors) may disturb the wildlife living in the national park.
- Noise barriers should be installed for the workers working more than 8 hr/day during construction activities. The noise level from construction activity can be reduced by regular maintenance of machinery.
- Noise can be controlled through engineering control e.g., hammering actions can be substituted by hydraulic.
- Ensure that the workers are wearing necessary personal protection equipment (PPE's) such as earplugs, earmuffs, etc. where engineering control is not applicable to reduce the impact of noise.
- Equipment emitting excessive noise in comparison with other similar equipment will not be allowed to operate.
- Equipment under use will be regularly maintained, tuned, and provided with mufflers to minimize noise levels.
- Prohibit blowing horns on all access roads except under emergency conditions.
- Use muffled breakers and silenced diesel generators and compressors to reduce construction noise

Noise and vibration generated from the blasting in quarry areas

- Using vibratory piling instead of impact piling.
- A Controlled Blasting Management Plan will be developed by the Construction Contractor. The Plan will be reviewed and approved by the Supervision Contractor before the initiation of the blasting work.
- Controlled Blasting will be scheduled during the day only.
- Throughout the blasting activity, vibration sensors will be installed at strategic location to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the Blasting Management Plan.
- Unscheduled blasting will be strictly prohibited in any case.
- Soft ground (e.g., grassland and cultivated fields) attenuation can sometimes have a greater impact in reducing noise than barrier attenuation, especially if the ground supports sound absorbing vegetation.

Noise emissions from concrete batching

- Locate noisy equipment away from potential sources of conflict.
- Locate noisy equipment behind sound barriers or sound absorbers – for example, gravel stockpiles or constructed barriers.
- Install silencing devices to all pressure operated equipment.

Residual Impact Rating	Likelihood	Consequence	Risk
	Unlikely	Moderate	Low

Remarks:
 Noise and vibration impact would not be a major consideration after the implementation of mitigation measures.

7.4.9 Biological Resources

This section assesses the impacts on ecology in and around the project site and outlines the mitigation measures recommended for the management of those impacts.

Deosai is home to about 24 mammalian species. Predators other than Brown bear, like Snow leopard, Himalayan wolf and Tibetan Red fox and associated prey species mostly ungulates i.e., Himalayan ibex, Musk deer, and Golden marmot; in or around DNP play a significant role in maintaining the ecological balance and health of the park. The impacts on fauna will result from the disturbance and degradation of habitats around the main construction sites resulting from increased worker population and improved access. Construction activities will generate moderate to major impacts to Fauna within the project area. Blasting and tunneling in particular will cause loud shocks and vibrations that are likely to affect habitats and wildlife in surrounding of the project area. The ability of wildlife species to move out of construction areas will depend on the availability of suitable alternative habitats, access to those habitats, and rapid mobility required to avoid construction clearance activities. The following points to be considered for faunal protection.

- Destruction of fauna and its habitats (soil and vegetation)
- Disturbance of the tranquility of the fauna
- Poaching Risqué
- Risks of falls in the basins and mortality
- Risk of poisoning of wildlife by the waste that will be generated

The following six habitat types delineated primarily based on the vegetation types (classes) as well geomorphology and topography were:

- a. Marshy habitat (prevalent in low-lying areas),
- b. Grassy habitat (generally associated with flat or undulating areas),
- c. Stony habitat (substrate is stony, dominated by herbs),
- d. Rocky habitat (rocky or gravel areas that are generally devoid of vegetation or have a sparse cover of plants), and
- e. Wetland (There are many mosses, swamps, streams, ponds, pools, peat lands and lakes, all over the Deosai plateau), and permanent snow fields.

Construction workers have the potential to greatly increase pressures on resources used within the project area if allowed to cut trees for fuel consumption. During construction stage, the impacts on flora and their habitat will be of two types:

- Damage to flora during construction activities by vehicles and machinery, establishment of camps and permanent structures etc.
- The clearance of vegetation is before the start of project activities is anticipated.

No endangered, threatened or vulnerable flora species exist in the project area. The medicinal plants grow at higher elevations. There is scanty growth of bushes in the project area.

No tree and plant species of conservation importance has been observed or reported from the Area of Habitat Loss or the Study Area. The Himalayan Brown Bear of the mammal species are found in the Study Area and are included in the IUCN Red List of Threatened Species. The flora and fauna species are common and widespread in the wider area around the project. Moreover, no critical habitat threatened or a unique ecosystem was identified in this area.

Impact: The impact has been assessed at catastrophic, sole reason being the project area serving as habitat of Himalayan Brown Bear and migratory birds' species.			
Applicable Project Phase			Construction
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Catastrophic	Very High
Mitigation Measures:			
<ul style="list-style-type: none"> • Ensure that no-hunting, trapping and/ or harassing wildlife takes place at site. The wildlife protection laws should be strictly implemented. • Large floodlights should not be installed outside 50 m of the Project fence. • Lights should be directed towards Project facilities and not towards the natural habitats. • Regulations for Project staff and contractors to avoid illegal poaching to be incorporated in contract documents. • Provide awareness training to staff and contractors on prevention of injury of animals; identification of likely species found on site; identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered. • Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching. • Encourage personnel to report sightings of wildlife of conservation importance or incidents of poaching to WEC. • Project staff and contractors to report kills of large mammals particularly designated species of conservation concern. • The Contractor shall prepare an Environmental Training Plan for all construction workers. • The Plan shall educate all construction workers on the following issues but not limited to them: firearm possession, traffic regulations, illegal logging and collection of non-timber forestry products, non-disturbance of resettlement communities, hunting and fishing restrictions, waste management, erosion control, health and safety issues, all prohibited activities, the Code of 			

<p>Conduct requirements and disciplinary procedures, and general information on the environment in which they will be working and living.</p> <ul style="list-style-type: none"> • Establishment of penalties for those who violate the rules. • Proposed methods for conducting the training program, which shall include formal training sessions, posters, data in newsletters, signs in construction and camp areas and ‘tool box’ meetings. • When aligning the access tracks ensure that the chosen route requires minimum vegetation loss and no tree cutting. Every tree cut on site for the execution of work will be replaced with the plantation of a minimum of five new trees • Ensure that the camping sites should be located away from the wildlife hot spots • Contractor will monitor the noise level near the noise producing activities and use silencer or cordon off the work area with the noise absorbing panels to make sure the noise level within the is acceptable. • Ensure that safe driving practices is observed so that accidental killing of human being and animals crossing the road could be avoided. • Ensure that the general awareness of the crew is enhanced regarding the wildlife, through environmental training and notice boards provided by the contractor • Contractor will provide clean source of energy at laborer camp and ensure wood and shrubs are not used as fuel during construction phase • Ensure camp waste/food waste is disposed of in such a way that animals are not attracted • Contractor will monitor the noise level near the noise producing activities and use silencer or cordon off the work area with the noise absorbing panels to make sure the noise level within the is acceptable. • Ensure that safe driving practices is observed so that accidental killing of human being and animals crossing the road could be avoided. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Major	Medium

7.4.10 Traffic Management

On the tracks leading to national park, there will be an increase of traffic during project construction period due to the supply of construction materials and the movement of personnel and equipment.

The potential impacts due to increased vehicular traffic and movement of heavy equipment are:

- Traffic congestion due to construction material transport and activities.
- Wear and tear and damage existing infrastructure.
- Community health and safety issues


The efficient management of traffic once the construction activity commences will be critical to minimize the risk of possible road accidents and construction related hazards.

Impact: Traffic congestion due to construction and material transport activities			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Moderate	Medium
Mitigation measures			
<p>Contractor will prepare and implement detailed traffic management plan in true letter and spirit. As part of this plan, Contractor will implement following measures</p> <ul style="list-style-type: none"> • Contractor will prepare and implement detailed traffic management plan in true letter and spirit. As part of this plan, Contractor will implement following measures • Submit temporary haul and access routes plan one month prior to start of works. • Formulate and implementation of a plan of alternate routes for heavy vehicles. • Public awareness campaigns through radio and newspaper ads to educate public and sensitize them to cooperate with project staff and to make them aware of potential risks of accidents and necessary precautions. • Installation of traffic warning signs and enforcing traffic regulations during transportation of materials and equipment and machinery. • Employing flag persons to control traffic at work sites for safety reasons when construction equipment is entering or leaving work areas. • Lanes shall be created through work sites using rope or flagging to minimize risks and injuries from falling objects. • As far as possible, lifting and placing of pre-cast sections will be done at night to minimize traffic congestion. • Use traffic cones to direct traffic to move to open lanes. • Provide sufficient lighting at night within and in vicinity of construction sites. • Regular monitoring of traffic conditions along access roads to ensure that project vehicles are not causing congestion. • Define and observe schedules for different types of construction traffic trips. • Install temporary access to properties affected by disruption to their permanent accesses. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	likely	Low	Low

7.4.11 Occupational Health and safety

Occupational Health and Safety (OHS) related impacts will arise during construction stage activities including clearing of earth, levelling, compaction, pavement finishing and testing & commissioning. The falls during inspection or maintaining pile rigs, steel fixing bridges, erection of framework and other related activities may also occur. Eye injury can be caused by stone or metal particles. Hazard of being hit by falling objects, major hand-arm and whole-body vibration hazards, skin and respiratory tract irritation from exposure to cement dust, overexertion and awkward postures etc. will be another impact. Welding hazards include electric shock, fumes and gases, fire and explosions, falls from height, eye and head injuries etc.

Other impacts will be fall from height, contact with heavy electrical and mechanical equipment, equipment failure, uncontrolled movement, unguarded moving mechanical equipment parts, fatigue, unbalanced load, falling objects, hand injury, slip and trip hazards, wind / storm activity, injury from releasing load too soon etc. Operating mechanical and electrical equipment will trigger the H&S issues e.g., struck by moving vehicles or other equipment, slips or trips, struck by flying objects, such as dirt or splashed fluids, caught in pinch points, shear points, falling from machine etc. Considering these consequences, this impact can be categorized as direct, moderate, site-specific, medium term, temporary, medium probability and irreversible.

Impact: Occupational Health and safety issues due to construction activities			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Major	High
<ul style="list-style-type: none"> • Health, Safety and Environment (HSE) plan will be developed and implemented by the contractor. • The contractor will ensure that medical dispensary having first aid equipment has been established at his camps. • The availability of a suitable ambulance service will also be ensured by the contractor. • A proper screening of laborer should be done at the time of recruitment. Ensure that the periodic awareness campaigns for HIV/AIDS are undertaken for the project staff. • Contractor will provide potable water and shadow area to the workers at work place for short breaks. • The Contractor will depute guards at all entry points into construction site for 24 hours a day. • The Contractor will provide PPEs to all workers working at site for their safety. • Contractor will ensure no machinery is left unattended in the project area. • The medical staff ensure periodical checks of the cooking staff and cooking practice particularly for symptoms of hepatitis. • Contractor will ensure that use of horns is prohibited, except when necessary. • Timely public notification on planned construction works. • Trained first aiders and medical staff to be available at project site. • Use of safety signs at the construction site, as shown below. 			
			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	likely	Moderate	Low

7.4.12 Community Safety

Impact: Community health and safety issues			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low
Mitigation Measures: <ul style="list-style-type: none"> • A speed limit of 20 km/h shall be imposed on unpaved roads and link roads for reducing traffic accident risks and dust generation. • Traffic warning signs will be placed at community roads used for the movement of project vehicles. • The camping sites of the Project site will be completely fenced off before the commencement of any other construction activities. Access to the site will be controlled and unauthorized people will not be allowed to enter. Children will not be allowed to enter the site under any circumstances. • Dust emissions due to vehicular traffic will be minimized by enforcing the speed limit. Water will be sprinkled on unpaved surfaces where necessary. • All vehicles used by the project will undergo regular maintenance and will be tuned in accordance with the requirements of the NEQS. • Training and capacity building of laborers regarding cultural norms and ethic of the project area in order to avoid any conflict with the locals. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.13 Influx of Labor

For the implementation of proposed Project activities, “skilled and unskilled labor is required by the Contractor. Mostly, skilled and unskilled workers have been associated with the contractor since long which they utilize. Along with that, some other workers with different cultural backgrounds are also hired as per the requirement.

Social problems and conflicts that are associated with Labor Influx are as follows:

- Risk of social conflict: Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.
- Increased risk of illegitimate behavior and crime: The influx of workers and service providers into communities may increase the rate of crimes and a perception of insecurity by the local community. Such illegitimate behavior

and crimes can include theft, physical assaults, substance abuse, sexual assault and human trafficking.

- Impacts on community dynamics: Depending on the number of incoming workers and their engagement with the host community, the composition of the local community and with it the community dynamics may change significantly. Pre-existing social conflict may intensify as a result of such changes.
- Increased burden on and competition for public service provision: The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional and separate supply systems.
- Local inflation of prices, accommodations and rents: A significant increase in Demand for goods and services due to labor influx may lead to local price hikes and crowding out of community consumers. Depending on project Worker income and form of accommodation provided, there may be increased demand for accommodations, which again may lead to price hikes and crowding out of residents.
- Increase in traffic and related accidents: Delivery of supplies for construction workers and the transportation of workers can lead to an increase in traffic, rise in accidents, as well as additional burden on the transportation infrastructure.

Impact: Social conflicts with local communities due to influx of labor.			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Certain	Major	High
<ul style="list-style-type: none"> • Labor camp(s) should be established away from residential population. • Preference should be given to the local people to work with contractor, and contractor should hire maximum labor force from the project area because this will reduce the labor influx. • Awareness should be created among the work force to ensure respect for local customs. 			

<ul style="list-style-type: none"> • Construction work should be completed within the stipulated time to move workers to next location. • Labor force should be shuffled with the time. • An effective GRM should be established for the project to resolve all issues related to the community. Thus, progress regarding resolving the issues should be monitored closely. • Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all project sites. • Develop and enforce a strict code of conduct for workers to regulate behaviour in the local communities. • Taking all sensible precautions to avert illicit, vicious conduct by or amongst the Contractor’s personnel, and to preserve unity and harmony, and protection of people and property on and near the sites. • Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel. • Appropriate fencing, security check points, gates and security guards should be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and • The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the Risk of vandalism and theft. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Moderate	Low

7.4.14 Communicable Diseases

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

Impact: Communicable diseases in workers			
Applicable Project Phase			Construction
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Likely	Moderate	Medium
Mitigation Measures:			
The Contractor shall:			

<ul style="list-style-type: none"> • Arrange to run an active campaign, in the labor camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS. • Strengthen the existing local health & medical services for the benefit of labor as well as the surrounding villages. • Ensure cleanliness and hygienic conditions at labor camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by Health Department. • Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.15 Gender Based Violence

During construction phase, gender-based violence might arise due to discrimination made against women by unequal work distribution and unequal pay structure among others. Sexual harassment against women might occur as a consequence of mixing of men and women at the construction site and moving on the roads and markets. This impact is negative in nature during construction stage.

Impact: Gender Based Violence			
Applicable Project Phase		Construction	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low
Mitigation Measures:			
<ul style="list-style-type: none"> • Awareness should be created among the females at individual and community levels about the construction sites. • During the timing of educational institutions workers should not be allowed to crowd in the surroundings. • Alternative routes for pedestrian should be provided to avoid mixing of women with workers. • Raise awareness among the communities of the potential risks of GBV, and establish response services in the communities that can respond to instances of GBV (particularly those related to issues of labor influx); • The contractor should make sure that no discrimination is made on the basis of gender while hiring of workers. • Provisions of gender disaggregate bathing, changing, and sanitation facilities; and • Contractor should take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women. • In this there is no population in the surrounding, so the Impact will be negligible. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Low	Low

7.4.16 Religious, Cultural and Historical Sites

The location of mosques and other cultural and other heritage sites has been reviewed. There is no mosque, graveyard, tomb or any other religious/archaeological site within 100 m boundary from the edge of the project as the project lies in a designated national park; therefore, no impact on the site is expected.

7.5 Operation Phase Impacts

The project works will extend the power generation and excess amount of drinking water for Skardu city. No houses, mosques or schools are close to the project site. Maintenance works will be very small in scale and infrequent and involve a few changes to the existing situation. The operation of the facility is not likely,

- Risk of disturbance of wildlife and wildlife habitat
- To cause any appreciable increase in the noise level
- To cause atmospheric pollution during the operation of the project.
- To generate liquid or solid waste at project site.

The negative impacts that will occur during the operation phase are mentioned below:

7.5.1 Degradation of Terrestrial Ecology

Impact: Degradation of terrestrial ecology			
Applicable Project Phase		Operation	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	likely	Moderate	Medium
Mitigation Measures:			
<ul style="list-style-type: none"> • Large flood lights should not be installed outside 50 m of the Project fence. • Lights should be directed towards Project facilities and not towards the natural habitats. • Regulations for Project staff to avoid illegal poaching to be incorporated in contract documents. • Provide awareness training to staff and contractors on prevention of injury of animals, identification of likely species found on site, identifications of animal hazards (such as venomous snakes) and what to do if dangerous animals are encountered. • Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching. • Encourage personnel to report incidents of poaching. • Solid waste should only be disposed of at designated sites. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Moderate	Low

7.5.2 Reduction in Downstream Flow

The Shatung Nullah Diversion Scheme is being designed to divert up to 10 m³/s of water from the Shatung Nullah to Satpara reservoir. These flows are available in Shatung Nullah during the summer months of peak snowmelt i.e., from June to September. However, the flows reduce significantly during the winter months. During the low flow months, it is very important that some portion of flows remain flowing in the Nullah downstream of diversion weir. These flows are essential to maintain the existing ecosystem of the Nullah. The vulnerable reach of Shatung Nullah is from the weir site up to its confluence with a perennial stream called Burgilla Nullah (about 11.5 km downstream of weir).

Impacts

The impacts that will occur due to reduction in downstream flow are:

- I. Degradation of the river ecosystem
- II. Reduction of water availability for downstream community
- III. Deterioration of aesthetics and visual amenity

Impact: Degradation of river ecosystem, Reduction of water availability for downstream community and Deterioration of aesthetics and visual amenity			
Applicable Project Phase		Operation	
Initial Impact Rating	Likelihood	Consequence	Impact Score
	likely	Moderate	Medium
Mitigation Measures:			
<ul style="list-style-type: none"> • The environmental release outlet structure has been designed to ensure the release of the ecologically required flow at all times towards downstream of the weir structure. • The minimum ecological release is set to 0.25 m³/s which corresponds to 10% of the minimum annual flow as per the requirement of EPA Gilgit-Baltistan. • With increasing discharge during June to September (the months with the highest flows), the environmental release will rise due to spilling from the weir. • Biodiversity Action Plan (BAP) will be implemented to maintain the quality of aquatic life. • Where possible, the cemented structures will be covered with vegetation to maintain the aesthetics and visual amenity. 			
Residual Impact Rating	Likelihood	Consequence	Impact Score
	Unlikely	Moderate	Low

7.5.3 Cumulative Impacts

- The diversion of water from the Shatung River could increase the dam's power generation capacity by up to 10-15% that will enable more electricity supply to the area.
- The region around Skardu is facing a growing problem of water scarcity. The diversion of water from the Shatung River could help to reduce water scarcity in the region.
- The Satpara Dam is currently used to provide water for domestic, industrial, and public use in Skardu and the surrounding villages. The diversion of water from the Shatung River could increase the availability of water for these uses. Therefore, it will be helpful to fulfill the requirement of Hydro Power Generation, Water Supply to Skardu City and Irrigation water Supply.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The main objective of the environmental and social management plan (ESMP) is to manage adverse impacts of proposed project interventions on both the environment and the people in the project area. The purpose of the ESMP is to ensure that environmental and social impacts or the risks identified during the ESIA process are effectively managed during the construction, operation and closure of the proposed project. The ESMP specifies the mitigation measures, which are to be implemented by the contractor's environmental team.

The diversion of Shatung Nullah is a design-built contract project. Current ESMP is part of ESIA study carried out by the Consultant and shall not be considered final, unless its design or alignment is unchanged. ESMP needs to be revised along with the change of design at any stage.

This ESMP not only specifies mitigation measures but also describe institutional arrangements for the ESMP. ESMP includes environmental mitigation, testing, monitoring, reporting and budgeting requirements, along with recommendations on Environmental trainings.

8.1 Environmental Objectives of ESMP

The specific objective of this document is to highlight the Environmental objectives and targets to ensure a sustainable and climate resilient approach towards the project. Stepwise environmental objectives, which are contractual obligations of contractor are as under:

- **Design & Alignment Selection:** As this is a design-built contract, while designing the weir, connecting channel and tunnel for the diversion, the contractor must be familiarized with WB safeguards policies and guidelines. Contractor needs to be guided to select an alignment, which is most climate resilient and has the least environmental and social impacts while fulfilling project objectives.
- **Site Selection for Facilities:** To ensure the environmental performance, site selection for different project facilities e.g., campsites, asphalt, batching and or crushing plant, workshop and or machine yard need to be carefully

- selected as per the guidelines. All the activities within these facilities along with construction work on site also need to be in line with the WB safeguards guidelines and EPA's approval.
- **Human Resource:** This identifies the human resource required to ensure environmental compliance, quality of reporting and enhanced environmental performance.
 - **Mitigation Measures:** Mitigation measures identified against each activity will maximize potential project benefits and control negative impacts.
 - **Climate Resilient and Environment Enhancement/ Friendly Infrastructure:** To ensure a climate resilient infrastructure i.e., green infrastructure, urban forest also incorporated to serve for climate regulations.
 - **Defining Roles and Responsibilities of Project Team:** ESMP also defines responsibilities of contractor team, supervisory consultant, and other members of the project team for the environmental and social management of the project.
 - **Defining Environmental Monitoring and Management Plans:** This document also emphasized on environmental monitoring and management plans. These plans are related to Health & Safety, Emergency response, Traffic safety, Noise, dust, Air Quality, Solid Waste, Liquid waste, noise, Flora, fauna, and all natural resources management.
 - **Environmental Trainings:** Need and frequency of Environmental trainings to the contractor and other project staff is also comprehended and included in the plan.
 - **Environmental Budgeting:** ESMP also calculates overall budget estimate along with its breakup for a sustainable and a resilient infrastructure.
 - **Inspection and Supervision:** This document also mentions inspection and monitoring frequency by SC and Client to make sure Contractor's compliance to ESMP document.

8.2 Institutional Responsibilities

Following functionaries will be involved in the implementation of ESMP:

- WAPDA
- WAPDA Environmental Cell (WEC)
- Supervision Consultant
- Contractor of project
- Project Management Unit

The overall responsibility for the implementation of the project rests with the PMU, which will be developed by WAPDA. The PMU will be headed by the Project Director (PD). Along with PMU, WAPDA Environment Cell (WEC) will be responsible for implementing the ESMP. The WEC headed by the Deputy Project Director-Safeguards, will include representatives of all actors responsible for ESMP/SRMP implementation. The institutional responsibilities for the project are shown in **Table 8.1**.

Table 8.1: Institutional Responsibilities

Functionaries	Responsibilities
PMU/PD	<ul style="list-style-type: none"> • Project Director under PMU is overall responsible for the project management and supervision along with the related E&S management. PD has to handle civil work along with managerial aspects of project during construction phase through RE and PM; and E&S management through WEC. • PMU will carry out internal audits on quarterly basis for ESMP implementation. • WEC will be overall in-charge of Environment and will handle the management issues of the contract in lieu of WB guidelines and GB-EPA NOC's requirements. • WEC will be responsible for the technical compliance of ESMP implementation through supervision consultant and contractor Environment team.
WAPDA Environment Cell (WEC)	<ul style="list-style-type: none"> • All technical hiring, (i.e., human resource) related to ESMP need recommendation & approval of WEC respectively. • All management plans as mentioned in ESMP below will need recommendation and approval of WEC. • In case of non-compliance of ESMP first time verbal then written warning may be issued to the contractor on the recommendation of ES. • WEC will facilitate WB safeguard mission and other required presentations to the WB on status of ESMP implementation and timely submission of ESMP compliance documents. • WEC will look after the Environment team of CSC on site in line with the specifications and requirements of ESMP and CESAP/SSEMP in order to ensure compliance in close coordination and cooperation with the PMU to ensure that the project complies with the World Bank Safeguard Policies as well as national environmental frameworks.

Functionaries	Responsibilities
	<ul style="list-style-type: none"> • Ensure compliance and adherence to World Bank Safeguard policies and GB-EPA standards through on-site visits, consultations, trainings of key project staff and contractors, supervision of on-site activities, ensuring preparation, updating and timely submission of requisite Environmental Safeguard Compliance Reports to WB through WEC.
<p>Supervision Consultant</p> <p>Environmental Expert /Specialist</p>	<ul style="list-style-type: none"> • SC through its team of environmental management will ensure implementation of ESMP on the site. • He/she will Inspect, supervise and monitor all the construction and allied activities related to ESMP. • He/she has to ensure Site Specific Environmental Management Plan get approved from WAPDA and WB one-month prior construction is started. • He/she will be responsible to prepare corrective action plan if required. • EE/ES of SC will facilitate and cooperate with WEC in the implementation of ESMP. • Visiting construction sites including incomplete construction work sites, where there are no contractor's activities, active construction work sites, completed areas of work sites as well as ancillary sites such as burrow areas, quarries, asphalt and crusher sites, construction camps and workshop to ensure contractors' compliance with ESMP stipulations and conditions of legal authorities. • Preparing monthly and quarterly environmental compliance reports
<p>Contractor of Project</p> <p>Environmental Specialist</p> <p>Environmental Engineer/HSE</p>	<ul style="list-style-type: none"> • Environmental Specialist (ES) of contractor will prepare site specific ESMP (before commencement of construction work), environmental testing and monitoring plan, traffic control/diversion plan, plantation plan, camps site management plan and other social and environmental plans as part of SSEMP. • ES will be responsible to supervise and manage day to day activities of Environmental Engineer (EE) • EE of contractor will be responsible for the implementation of ESMP and to take effective measures against corrective actions plan • EE will prepare the compliance reports as per schedule and will submit it to SC • ES will ensure provision and usage of proper Personal Protective Equipment (PPE) to the workers and train them for their proper use • ES and EE will conduct environmental trainings for project staff and labor

8.3 Mitigation Management Matrix

The Mitigation Management Matrix (MMM) provides the framework for the implementation of the mitigating measures and environmental management during construction and operation phases of the project.

Tables 8.2, 8.3 and 8.4 reflect the impacts arising from project activities, their mitigation measures and responsibilities for the implementation of ESMP during design, construction and operation phases respectively.

Table 8.2: Design/Planning Phase ESMP

Sr. No.	Potential Impact/Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
Design/Planning Stage					
1.	Improper route selection and Incompatible Engineering design	<ul style="list-style-type: none"> The technical design of the proposed Project must consider all the factors (i.e. social issues due to resettlement/relocation of assets and displacement of people and design impact on overall aesthetic beauty and ambience of the project area at final design and should meet all the local and international standards; The design consultants have reviewed and validated the design as per feedback of ESIA field team considering the possible impacts before the start of construction of proposed Project. 	<p>Confirmation of design incorporation.</p> <p>Audits and Checks</p>	ESIA Consultant, WAPDA	PMU/WEC
2.	Land Acquisition/ Resettlement	<ul style="list-style-type: none"> The project involves no land acquisition as the project lies in a designated national park where there are no public or private properties. The project under component land to be required is 18 Acres only. This land is owned by GoGB and will handover to project free of cost. 	<p>Confirmation of design incorporation, Land records</p>	ESIA Consultant, WAPDA	PMU/WEC
3.	Seismicity	<ul style="list-style-type: none"> The proposed weir and the associated structures will be designed and constructed as per Seismic Building Code of Pakistan 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures. Geotechnical investigations will be carried out prior to the construction of weir and tunnels keeping in view the seismic hazards of the Project Area 	<p>Confirmation of design incorporation;</p> <p>Check Geological Investigation results</p>	WAPDA	PMU/WEC

Sr. No.	Potential Impact/Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
4.	Loss of vegetation	<ul style="list-style-type: none"> ▪ The camps, mobility of machinery and construction of temporary road should be proper planned and well designed to avoid any loss to local green cover and faunal habitats. ▪ The alternate routes for roads and points for camps are recommended where no loss of biodiversity is expected. ▪ The location of construction camp should be selected so, as to have limited environmental impact during construction phase and to reduce the cost and land requirement 	Confirmation of design incorporation, Checks and audits of suitable place, Tree compensation record	Design Consultant	PMU/WEC
5.	Biodiversity Conservation and NRM	<ul style="list-style-type: none"> ▪ Pre-construction surveys to contribute to final mitigation plans for species ▪ Minimize construction footprint and temporary construction areas ▪ Minimize construction during seasonal months (i.e. bird breeding seasons) Review design of new power lines and supporting structures to minimize risk or electrocution or other injury to birds. Monitor and restrict use of poisons or chemicals which are likely to harm birds, especially scavenging birds such as vultures ▪ Incorporate technical design measures to minimize removal of trees and plan for compensatory planting for more trees against each fallen tree of similar floral function. ▪ Strict watching to be required for conservation of Biodiversity, especially mammals and birds. 	Confirmation of design incorporation, Audits and Checks	ESIA Consultant, WAPDA	PMU/WEC

Sr. No.	Potential Impact/Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Disallow introduction of invasive/ exotic species and native species should be recommended for plantation ▪ Provision of animal corridors for the free movement of faunal species, especially, near the attractive sites such as grazing lands and water bodies. 			
6.	Public Disclosure of Final Design	<ul style="list-style-type: none"> ▪ It is recommended to share the route alignment with the identified stakeholders, especially DNP Management through meetings and detailed presentations. Continued stakeholder engagement and timely public disclosure will help to decrease the significance of impact from moderate to low. 	Audits and Checks	WAPDA	PMU/WEC

Table 8.3: Construction Phase ESMP

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
Construction Stage					
1.	Soil Erosion and Contamination	<ul style="list-style-type: none"> ▪ The Contractors will be required to instruct and train their workforce in the storage, handling and management of materials and chemicals that can potentially cause soil contamination. ▪ Material Safety Data Sheets (MSDS) will be strictly followed during handling and storage of chemicals. ▪ Soil contamination by asphalt will be minimized by placing all containers in a bonded area away from watercourses. ▪ Provision of impervious platform with oil and grease trap for collection of spillages during equipment and vehicle maintenance. ▪ In areas with strong sheet flow, high embankments will be provided with chutes and drains/culverts to minimize soil erosion. Stone pitching and retaining walls will be made at high embankments in critical areas. ▪ As applicable and needed, plantation of grasses and shrubs will be done for slope protection. ▪ Productive land or land adjacent to agricultural /irrigated land may not be preferred for excavation. 	<p>Compliance; evidence of Training</p> <p>Record Compliance; site inspections</p> <p>System in place</p> <p>Compliance with Drawings</p> <p>Site inspection; Photographic record</p> <p>Compliance; site inspection</p> <p>Compliance with Drawings; site inspections</p> <p>Written approval</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Non-productive, barren lands in broken terrain, nullahs and publicly recognized wastelands should be given preference for borrowing materials. ▪ Aggregate required for construction procured from quarries and riverbeds will need approval from authorities; ▪ If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned. ▪ Use of modern, well-maintained machinery and vehicles by the contractor to avoid leakages; and ▪ Soils removed during construction would be stockpiled for reuse where possible. 	<p>Compliance, Site Inspections</p> <p>Compliance, Record check</p> <p>Compliance</p>		
2.	Borrow Materials from Earth Borrow Site	<ul style="list-style-type: none"> ▪ Preferably no private land will be used for borrow area. Contractor will excavate the material from the specified and demarcated borrow area and restricted to specified depth. ▪ Contractor will maintain photographic record of the site before and after the restoration of the borrow site. ▪ Contractor will ensure that the surface drainage is provided to control the surface run off ▪ Contractor will ensure that the movement of earth moving machinery is limited to the work area 	<p>Records of clear boundary marker demarked in Place Photographs records and SFA signed by the land owner</p> <p>Compliances with Specification</p> <p>Compliance</p> <p>Site inspections</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Contractor will ensure that erosion protection measures are taken, such as retaining wall (if required), avoidance of steep cut ▪ Contractor will level the borrow and the edges of the pits be given flat slopes as far as possible and as per the satisfaction of the land owner and top soil restored after the completion of the excavation activity ▪ Contractor will maintain the complete documentation for the borrow areas i.e., volume excavated, date of excavation, leveling date after completion of excavation. ▪ Contractor will carry out regular water sprinkling during executing of excavation to mitigate the dust pollution ▪ Contractor will ensure that the movement of excavating machinery and vehicles is limited to the work area. ▪ The Contractor will prepare Borrow Area Restoration Plan ▪ Contractor will maintain the Photographic record of the area of the nominated waste disposal site in order to restore the site at the completion of the construction phase ▪ Contractor will ensure that waste soil is properly disposed off in a manner that does not affect the natural drainage. 	<p>Visible signs of any soil erosion</p> <p>Photographs Record</p> <p>Records</p> <p>Compliance</p> <p>Photographic Records</p> <p>Compliance; Photographs</p>		
3.	Installation and operation of batching plant, Asphalt Plant	<ul style="list-style-type: none"> ▪ Preferably, no private land will be used to establish the batching plant & asphalt Plant. Contractor needs to get approval from SC 	Photographs; a statement signed by WEC/WAPDA that no private land is	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<p>and WEC if he uses any private land for this purpose. Contractor will pay for the use of private land</p> <ul style="list-style-type: none"> ▪ The location of the batching plant & Asphalt plant needs to be out from national park or at least away from protected fauna population and out of phase with the prevailing wind direction. If the selected location is less than 500m from the residential area, then it has to be emission-controlled plant i.e., equipped with wet scrubber. ▪ Contractor will ensure that land contamination from the batching plant, during transportation and dumping of the waste fresh concrete is controlled through careful working of the Contractor's crews to avoid spillage of concrete and dumping of waste concrete on private land. Carry fresh concrete in mobile concrete drums only ▪ Contractor will maintain leak / spill record for each incident of spill or damaged vehicles. Damaged / defective vehicles will not be operated unless repaired ▪ Contractor will ensure that the material is stock piled at the designated area only. ▪ Contractor will ensure that surface drainage is not blocked due to the piling of the raw material ▪ Contractor will store material on site with care and suggestions provided in EIA, in order to minimize the risk of spill or leakage into the river or control water body 	<p>used, otherwise, contractor will be responsible for land use</p> <p>Payments.</p> <p>Compliance; community</p> <p>Complaints.</p> <p>Compliance</p> <p>Compliance, Photographs</p> <p>System in place</p>		

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
4.	Construction Camps/Camp Sites	<ul style="list-style-type: none"> ▪ The Contractor will seek to avoid sitting camps where their presence might contribute to any conflicts with locals; ▪ Camps will be designed to be self-contained to reduce demand on infrastructure and services of nearby communities; ▪ Contractor will prepare a comprehensive safety and security plan for the camps which will comprise of a training manual, use of safety equipment and emergency preparedness; ▪ Training will be provided to all staff on camp management rules and overall discipline and cultural awareness; ▪ Camps should be located far away the faunal importance areas like Brown Bear and Migratory birds nesting. ▪ Contractor will prepare a Waste Management Plan that will be implemented to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste; ▪ Contractor should mark and preserve Individual trees and shrubs of high conservation value wherever possible or transplanted if the root conditions are suitable for such an operation; ▪ Site for construction camp will be selected to minimize the removal of existing macro- plants at camp sites; ▪ Contractor will make Photographical and botanical inventory of vegetation before clearing the site; 	<p>Compliance, Community Complaints</p> <p>Safety and security plan in place and operational</p> <p>Evidence of Training</p> <p>Waste Management plan in place and</p> <p>Operational; Evidence of Training</p> <p>Compliance with drawings, Site inspection</p> <p>Photographic records</p> <p>Photographic record; Site Inspection</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Compensatory plantation to be done when construction work near ends; and ▪ The contractor(s) shall ensure removal & rehabilitation of site upon completion. 			
5.	Wastewater Generation at Construction Camps	<p>To dispose the liquid waste generated from the construction activities, Contractor will be required to take following steps:</p> <ul style="list-style-type: none"> ▪ Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e., septic tanks. ▪ Proper monitoring to check the compliance of NEQS will be carried out. ▪ Sewage from construction camps will be disposed of after proper pre-treatment and processes such as soakage pit; and ▪ The Contactor(s) will be responsible to submit details of site-specific wastewater management plan along with detail of wastewater collection, transportation and its disposal. 	<p>System in place; site inspection</p> <p>Water Quality monitoring results report</p> <p>System in place; site inspections</p> <p>wastewater management plan in place and operational; site inspections</p>	Contractor	CSC/WEC
6.	Solid Waste (Construction, Municipal and Hazardous Waste)	<ul style="list-style-type: none"> ▪ The demolition waste and excavated material's disposal site will be agreed with the Supervision Consultant and Contractor and marked on site before starting the work ▪ Solid Waste generated during construction and camp sites will be safely disposed in demarcated waste disposal sites and the contractor will provide a proper waste management plan; ▪ Training of work force in the storage and handling of hazardous materials and chemicals construction workers and supervisory 	<p>Photographs;</p> <p>Compliance, site inspections, Waste Management Plan in place and operational</p> <p>Evidence of Training'</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<p>staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of the waste;</p> <ul style="list-style-type: none"> ▪ Proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.; ▪ Waste disposal plan must be reviewed during the entire construction phase in the light of changing weather conditions ▪ Emergency Response Plan shall be prepared to address the accidental spillage of fuels and hazardous goods; ▪ Immediate collection of spilled oils/fuels/lubricants by collection of contaminated soils and skipping oils from surface water by applying appropriate technologies; ▪ Reusing bitumen spillage; and disposing non-usable bitumen spills in a deep trench providing clay linings at bottom and filled with soil at the top (for at-least 0.5 m); ▪ Used oil shall be collected in separate containers stored on impervious platform with restricted access and shall be sold to licensed contractor and the burning of waste oil shall be strictly restricted 	<p>Compliance, Photographs</p> <p>Compliance; Records and Checks</p> <p>Emergency Response Plan in place and Operational</p> <p>System in place; Compliance</p> <p>Records and Checks</p> <p>System in place; Site inspections; records and checks</p>		
7.	<u>Ambient Air Quality</u>	<ul style="list-style-type: none"> ▪ All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; 	Monitoring gaseous emission rates from generator and other key equipment	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
	<p>Dust, smoke and other potential pollutants from Plants & equipment's</p> <p>Smoke from burning of waste material or burning of firewood in the labor camp</p>	<ul style="list-style-type: none"> ▪ If the selected site for batching plant is closer than 500m from the build-up area than ensure that zero emission plant is installed. ▪ Ensure that dust emissions due to vehicular traffic are minimized by reducing speed, vehicular traffic minimized through good journey management and water sprinkling on non-mettle road when required. ▪ Ensure that periodic Ambient air quality is monitoring to assess the concentration of Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2) and Particulate Matter / (PM10) in the atmosphere, ▪ Contractor's obligations to provide gas as clean source of energy at contractor's camp and not allow them to use wood as fuel. ▪ Ensure that all the combustible non-hazardous waste material should be burnt in the burn pit only. ▪ Ensure that the quantity of waste burnt at one time is managed so as to minimize smoke emission ▪ Control fuel consumption and minimize its waste or leakage by regular monitoring 	<p>System in place</p> <p>Visible dust:</p> <p>Visible observation of size of dust clouds</p> <p>Quarterly Air Quality Monitoring lab results;</p> <p>Compliance</p> <p>Compliance contractual obligations</p> <p>System in place</p> <p>Maintain record</p>		
8.	Noise Pollution from Construction Activities	<ul style="list-style-type: none"> ▪ It is recommended that construction should be minimized during nighttime. ▪ Construction Machinery that produces less noise and vibration should be used in sensitive areas. 	Compliance, site inspections	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ The contractor should make arrangements to minimize the vibration, and noise pollution through good engineering practices. ▪ The noise level from construction activity can be reduced by regular maintenance of machinery. Noise can be controlled through engineering control e.g., hammering actions can be substituted by hydraulic. ▪ Ensure that the workers are wearing necessary personal protection equipment (PPE) such as earplugs, earmuffs, etc. where engineering control is not applicable to reduce the impact of noise. Equipment emitting excessive noise in comparison with other similar equipment will not be allowed to operate. ▪ Equipment under use will be regularly maintained, tuned, and provided with mufflers to minimize noise levels. ▪ Prohibit blowing horns on all access roads except under emergency conditions. ▪ Use muffled breakers and silenced diesel generators and compressors to reduce construction noise. 	<p>Arrangements in place</p> <p>Compliance; availability of PPE.</p> <p>System in place; record; site inspections</p> <p>Compliance</p>		
9.	<p>Vibration and Noise from blasting</p> <p>During the construction phase may disturb the wildlife.</p>	<ul style="list-style-type: none"> ▪ A Blasting Management Plan will be developed by the Construction Contractor. The Plan will be reviewed and approved by the Supervision Contractor before the initiation of the blasting work. ▪ Blasting will be scheduled during the day only. ▪ Throughout the blasting activity, vibration sensors will be installed at strategic location to monitor the impact of blasting and to ensure that the vibration levels are within the adopted criteria. The monitoring plan will be part of the Blasting Management Plan. 	<p>Blasting and Explosives Control Plan document</p> <p>Blasting Schedule</p> <p>Vibration record</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Unscheduled blasting will be strictly prohibited in any case. 			
10.	<p>Biodiversity</p> <p>Decline in abundance and diversity of terrestrial flora and fauna caused by Construction related activities.</p>	<ul style="list-style-type: none"> ▪ Educating workers about the importance of wildlife ▪ Respect for wildlife habitats during the work ▪ Remediation of sites disturbed during the work ▪ Prohibition of all forms of poaching ▪ Driver Awareness for disturbance of wildlife. ▪ Large flood lights should not be installed outside 50 m of the Project fence. ▪ Lights should be directed towards Project facilities and not towards the natural habitats. ▪ Regulations for Project staff and contractors to avoid illegal poaching to be incorporated in contract documents. ▪ Provide awareness training to staff and contractors on prevention of injury of animals; identification of likely species found on site; identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered. ▪ Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching. ▪ Encourage personnel to report sightings of wildlife of conservation importance or incidents of poaching to WEC. ▪ Project staff and contractors to report kills of large mammals particularly designated species of conservation concern. ▪ The Contractor shall prepare an Environmental Training Plan for all construction workers. ▪ The Plan shall educate all construction workers on the following issues but not limited to them: firearm possession, traffic 	<p>Site inspection</p> <p>Compliance with wildlife protection rules & regulation</p> <p>Training Plan</p> <p>Record</p> <p>Training Schedule</p> <p>Compliance with EIA/EMP</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<p>regulations, illegal logging and collection of non-timber forestry products, non-disturbance of resettlement communities, hunting and fishing restrictions, waste management, erosion control, health and safety issues, all prohibited activities, the Code of Conduct requirements and disciplinary procedures, and general information on the environment in which they will be working and living.</p> <ul style="list-style-type: none"> ▪ Establishment of penalties for those who violate the rules. ▪ Proposed methods for conducting the training program, which shall include formal training sessions, posters, data in newsletters, signs in construction and camp areas and ‘tool box’ meetings. ▪ When aligning the access tracks ensure that the chosen route requires minimum vegetation loss and no tree cutting. Every tree cut on site for the execution of work will be replaced with the plantation of a minimum of five new trees ▪ Ensure that the camping sites should be located away from the wildlife hot spots ▪ Contractor will monitor the noise level near the noise producing activities and use silencer or cordon off the work area with the noise absorbing panels to make sure the noise level within the is acceptable. ▪ Ensure that safe driving practices is observed so that accidental killing of human being and animals crossing the road could be avoided. 	<p>Site inspection</p> <p>Compliance</p>		
11.	Traffic Management	<ul style="list-style-type: none"> ▪ Contractor will prepare and implement detailed traffic management plan in true letter and spirit. As part of this plan, Contractor will implement following measures ▪ Submit temporary haul and access routes plan one month prior to start of works. 	<p>Traffic Management plan in place and operational</p> <p>Temporary haul and access routes plan</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Formulate and implementation of a plan of alternate routes for heavy vehicles. ▪ Public awareness campaigns through radio and newspaper ads to educate public and sensitize them to cooperate with project staff and to make them aware of potential risks of accidents and necessary precautions. ▪ Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. ▪ Employing flag persons to control traffic at work sites for safety reasons when construction equipment is entering or leaving work areas. ▪ Lanes shall be created through work site using rope or flagging to minimize risks and injuries from falling objects. ▪ As far as possible, lifting and placing of pre-cast sections will be done at night to minimize traffic congestion. ▪ Use traffic cones to direct traffic to move to open lane. ▪ Provide sufficient lighting at night within and in vicinity of construction sites. ▪ Regular monitoring of traffic conditions along access roads to ensure that project vehicles are not causing congestion. ▪ Define and observe schedules for different types of construction traffic trips. ▪ Install temporary accesses to properties affected by disruption to their permanent accesses. ▪ Reinstate good quality permanent accesses following completion of construction. 	<p>Plan of alternate routes for heavy vehicles in place and operational</p> <p>Campaign evidence; ads record</p> <p>Photographic record; site inspections;</p> <p>Employment record; site inspections</p> <p>System in place; site inspections</p> <p>Arrangements in place</p>		
12.	Health & Safety of Workers at Active	<ul style="list-style-type: none"> ▪ Health, Safety and Environment (HSE) plan will be developed and implemented by the contractor. 	Plan in place and Operational	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
	Construction and Camp Site	<ul style="list-style-type: none"> ▪ The contractor will ensure that medical dispensary having, first aid equipment has been established at his camps. Contractor will have to specified work staff and basic medical service and supplies to workers. Suitable ambulance service is available at the camps all time. ▪ A proper screening of laborer should be done at the time of recruitment. Ensure that periodic awareness campaigns for HIV/AIDS are undertaken for the project staff. ▪ Contractor will provide potable water and also shadow area to the workers at work place area for short breaks. ▪ The Contractor will depute guards at all entry points into construction sites 24 hours a day. ▪ The Contractor will provide PPEs to all workers working at site for their safety. ▪ The medical staff ensure periodical checks of the cooking staff and cooking practice particularly for symptoms of hepatitis A. ▪ Timely public notification on planned construction works. ▪ Trained first aiders and medical staff to be available at project site. ▪ Use of safety signs at the construction site at suitable places 	<p>Fully equipped dispensary established; System and staff in place; community complaints</p> <p>Availability of record; evidence of training</p> <p>Provided to staff. System in place. Compliance. HSE plan in place; availability of PPE.</p> <p>Medical Record Compliance.</p> <p>Photographs</p>		
13.	Community Safety	<ul style="list-style-type: none"> ▪ A speed limit of 30 km/h shall be imposed on unpaved roads and link roads for reducing traffic accident risks and dust generation. ▪ Traffic warning signs will be placed at community roads 	<p>Compliance</p> <p>evidence of training provided to drivers.</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<p>used for the movement of project vehicles</p> <ul style="list-style-type: none"> ▪ The camping sites of the Project site will be completely fenced off before the commencement of any other construction activities. Access to the site will be controlled and unauthorized people will not be allowed to enter. ▪ In order to avoid traffic congestion Traffic Management Plan will be generated and implemented by contractor in true letter and spirit. ▪ Dust emissions due to vehicular traffic will be minimized by enforcing the speed limit. ▪ Water will be sprinkled on unpaved surfaces where necessary. ▪ All vehicles used by the project will undergo regular maintenance and will be tuned in accordance with the requirements of the NEQs. ▪ Training and capacity building of laborers regarding cultural norms and ethic of the project area in order to avoid any conflict with the locals. 	<p>Site inspections</p> <p>Arrangements in place; Site inspection;</p> <p>Traffic Management plan</p> <p>photographs Record</p> <p>Evidence of Training</p>		
14.	Influx of Labor	<ul style="list-style-type: none"> ▪ Labor camp(s) should be established away from residential population; ▪ Preference should be given to the local people to work with contractor, and contractor should hire maximum labor force from the project area because this will reduce the labor influx; ▪ Awareness should be created among the work force to ensure respect for local customs; ▪ Construction work should be completed within the stipulated time to move workers to next location; 	<p>Site Inspections; community complaints</p> <p>Employment record</p>	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Labor force should be shuffled with the time; ▪ An effective GRM should be established for the project to resolve all issues related to the community. Thus, progress regarding resolving the issues should be monitored closely; ▪ Create awareness among workers on proper sanitation and hygiene practices to endorse proper health and maintain good housekeeping practices at all project sites; ▪ Develop and enforce a strict code of conduct for workers to regulate behavior in the local communities; ▪ Taking all sensible precautions to avert illicit, vicious conduct by or amongst the Contractor’s personnel, and to preserve unity and harmony, and protection of people and property on and near the sites; ▪ Prohibiting drugs, alcohol, weapons, and ammunition on the worksite among personnel; ▪ Appropriate fencing, security check points, gates and security guards should be provided at the construction sites to ensure the security of all plant, equipment, machinery and materials, as well as to secure the safety of site staff; and ▪ The Contractor must guarantee that good relations are maintained with local communities and their leaders to help reduce the Risk of vandalism and theft. 	<p>Compliance; record</p> <p>GRM in place and operational</p> <p>Compliance with awareness courses on</p> <p>Good Hygiene practices</p> <p>Records and Checks</p> <p>Community Consultation evidence</p>		
15.	Communicable Diseases	<ul style="list-style-type: none"> ▪ Arrange to run an active campaign, in the labor camp, to make people aware of the cause, mode of transmission and consequences of HIV/AIDS. 	Compliance with safety awareness courses	Contractor	CSC/WEC

Sr. No.	Potential Impact/ Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
		<ul style="list-style-type: none"> ▪ Strengthen the existing local health & medical services for the benefit of labor as well as the surrounding villages. ▪ Ensure cleanliness and hygienic conditions at labor camp by ensuring proper drainage and suitable disposal of solid waste. Inoculation against Cholera will be arranged at intervals recommended by Health Department. ▪ Keep all the camps, offices, material depots, machinery yards and work sites open for the inspection of health and safety measures and related documents. 	<p>Record; site inspections</p> <p>Compliance; Photographs; Site inspections</p>		
16.	Gender Based Violence (GBV)	<ul style="list-style-type: none"> ▪ Awareness should be created among the females at individual and community levels about the construction sites. ▪ During the timing of educational institutions workers should not be allowed to crowd in the surroundings. ▪ Alternative routes for pedestrian should be provided to avoid mixing of women with workers. ▪ Raise awareness among the communities of the potential risks of GBV, and establish response services in the communities that can respond to instances of GBV (particularly those related to issues of labor influx); ▪ The contractor should make sure that no discrimination is made on the basis of gender while hiring of workers. ▪ Provisions of gender disaggregate bathing, changing, and sanitation facilities; and ▪ Contractor should take proper measures to address and resolve issues relating to harassment, intimidation, and exploitation, especially in relation to women. 	<p>Awareness campaign Record</p> <p>Community complaints</p> <p>Arrangements in place, site inspections</p> <p>Awareness campaign Record</p> <p>Compliance; site inspections</p>		

Table 8.4: Operational Phase ESMP

Sr. No.	Potential Impact/Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
Operational Stage					
1.	Degradation of Terrestrial Ecology	<ul style="list-style-type: none"> ▪ Large flood lights should not be installed outside 50 m of the Project fence. ▪ Lights should be directed towards Project facilities and not towards the natural habitats. ▪ Regulations for Project staff to avoid illegal poaching to be incorporated in contract documents. ▪ Provide awareness training to staff and contractors on: prevention of injury of animals, identification of likely species found on site, identifications of animal hazards (such as venomous snakes) and what to do if dangerous animals are encountered. ▪ Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching. ▪ Encourage personnel to report incidents of poaching. ▪ Solid waste should only be disposed of at designated sites. 	<p>Compliance Site inspection</p> <p>Compliance with wildlife protection rules & regulation</p> <p>Training Plan and Records</p>	O&M Contractor	WEC/ WAPDA
2.	Reduction in downstream flow	<ul style="list-style-type: none"> ▪ The environmental release outlet structure has been designed to ensure the release of the ecologically required flow at all times towards downstream of the weir structure. ▪ The minimum ecological release is set to 0.25 m³/s which corresponds to 10% of the minimum annual flow as per the requirement of EPA Gilgit-Baltistan. ▪ With increasing discharge during June to September (the months with the highest flows), the environmental release will rise due to spilling from the weir. 	<p>Compliance Site inspection</p>	O&M Contractor	WEC/ WAPDA

Sr. No.	Potential Impact/Project Activity	Mitigation Option/Action	Performance Monitoring Indicators	Responsibility	
				Implementation	Supervision
3.	Degradation of the river ecosystem	<ul style="list-style-type: none"> Biodiversity Action Plan (BAP) will be implemented to maintain the quality of aquatic life. The Environmental flow is set to 0.225 m³/s which corresponds to 10% of the minimum annual flow as per the requirement of EPA Gilgit-Baltistan, to maintain the aquatic ecosystem. 	BAP, Environmental flow release records	O&M Contractor	WEC/WAPDA
4.	Deterioration of aesthetics and visual amenity	<ul style="list-style-type: none"> Environmental flow will be ensured to maintain the aesthetics of the park. Where possible, the cemented structures will be covered with vegetation. 	Environmental flow release records	O&M Contractor	WEC/WAPDA
5.	Reduction of water availability for downstream community	<ul style="list-style-type: none"> The environmental flow of 0.225 m³/s will be maintained all the time to ensure the water availability to the community downstream. In the months from June to September, the environmental release will be rise due to increasing discharge. 	Environmental flow release records	O&M Contractor	WEC/WAPDA
6.	Cumulative Impact	<ul style="list-style-type: none"> The diversion of water from the Shatung River could increase the dam's power generation capacity by up to 10-15% that will enable more electricity supply to the area. The region around Skardu is facing a growing problem of water scarcity. The diversion of water from the Shatung River could help to reduce water scarcity in the region. The Satpara Dam is currently used to provide water for domestic, industrial, and public use in Skardu and the surrounding villages. The diversion of water from the Shatung River could increase the availability of water for these uses. 	Dam's power generation records Community Consultation	O&M Contractor	WEC/WAPDA

8.4 Reporting Mechanism

The contractor of the project will prepare and submit the environmental compliance reports to the CSC. The CSC will take it further, signed and approved by RE, CRE and submit the Due Diligence reports to PMU/WEC on monthly, quarterly and semi-annually. The PMU/WEC will further submit the reports to WB after critically reviewed and rectified for further proceedings and requirements (Table 8.5).

Table 8.5: Reporting Frequency

Sr. o.	Type of Reports	Frequency	Submission: By	Submission: To
1	Environmental Monitoring Report	Quarterly	WEC	WB
2	Environmental Progress	Monthly	CSC	WEC
3	Environmental Checklists	Weekly	CC	CSC
4	Biodiversity Protection Measures	Monthly	CSC/PMU	Deosai National Park Management

8.5 Non-Compliance of ESMP

The implementation of the ESMP involves input from various functionaries as discussed earlier. The contractor will be primarily responsible for ensuring implementation of mitigation measures proposed in the ESMP, which will be part of the contract documents.

The provision of environmental mitigation cost as being made a separate head in the form of ESMP of Bill of Quantities (BOQs) shall make compliance of ESMP implementation. However, if the contractor fails to comply with the implementation of ESMP and submission of the monthly compliance reports, WEC will enforce compliance of contractor with the terms of the contract, including adherence to the ESMP and WB operational policies.

8.6 Environmental Monitoring Plan

Monitoring of environmental components and mitigation measures during construction and operation stages is a key component of ESMP to safeguard the protection of environment. The objectives of monitoring are to monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions and manage environmental issues arising from construction works through closely monitoring the environmental compliances as per WB Safeguard Policies and national

requirements. A monitoring mechanism is developed for each identified impact under **Table 8.6** below. It includes but not limited to the following components:

- Location of the monitoring (near the project activity, sensitive receptors or within the project influence area)
- Means of monitoring, for example, parameters and methods of monitoring (visual inspection, field measurements or sampling and analysis)
- Frequency of monitoring (daily, weekly, monthly, annually or during implementation of a particular activity)
- The monitoring program will also include regular monitoring of construction activities for their compliance with the environmental requirements in accordance with the ESMP.

The purpose of such monitoring is to assess the performance of undertaken mitigation measures and to immediately formulate additional mitigation measures and modify the existing ones aimed at meeting the environmental compliance as appropriate during construction. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as performance indicators and recommended for monitoring during project implementation and operation stages.

These monitoring indicators will be continuously monitored to ensure compliance with the ESMP and comparison with the baseline conditions established during the design stage. The list of indicators and their applicable standards to ensure compliance are given below:

- Ambient air quality of project area (NEQs, WHO and other WB standards)
- Noise Levels (NEQs, WHO and other WB standards)
- Surface water quality (NEQs, WHO and other WB standards)
- Groundwater quality (NEQs, WHO and other WB standards)

Environmental monitoring during construction is a function of supervision and ensure adherence to the ESMP. The monitoring is a day-to-day process, which ensures that departures from ESMP are avoided or quickly rectified. During preconstruction period, the monitoring activities will focus on checking the contractor is bidding documents.

This will include whether all necessary environmental requirements have been included or not.

Post monitoring evaluation will be carried out to evaluate the impacts of the project for a certain period. Recommended air, noise, and water quality monitoring, greening and landscaping and community feedback are also included in the monitoring plan.

The Environmental action and monitoring plan provides framework for the implementation of mitigating measures and monitoring during construction and operation phases. Table 8.7 and Table 8.8 illustrate the action to be taken during construction and operational phases of the project. A sample format of monitoring checklist for construction phase activities is placed under Table 8.7 that guides the CC regarding monitoring mechanism. However, this checklist shall be modified and updated accordingly in SSEMP/CESAP by the CC for implementation and submission to CSC on a weekly basis.

Table 8.6: Monitoring Plan for Construction Stage

Sr. No.	Monitoring Parameters	Location	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
1.	Vegetation clearance	Within project RoW	Visual inspection of loss of vegetation, soil erosion & instability.	Weekly	-	Contractor/CSC	CSC/WEC
2.	Erosion	Side slopes of the embankments and material storage sites	Visual inspection of occurrence of erosion and erosion prevention measures	At the end of filling activity	-	Contractor/CSC	CSC/WEC
3.	Operation of burrow and quarry site	Quarry sites	Visual inspections of quarry sites/ burrow areas for change in landscape and creation of water ponds.	Monthly	-	Contractor/CSC	CSC/WEC
4.	Excavation of earth	Within project RoW	Visual inspection for soil erosion & stability	Weekly	-	Contractor/CSC	CSC/WEC
5.	Material supply	Material supply sites	Inspection of possession of official approval or valid operating license of suppliers' materials (asphalt, cement, quarry and burrow material)	Before the agreement for supply of material	-	Contractor/CSC	CSC/WEC
6.	Storage and handling of materials	Material storage yard/work area and construction camps	Visual inspection of storage facilities	Monthly	-	Contractor/CSC	CSC/WEC

Sr. No.	Monitoring Parameters	Location	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
7.	Local roads	Connecting/parallel roads	Visual inspection to ensure local roads are not damaged	Monthly	-	Contractor/CSC	CSC/WEC
8.	Traffic safety	Outside the national park	Visual inspection to see whether proper traffic signs are placed and safety barriers for traffic management are occupied	Monthly	-	Contractor/CSC	CSC/WEC
9.	Air Quality	Construction site and camp site	Air quality monitoring mobile lab (Certified laboratory from relevant agency)	Quarterly	NEQs & WHO standards	Contractor/CSC	CSC/WEC
		Material storage & active sites	Visual inspection to ensure water sprinkling is being implemented	Daily		Contractor/CSC	CSC/WEC
		Asphalt plant	Visual inspection to ensure asphalt plant is located greater than 500 m from residential areas	Monthly		Contractor/CSC	CSC/WEC
10.	Noise Levels	Construction site and camp site	Noise meters	Monthly	NEQs & WHO standards	Contractor/CSC	CSC/WEC
11.	Surface Water Quality	Water body (if any) within RoW	Sampling and analysis of surface water quality (Certified laboratory from relevant	Monthly	NEQs & WHO standards	Contractor/CSC	CSC/WEC

Sr. No.	Monitoring Parameters	Location	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
			agency)				
12.	Groundwater Quality	Campsite, active construction site, adjacent communities at minimum 100 m distance	Sampling and analysis of groundwater quality (Certified laboratory from relevant agency)	Monthly	NEQs & WHO standards	Contractor/CSC	CSC/WEC
13.	Drinking Water and Sanitation	Construction site and camp site	Visual inspection of safe water and sanitation facilities for the construction workers on the site (Sampling and analysis of groundwater quality - Certified laboratory from relevant agency)	Quarterly	NEQs & WHO standards	Contractor/CSC	CSC/WEC
14.	Solid waste	Campsite and active construction site	Visual inspection that solid waste is disposed at designated site	Weekly	-	Contractor/CSC	CSC/WEC
15.	Biodiversity (Floral and Faunal) Monitoring	Within RoW	Follow BAP Visual inspection	Daily	-	Contractor/CSC	CSC/WEC
16.	Visual check for exhaust emissions from equipment and	Campsite and active construction site	Visual inspection	Daily	-		CSC/WEC

Sr. No.	Monitoring Parameters	Location	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
	vehicles						
17.	Grievances of the local communities	Campsite, active construction site, adjacent communities at 100m distance	Verification and tracking of grievances registered in the Compliant Registers Feedback from aggrieved persons.	Daily	-	Contractor/CSC	CSC/WEC
18.	Safety of Worker	At work sites and Camp office	Inspection of usage of Personal Protective Equipment (PPEs)	Daily	-	Contractor/CSC	CSC/WEC
			Accident/incident reporting record	Monthly	-	Contractor/CSC	CSC/WEC
19.	Female-Fit Work wear and Women's PPE	Contractor HR office	Site inspections	Monthly	-	Contractor/CSC	CSC/WEC
20.	Gender-segregated restrooms, changing facilities, and washrooms.	Contractor HR office	Site inspections	Monthly	-	Contractor/CSC	CSC/WEC
21.	Harassment and Discrimination	Work sites	Female worker concerns; record check;	Monthly	-	Contractor/CSC	CSC/WEC

Sr. No.	Monitoring Parameters	Location	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
22.	Inclusion of gender-sensitive training modules in the project's training programs.	Work sites and Camp	Training record, photographs	Monthly	-	Contractor/CSC	CSC/WEC

Table 8.7: Sample Checklist for Monitoring

Monthly Environmental Management Checklist- (Construction Phase)					
Sr. No.	Factor Group/Parameters	Factor	Yes	No	
1.	Vegetation clearance	1.1	Is a copy of the SSEMP on site with contractor?		
		1.2	Is loss of vegetation and soil erosion observed?		
		1.3	Does the contractor have Horticulturist/Forester?		
		1.4	Does the contractor have Plantation Plan?		
		1.5	Does contractor do plantation as per the plan?		
		1.6	Is the contractor enforcing the child labor prohibition in vegetation clearance?		
		1.7	Is the contractor encouraging local hiring for plantation		

Monthly Environmental Management Checklist- (Construction Phase)					
Sr. No.	Factor Group/Parameters	Factor	Yes	No	
2.	Top Soil	2.1	Are borrow areas located on higher ground, away from potential flooding?		
		2.2	Is the topsoil being stockpiled so that it cannot wash away with rain or blow away?		
		2.3	Is post-ditching landscaping undertaken by contractor?		
3.	Erosion	3.1	Does soil erosion occur on site?		
		3.2	Is contractor following the mitigation measure to control soil erosion?		
4.	Operations of borrow & quarry sites	4.1	Are borrow areas located on higher ground, away from potential flooding?		
		4.2	Is borrow material suitable for construction?		
		4.3	All quarry materials are being taken from existing licensed/permitted facilities?		
		4.4	Is borrow area require private land?		
5.	Excavation of earth	5.1	Is excavation occurring on site?		
		5.2	Where does the excavated material dispose of?		
		5.3	Does contractor have enough mean of transportation for material supply?		
		5.4	Has contractor conduction community consultation as needed?		
		5.5	Signage in place describing the work?		
		5.6	Safety signs in place and at several locations?		

Monthly Environmental Management Checklist- (Construction Phase)					
Sr. No.	Factor Group/Parameters		Factor	Yes	No
6.	Local roads	6.1	Is the dust management record in place with contractor?		
		6.2	Is the dust suppression (sprinkling) carried out daily and adequately?		
		6.3	Is construction camp(s) at least 100m from settlements & residential areas?		
7.	Noise & vibration	7.1	Any complaint filed against noise & vibration by the locals of the area?		
		7.2	Does contractor implement noise mitigation measures s like working in daytime or near sensitive features?		
8.	Air Quality	8.1	Has there been any complaint by the residents of the area regarding air quality damage? Does the contractor implement mitigation measures proposed in the SSEMP?		
9.	Ground water quality	9.1	Any contamination observed due to spillage or something else? Water quality tests performed? If yes, are the results found under the standard limits of NEQs & WHO?		
		9.2	Any ground water body located nearby the ROW?		
10.	Solid waste	10.1	Does the contractor dispose of the solid waste in a designated site? Record maintenance of solid waste?		
		10.2	Does the contractor provide waste bins on camp site and active construction site?		
11.	Drinking water & sanitation	11.1	What is the source of drinking water at camp site and construction site for the workers?		
		11.2	Is the water tested? Is there any sanitation system installed for the camp site?		

Monthly Environmental Management Checklist- (Construction Phase)					
Sr. No.	Factor Group/Parameters		Factor	Yes	No
12.	Flora & fauna	12.1	Are workers instructed to avoid hunting & cutting of plants/trees?		
13.	Exhaust emissions	13.1	Exhaust emissions monitored? What are the sources of exhaust emissions at site?		
		13.2	Mitigation measures followed as proposed in the SSEMP?		

Table 8.8: Monitoring Plan for Operational Stage

Sr. No.	Monitoring Parameters	Locations	Means of Monitoring	Frequency	Applicable Standards	Responsibility	
						Implementation	Supervision
1.	Environmental flow	Weir Site	Continuous record of downstream release into nullah by weir	Continuous	Environmental flow study	WEC	External Monitor
2.	Biodiversity action plan	As described in BAP	As described in BAP	As described in BAP	As described in BAP	As described in BAP	As described in BAP
3.	Landscape	Along project alignment	Visual inspection of long-term degradation of natural landscape at land strips and slopes adjacent to weir and tunnel. Development of landslides, rock falls and other natural hazardous process change of drainage patterns, erosion and degradation of vegetation.	Quarterly	NEQs & WHO standards	WEC	External Monitor

8.7 Environmental and Social Management Budget

An environmental and social management budget of **Rs. 46.69 Million PKR** has been estimated for implementation of the ESMP for two years including the Biodiversity Conservatin cost. This budget also includes cost of environmental monitoring and associated trainings, plantation and its maintenance, equipment used to be used and health and safety cost and will be included in the bid documents for contractor hiring, so that all E&S mitigation costs mentioned in ESMP are part of bid requirement. A summary of environmental management budget is given below in **Table 8.9** below:

8.7.1 Environmental Monitoring Cost

In order to respond to the anticipated environmental concerns at an early stage and to determine the intensity of the impact, prediction is required. The specific monitoring schedule is tabulated below in Table. The objectives of the environmental monitoring are listed below:

- To respond to the likely and unforeseen environmental and social impacts when the project is under implementation phase.
- To assess the usefulness of mitigation measures and if the mitigation fails corrective action can be taken.

Table 8.9: Environmental Monitoring Cost

Components	Parameters	No. of Samples x Frequency x Year)	Frequency	Responsibility	Duration	Unit Cost (Rs.)	Cost (Rs.)
Construction Phase (2 years)							
Ambient Air quality	NO ₂ , SO ₂ , CO, CO ₂ , PM ₁₀ , PM _{2.5} , TPM	5x4x2 = 40	Quarterly	Contractor	24 hours	40,000x40	1,600,000/-
Surface water quality	Priority parameters	2x4x2 = 24	Quarterly	Contractor	-	30,000x24	720,000/-
Ground water quality	Priority parameters	4x4x2 = 32	Quarterly	Contractor	-	30,000x32	960,000/-
Noise level	Day and Night time	10x4x2 = 80	Quarterly	Contractor	24 hours	5,000x80	400,000/-
Total Cost							3,680,000/-
Operation Phase (1 year)							
Air quality	NO ₂ , SO ₂ , CO, CO ₂ , PM ₁₀ , PM _{2.5} , TPM	5x2x1 = 10	Bi-annually	WEC	24 hours	40,000X10	400,000/-
Surface water quality	Priority parameters	2x1x1 = 2	Annually	WEC	-	30,000X2	60,000/-
Ground water quality	Priority parameters	4x1x1= 4	Annually	WEC	-	30,000X4	120,000/-
Noise level	Day and Night time	10x2x1 = 20	Bi-annually	WEC	24 hours	5,000X20	100,000/-
Total Cost							680,000/-
Other costs							1,000,000/-
Grand Total							5,600,000/-

8.7.2 Health, Safety and Environment Cost

The need of Health Safety and Environment (HSE) intends to provide a framework for safety and security to infrastructure, people and vehicles. It assigns responsibility to organizations and individuals for carrying out specific actions at projected times and places in normal and emergency situations that exceed the capability or routine responsibility of any agency. The Environment, Health & Safety (EHS) strategies provide guidance to prevent any potential sources causing hazard to the resources during all stages of the project (**Tables 8.10**).

After Pandemic-2019, health and safety issues have emerged more critically. Because of the high vulnerability, the overall HSE should be ensured as per Occupational Health and Safety Guidelines of International Finance Corporation IFC World Bank Group (OHS WBG). The contractor has to ensure the compliance of WB OHS policies and guidelines in following dimensions:

1. Occupational Health and Safety

- General Facility Design and Operation
- Communication and Training
- Physical Hazards
- Chemical Hazards
- PPEs
- Special Hazard Environments
- Monitoring

2. Community Health and Safety

- Water Quality and Availability
- Structural Safety of Project Infrastructure
- Life and Fire Safety (LFS)
- Traffic Safety
- Transport of Hazardous Materials
- Disease Prevention

- Emergency Preparedness and Response
- Prevention of and response to Sexual Exploitation and Abuse (SEA) and Sexual Harassment (**SH**)

3. Construction and Decommissioning

- Environment
- Occupational Health and Safety
- Community Health and Safety

Table 8.10: Cost of HSE & Staffing

Items	Quantity	Unit Price (PKR)	Total Price (PKR)
Items of PPEs			
Safety shoes	200	3,000	600,000
Gloves	1,000	500	500,000
Dust masks	2,500	30	75,000
Ear plugs	1,000	40	40,000
Safety Helmets	200	2,000	400,000
Safety Jackets	250	600	150,000
First Aid Box	5	5,000	25,000
Dust Bins	60	1,500	90,000
Rain Coat	100	2,500	250,000
Safety Cones	100	2,000	200,000
Safety Sign Boards	50	2,000	100,000
Warming Tape	100	600	60,000
Gum Boots	100	2,500	250,000
Sub-Total			2,740,000
Human Resource			
HSE Engineer	1	80,000	1,920,000
Environmental Specialist	1	200,000	4,800,000
Dispenser	1	50,000	1,200,000
Establishment of Dispensary	1	1,000,000	1,000,000
Sub-Total			8,920,000
Other Resources			
Rent of ambulance	1	100,000	2,400,000
Rent of Vehicle	1	100,000	2,400,000
Sub-Total			4,800,000
Total			16,460,000

8.7.3 Summary of Biodiversity Conservation Budget

Table 8.11: Cost of HSE & Staffing

Sr. No.	Item	Quantity	Duration (Months)	Unit Rate (Rs.)	Total (Rs.)
A	Terrestrial Wild Life (Brown Bear, Ibex, Snow Leopard, Lynx, Birds etc.) Monitoring (No Mortality etc.)				
1	Game watcher (one at dam site, one at tunnel outlet area)	2	45	50,000	4500000
2	Construction of watcher's hut	2		1500000	3000000
3	Motorbikes	2		265000	530000
4	Pol and Maintenance of Bikes	2	45	8000	720000
5	Binocular	2		65000	130000
6	Spotting scope	1		350000	350000
7	DSLR Camera	1		450000	450000
8	Training of wildlife staff	4		200000	800000
9	Awareness campaigns	4		150000	600000
10	Pamphlets, maps etc.	LS.		LS	100000
11	Signboards	LS.		LS.	300000
				Subtotal A.	11480000
B.	Terrestrial Flora				
1	Phonological studies	LS.		LS.	1000000
C.	Fisheries (Fish and water quality monitoring)				
1	Fisheries Inspector	1	45	60,000	2700000
	Motorbike	1		265000	265000
2	Pol and Maintenance of Bike	1	45	8000	360000
3	DO Meter	1		100000	100000
4	Thermometer	1		200	200
5	Sampling Bottles	200		10	2000
6	Water quality analysis charges		20	15000	300000
				Subtotal B.	3727200
				Total A+B+C	16207200
				Contingencies @10%	1620720
				Grand Total	17827920
				Say	17.83 million

Note: All the equipment will remain the property of the client (WAPDA) and will be returned after completion of the project.

8.7.4 Summary of Environmental Management Budget

Table 8.12: Summary of Environmental Budget

Sr. No.	Component	Total Cost (PKR)	Total Cost (Million PKR)
1	Environmental Monitoring Cost	5,600,000	5.6
2	Plantation (includes plantation and maintenance for 3 years) for Green Belt and along route plantation	2,000,000	2
3	HSE & staffing	16,460,000	16.46
4	Training	1,000,000	1
5	External Monitor (2 years)	3,800,000	3.8
6	Biodiversity Conservation Budget	17827920	17.83
Total		28,860,000	46.69

8.8 Development of Environmental & Social Management Plans

The EPC Contractor will be required to prepare site-specific Environmental Management plans (SSEMP)/ Construction Environmental & Social Action Plan (CESAP) before mobilization and commencement of construction works. The SSEMP/ CESAP may include:

8.8.1 Construction Environmental and Social Action Plan

The Contractor will prepare a 'Construction Environmental and Social Action Plan' (CESAP) demonstrating how they will comply with the requirements of Site-Specific Management Plans, ESCPs, and the mitigation measures proposed in the ESMP of this ESIA Report. CESAP will form the part of the contract documents and will be used as a monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing penalty on the EPC Contractor.

8.8.2 Occupational Health and Safety Plan

The Contractor will also prepare an occupational health and safety plan devising the general guidelines for the identified hazards and preventive measures presented in the site-specific actions and ESCPs in this ESIA.

OHS plan will be done (a) when there is a change in the scope of the project, (b) there is a change in construction methodology/technique based on site condition, (c)

following significant OHS hazard or a major accident, and (d) at the end of the project (to allow for improvements in subsequent projects).

OHS Plan should contain general guidance for all identified hazards under each work activities and they should be presented in three discrete headings, (a) Contractor's Standards on the identified hazard management, (b) Expected site-specific OHS hazard and risks during construction, and (c) Control and Preventive Measures proposed by the Contractor.

8.8.3 Worker Accommodation Plan

Worker Accommodation Plan (WAP) for the Project shall be prepared and implemented by the EPC Contractor. The scope and applicability of the WAP is limited to the design and management of the worker accommodations provided during the construction phase of the Project. EPC Contractor will ensure sufficient resources are allocated on an on-going basis to achieve the effective implementation of the worker accommodation plan.

i) Accommodation Planning and Arrangement

Worker accommodation will be located within the Project site and will be provided during the construction phase of the Project. The worker accommodation will encompass areas where it shall not interfere with the construction activities. Alongside the construction planning, the EPC Construction along with WEC, shall conduct a space assessment of accommodations.

- The average minimum space of usual standards ranges from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) per person will be provided throughout the construction period. A minimum ceiling height of 2.1 meters shall be provided.
- Other specifications including building construction standards and fire safety will be managed according to the Building Code of Pakistan.
- Drinking water complying with the provincial Environmental Quality Standards shall be provided at the worker accommodations.
- The sewage and waste disposal system will be provided in residential facilities following the regulatory requirements. As septic tanks will be

- constructed for management of sewage from the residential area and grease traps will be constructed to manage sewage from the kitchen/mess.
- Health and hygiene facilities will be provided against cold, heat, damp, biological hazards (disease-carrying animals), noise, vibration, food security, and fire.
 - Washing facilities will be provided as required. For sanitation, septic tanks will be constructed on the campsite as per guidelines.
 - Employees will be provided with first aid training to cope with emergencies at the camp, in addition to emergency response at the workplace. Basic health care facilities at the Project site and ambulance services will be available.
 - If required, the project site during construction may be encompassed by walls to limit the impact on communities and ensure camp security.
 - All workers will be provided with an employee identity card and no person will be allowed to enter in the worker accommodations area without identification, or prior approval through security for visitors and other employees.
 - Standby generators to be located away from the communities towards the backside of the Project site and also away from Worker Accommodation.

ii) **Inspection**

A standard checklist on the workers' accommodation should be developed by the EPC Contractor on the cleanliness of the rooms, kitchen, toilets, open areas, and disposal sites. The checklist will be used for the daily compliance of the cleanliness condition.

- The Project Manager of the EPC Contractor will conduct an ongoing assessment of the accommodation requirement and the residual requirements for upcoming staffing.
- The responsible staff of HSE of the CPC Contractor will prepare monthly inspection report based on the inspection checklists and keep records and submissions along with other submissions to WEC.

8.8.4 Waste Management Plan (WMP)

This section provides the key elements to be included in a waste disposal plan or operating procedure to be developed by the EPC Contractor that will be employed during the construction activities of the Project. The Licensed Contractor will be hired, who will collect waste on regular basis and disposed-off on a designated area declared by TMA. Practicable efforts will be made to minimize the waste generated while the project is in progress. The main types of waste that will be generated are:

- Used oils and chemicals
- Garage Waste
- Sewage
- Camp waste
- Medical waste
- Packing waste
- Excess construction material.

The solid and liquid waste to be generated from the project activities and camps is to be disposed of as per measures discussed above.

8.8.5 Other Management Plans

1. **Material Transportation Plan (MTP)** will be prepared by the EPC Contractor to prevent accidents during transportation by using vehicles to work locations using other means. The plan should address specific details on the site conditions of the plain area and mountainous terrain and the complexity of transporting construction materials. Extreme precautions will be required in terms of safety and security.
2. **Spoil Management Plan (SMP)** will be prepared by the EPC Contractor on the management of excess spoils from various excavation activities during the construction period.
3. **Solid Waste Management Plan (SWMP)** will be prepared by the EPC Contractor on the management of solid waste during the construction period.

4. **Emergency Preparedness Plan (EPP)** will be prepared by the EPC Contractor after assessing potential risks and hazards that could be encountered during construction.
5. **Communication Plan (CP)** to deal with the interaction of the community, complaints management, workers recruitment, notice of works, and workers conduct with locals.
6. **Traffic Management Plan (TMP)** to deal with the management of project vehicles
7. **Resources Utilization Plans (RUP)** such for Energy and Water

8.9 Training and Skill Development Programs

EPC Contractor to organize sessions for skill development and training to maintain awareness of relevant environmental and social aspects for staff and workers.

8.9.1 Skill Development for EPC Contractor Employees

It is proposed that skill development by the EPC Contractor be considered in the project. One-week job-specific skill development training will be provided with pay before the employment. The EPC Contractor will provide training in the following areas:

Communication Skills: Communication forms the backbone of almost any construction project. Whether it is to present an idea to the supervisor or foreman, discuss an alternate plan when construction hits a snag, or even just request new supplies, communication is important to make sure the project stays on track. The EPC Contractor will always prefer construction workers who already have this soft skill; therefore, a good communicator will pay off the construction site by this skill.

Teamwork Skills: Construction workers have to work in teams. Teamwork skills help get the job done. Much like good communication skills keep everyone on the same page, good teamwork skills allow everyone to work together harmoniously. The job stays on track and will likely be finished sooner if everyone works together.

Time Management Skills: Time management skills are incredibly important for construction workers in any number of roles. Construction work has deadlines to meet. Some tasks are time-sensitive (e.g., concrete creeping). Delays are very common on the sites of construction projects. EPC Contractor need workers who can manage their

time effectively. The EPC Contractor needs workers who know how to prioritize and reorganize their schedules when faced with unexpected delays.

Technical Skills: Specific construction skills include manual and mechanical excavation, stone-laying, pouring cement, erecting, and installing specific types of equipment. EPC Contractor, typically appreciate versatile workers who can take on additional tasks as needed. Construction tasks may include:

Table 8.13: Construction Tasks

(i)	Masonry	(vii)	OSHA safety requirements
(ii)	Electrical	(viii)	Reading and interpreting drawings
(iii)	Framing	(ix)	Erecting
(iv)	Concrete	(x)	Crane and Rigging
(v)	Sheet metal work	(xi)	Operation of Construction equipment
(vi)	Environmental codes	(xii)	Use of Power tools

8.9.2 Training on Environment and Social Aspects

Personnel, including EPC Contractor personnel, working for or on behalf of the project will receive training to maintain awareness of relevant environmental and social aspects, impacts, and risks associated with the Project and corresponding controls. The training will also maintain awareness of the environmental benefits of improved personal performance and the potential consequences of departure from specified procedures.

Visitors to the project sites will receive relevant environmental and social awareness training as part of site induction training. Environmental training will help to ensure that the requirements of this ESIA and ESMP are clearly understood and followed by all the project personnel during the construction phase. The EPC Contractor will have primary responsibility for providing training to all construction personnel in line with the Training Plan shown in **Table 8.14** below:

Table 8.14: Training Schedule

Target Audience	Trainers	Contents	Schedule
Contractor Supervisors/Managers	Third Party	Induction training per 'Training Plan'	Before the start of construction activities
Selected management staff from Contractor	EPC Contractor	<ul style="list-style-type: none"> • Key findings of ESIA • Mitigation measures • ESMP 	Before the start of construction activities
All site personnel	EPC Contractor	<ul style="list-style-type: none"> • Mitigation measures of EMP and ESIA • Camp rules 	Before and during construction activities
Construction crew	EPC Contractor	<ul style="list-style-type: none"> • ESMP • Waste disposal procedures 	Before and during construction activities
Drivers	EPC Contractor	<ul style="list-style-type: none"> • Road safety • Defensive driving • Road access restrictions • Vehicle movement restrictions • Waste disposal 	Before and during the construction phase
Construction Staff	EPC Contractor	<ul style="list-style-type: none"> • Waste disposal • Vehicle movement restrictions 	Before and during the construction phase
Camp staff	EPC Contractor	<ul style="list-style-type: none"> • Camp operation • Waste disposal • Natural resource conservation • Housekeeping • Camp Rules 	Before and during the construction phase
Construction Staff of Contractors	EPC Contractor	<ul style="list-style-type: none"> • Introduction to the Gender Code of Conduct • Respectful and Inclusive Behavior • Preventing and Addressing Sexual Harassment • Equal Opportunities and Non-Discrimination • Promoting Women's Participation 	Before and during the construction phase

8.10 Job Hazard Analysis

Job hazard analysis (JHA) will be conducted for each construction component focusing on job tasks as a way to identify hazards before they occur. It will focus on the relationship between the worker, the task, the tools, and the work environment. Ideally, after identifying uncontrolled hazards, steps should be taken to eliminate or reduce them to an acceptable risk level. Many workers are injured and killed at the worksite every day. The JHA should be one of the major components of the larger commitment of the EPC Contractor health and safety management system. The JHA

should be conducted on many jobs in the worksite. Priority should be given to the following types of jobs:

- Jobs with the highest injury or illness rates.
- Jobs with the potential to cause severe or disabling injuries or illness, even if there is no history of previous accidents.
- Jobs in which one simple human error could lead to a severe accident or injury.
- Jobs that are new or complex to the construction or have undergone changes in construction processes and procedures.
- Jobs complex enough to require written instructions.

8.11 Inclusion of ESMP in Contract Documents

The ESMP of the Project and OHS was included in the EPC Contractor agreement documents and will be followed. The technical specifications of the agreement documents will clearly state that the contractor will need to comply with the mitigation measures and preventive actions provided in the ESMP and ESCPs; International best practices for HSE; and NEQs.

8.11.1 BOQs in Agreement Documents

The following items will be included in the Bills of Quantities (BOQs) of agreement documents:

- After the award of the contract and before mobilization, the EPC Contractor will prepare and submit two separate plans, CESAP/SSEMP and OHS Plan.
- Provision of Environmental and OHS Staffs for the entire construction period.
- Quarterly noise and ambient air quality monitoring i.e., PM10, NO2, SO2, CO2, CO.
- 15 minutes' continuous noise monitoring at work site during the construction work.
- Payments to EPC contractor will be linked to environmental, health, and safety performance, measured by completion of the prescribed

environmental and social mitigation measures in the CESAP and preventive actions described in the OHS plan.

8.11.2 Contractor`s Certifications

It is recommended that the EPC Contractor procured under the Project be compliant of ISO 9001 Quality Management, ISO 14001 Environmental Management, and OHSAS 18001 Occupational Health and Safety Management. These will be done by the client giving preference to the EPC Contractor having ISO and OHSAS certifications during prequalification or technical evaluation.

8.12 Change Management

A change is one that leads to a significant departure from the project described in ESIA and consequently requires a reassessment of its environmental impact.

At this stage, no changes are under consideration. Any change in the project design will be evaluated based on the criteria provided in National & applicable International Standards, and appropriate action will be taken. The record will be maintained in the Change Record Register.

8.13 Equipment Maintenance Details

Construction: Equipment during the construction phase includes dump trucks, loader trucks, excavators, cranes, front-end loaders, fuel tankers, water bowser, cars, etc. This equipment and other machinery will only be repaired at designated sites at the warehouse.

Operations: Limited vehicular movement by the maintenance team will be required on a needy basis.

8.14 Chance Find Procedures

Chance Finds Procedures (CFP) are defined as cultural heritage objects, commonly related to archaeological or historic sites (e.g., pottery, bones, stone tools) that are unexpectedly encountered during project related activities/clearance. A CFP is a project-specific instruction that outlines the actions to be taken if archaeological objects are accidentally encountered.

The Proponent is advised to commence clearance and preparation activities as early as possible, prior to the start of proposed construction activity. This will ensure that

any delays that may result from the accidental disturbance of archaeological assets (and the subsequent implementation of this Procedure) are resolved as efficiently as possible. As set out in detail below, delays would involve time for the archaeologist to investigate a disturbed site and recommend appropriate recommendation (e.g., preservation in situ and Project redesign or archaeological excavation / evaluation and preservation by record) by the consultation of Archaeology Department.

No excavation or disturbance of archaeological sites should occur by persons without the appropriate license by the Archaeology Department. Further to the national legislative requirements, international guidance on cultural heritage management and mitigation has been considered, specifically IFC/World Bank Group Performance Standard 8 which provides guidance on cultural heritage management best practice. The pertinent requirements of Performance Standard 8 (IFC, 2012), in relation to cultural heritage management, include:

- An objective to protect cultural heritage, as defined by IFC PS8, paragraph 3 (regardless of whether it has been legally protected or previously disturbed) from the adverse impacts of project activities and support its preservation.
- Where the risk and identification process (e.g., baseline assessment) determines that there a chance of impacts to cultural heritage, the client will retain competent professionals to assist in the protection of cultural heritage.

The implementation of the CFP aims to ensure that accidental cultural heritage discoveries are managed in a clear and sustainable fashion throughout the lifetime of the project. This procedure is intended for review on an annual basis so the content can be refined to take account of experiences learnt and any significant new phases of activity.

8.15 Performance Indicators

For evaluating the performance of the environmental and social management and monitoring plan, performance indicators are identified for the efficient and timely implementation of measures/actions proposed in ESMP. The indicators are defined both for the implementation phase and for the operation phase. SC will be responsible for compiling the information on these indicators and report to WEC. To measure the

overall environmental performance of the project, a list of performance indicators is given below:

- The number of inspections carried out by SC Consultant per month.
- The number of non-compliances observed by SC Consultant or RE.
- Availability of environmental, social, and OHS specialists in CSC Consultant.
- Availability of environmental, social, and OHS specialists with Contractors.
- Timely reporting of documents (as defined in ESMP and monitoring plan).
- Number of training imparted to stakeholders/other capacity building initiatives.
- Number of consultations held and number of male and female participated.
- Number of grievances received.
- Number of grievances resolved.
- A number of PAPs received timely compensation for their affected assets.

Accident Report FORM – Worker’s Health and Safety

To : Site Supervisor

Accident: _____ Date & Time: _____

Location : _____ Report by : _____

Contact Information : _____

Consequences	Provide Details (what, where, how many, how much)		
Impact on people :	Injuries :		
	Fatalities :		
Impact on Property :	Building :		
	Equipment: (IT, Tel., etc.)		
	Utilities :		
	Site accessible :		
Surrounding :	Spill, leak :		
	Neighbors :		
Media :	On site :		
	Potential to attract :		
	Spokesperson notified :		
Business Continuity :	Disrupted temporary :		
	Could lead to disruption :		
Incident Level: (circle the level)	1 Contained and Isolated	2 Potentially Serious :	3 Very Serious
Incident witness people notified:			

End of Preliminary Report – Complete following items when accident is resolved	
Cause of Outage and Resolution:	
Chain of Events and Activities :	
Internal and External Contributors:	
Follow-up Activities:	
Strong / Weak Points/Recommendations:	
Costs incurred due to this incident:	
Equipment:	
Travel:	
Manpower:	
Overtime:	
Others:	

Number of constructions related accidents. The incident report template is provided below:

8.16 Grievance Redress Mechanism

8.16.1 General

A Grievance redress mechanism (GRM), consisted with the requirements of WB safeguard policies will be established to prevent and redress community concerns, reduce risks, and assist the project to maximize social and environmental benefits, in addition to serving as a platform to resolve grievances, for this purpose a public complaint Centre with public complaint committee will be established in all concerned Agencies where the project activities are in progress. Generally, all project staff, management staff involved in the project, and government administrators will take on grievance handling as a responsibility. The GRM members should be qualified, experienced, and competent personnel who can win the respect and confidence of the affected communities. Criteria for selecting members of GRM could include the following knowledge of the project, its objectives, and outcomes; technical knowledge and expertise, e.g., irrigation, engineering, environmental, geological; understanding of the social, economic, and cultural environments and the dynamics of the communities; capacity to absorb the issues dealt with and to contribute actively to decision-making processes; social recognition and standing; and an equitable representation of the community.

Composition of following committee members are being proposed for public complaint center's at concerned Agencies where project activities are prevailing:

1. Chairman, Project Director-SNP.
2. Member, community elder/Malak, Religious leader.
3. Member, Social Development Officer/ Resettlement Officer.
4. Member, Environment Officer.
5. Member Divisional Forest Officer (Wildlife Deosai National Park
6. Member from Contractor/Environment Specialist/Manager
7. Member District Representative

8.16.2 Objectives of Grievance Redress Mechanism

The main objective of establishing GRM is to resolve problems in an efficient, timely and cost-effective manner in a cordial environment with the participation of all

stakeholders including affected parties. Under the GRM, it shall describe the options available to the project for grievance redress. Any environmental or social impacts, especially Land Acquisition and Resettlement aspects that would be adversely affecting the general public in the project area should be resolved at the GRC.

The PIU shall indicate how these would be disseminated and accessible to affected parties in a way that should be clear and understandable to the Implementing Agency (IA) also. The grievance redress mechanism should also have an in-built monitoring mechanism to check on responsiveness to complaints or grievances lodged. The different forms of receiving the complaints should be clearly described together with the different stages of going through the process. In addition, the redress mechanism shall indicate alternatives, in case the proposed mechanism, for any reason, does not respond to all grievances and complaints. GRM should be able to provide benefits to both the project and affected parties by setting up following objectives,

1. Provide a forum for redressing grievance and disputes at the lowest level.
2. To build up productive relationship among the all stakeholders including affected parties.
3. Provide access to affected parties to negotiate and influence the decisions and policies of the project which might be adversely affected to them.
4. Mitigates or prevents adverse impacts of the project on Wildlife, Protected Species, and Protected Range land and produces appropriate corrective or preventive action.
5. Mitigates or prevents adverse impacts of the project on communities and produces appropriate corrective or preventive action.
6. To harmonize both project and affected parties' activities.
7. open channels for affective communication, including the identification of new social and environmental issues of concern arising from the project:
8. The GRM will be accessible to diverse members of community, including more vulnerable groups such as women and youth
9. Opportunities for confidentiality and privacy for complainants are to be honored where this is seen as important

10. Incorrect identification of losses;
11. Disconnect between compensation and entitlement matrix;
12. Dispute over ownership;
13. Delay in disbursement of compensation;
14. Unfair distribution of compensation, especially in case of joint ownership/communal land

8.16.3 Principles

World Bank requires that a GRM is established and maintained. A grievance mechanism will ensure that APs appealing against any disagreeable decision, practice or activity arises from land or other assets compensation. APs will be fully informed of their rights and the procedures for addressing complaints whether verbally or in writing during consultations, surveys and the timing of compensation. This GRM is designed to efficiently receive and facilitate the resolution of APs' concerns and grievances on project-level social and environmental issues. The GRM should be scaled to the risks and impacts of the Project. It will address Protected Area concerns, APs concerns and complaints promptly, using a simple and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of the APs.

The information of grievance redress process will be widely disseminated to all AP's during Project consultations and FGD's after the finalization of this document. The Project GRM will be in effect from the commencement of Project implementation activities up till six (06) months after the completion of the civil works. To launch a complaint, APs/local community should enter their complaints/concerns and issues formally and accordingly the Project staff will enter the complaint on Community Complaint Register (CCR) consisting of as a minimum information such as; name and address of complainer, description of complaints and other necessary information / record and reasons in case issue has not been resolved. Proper consideration will be given to avoid the grievances rather than going through a redress process. This will be obtained through the practicable RP design and implementation, by ensuring full participation and consultation with the APs and by establishing extensive communication and coordination between the APs/local community, PMU, Wildlife Department, revenue department (LAC) and other line departments. This leaves a gap in land/asset acquisition process followed under local legal frameworks and ADB policy

as far as compensation for resettlement and rehabilitation aspects are concerned. To address these gaps and resulting concerns or grievances of APs, an effective grievance redress mechanism that is fully commensurate with local customs and legal framework is required for timely resolution of grievances and achieving transparency in resettlement process.

8.16.4 Awareness of GRM

GRM should be widely publicized among stakeholder groups such as the affected Communities, government agencies, and Community organizations. Lack of knowledge about GRM results in people not approaching and using them, and they eventually lose the importance and the validity of the purpose for which they were created. People should also be informed about their options, depending on the types of complaints, but should not be encouraged to submit false claims. Criteria for eligibility need to be communicated. An effective awareness campaign should be launched to give publicity to the roles and functions of the GRM and should include the following components:

How complaints can be reported to those GRMs and to whom, e.g., phone, postal address and email addresses, of the GRMs as well as information that should be included in a complaint; procedures and time frames for initiating and concluding the grievance redress process; boundaries and limits of GRMs in handling grievances; and Roles of different agencies such as project implementers and funding agencies.

9. CONSULTATIONS AND STAKEHOLDER ENGAGEMENT

The people or the group of people who can be potentially affected (positively or negatively) directly or indirectly from the project during the entire life cycle of the project (planning, construction, operations, and decommissioning) are called “Stakeholders”. Stakeholder engagement is a broad, inclusive, and continuous process between a developer of a project and its stakeholders. This process comprises a range of coherent approaches and activities. This is achieved by informing the stakeholders on time about the proposed project and its potential consequences on the environment and by encouraging their feedback. The purpose of this exercise is to inform all the stakeholders about the project and include their concerns, suggestions, and opinions and develop confidence amongst them that the project will be developed responsibly.

9.1 Stakeholder Engagement Plan

The objectives of this stakeholder engagement plan are to identify all project stakeholders including their priorities and concerns, to identify strategies for information sharing, communication, and consultation with stakeholders during the project cycle, and for monitoring and reporting of project impacts. Furthermore, appropriate grievance mechanisms are recommended for the project.

9.2 Stakeholders at the Institutional Level

- District level administration and government (Skardu District and Satpara villages)
- Village level government (Union councils of Shiger 01 and 02)
- Non-governmental organization (NGOs) working with environmental and social agendas

9.3 Project Affected Persons (PAPs) and Communities

- Village committee/ local Jirga system/ religious leaders
- Users of Project affected by assets and natural resources
- The inhabitants affected by the activities during/or after the construction phase of the project
- PAPs affected by the acquisition of land and assets

- The local population affected by the presence of the outsiders

9.4 Consultation Methodology

There are two types of stakeholders, i.e., community and institutions. These stakeholders were identified then separate consultations were carried out with both, and their concerns, suggestions, and opinions have been recorded on a consultation form, which are also included in the project potential impacts, and mitigation measures are advised for each of the impacts.

9.5 Stakeholder Engagement during the Detailed Design Stage

The stakeholders intended to conduct the following activities:

- In order to collect the information from the various stakeholders, the consultant's socio-environmental team contacted with the Skardu district administration and departments in July 2023.
- A detailed consultation process occurred with the proposed affected communities and individuals' households in July 2022 and September 2023.
- The consultation process was also extended to other stakeholders/government departments (Wildlife, fisheries, forest departments and Parks etc. (see for example summary of meeting with institutional stakeholders).

A legal feasibility frame workshop was held at Skardu on September 19, 2022 as a part of Task-1 of the Consultancy Services Agreement (as laid down in its Appendix-A). The stakeholders of this aspect of the Project were invited for Stakeholder Consultations Workshop (**Annexure VI**). Prior to holding the workshop, the stakeholders were individually consulted and their views about the project were recorded.

9.5.1 Consultations with District Administration

A meeting with the Skardu District officials was held on July 11, 2023. Representatives from Departments of Revenue, Forest, Wildlife, Health, Education, Agriculture, Population Welfare, Fisheries and Livestock attended the meeting, which was chaired by the Additional Deputy Commissioner (ADC). The meeting served to provide an update on the project planning activities to the district officials, and the Consultants

were also requested to give information on environmental and social topics for project planning (**Table 9.1**).

An information collection checklist was distributed to the participants and the information was briefly explained by the Consultants for each topic, and ADC referred the topics to the relevant representatives. The subsequent documentation includes a limited amount of useful information/data. The main agenda items of the meeting were:

- Steps are required to be taken for protection and conservation of natural habitat and bio-diversity during the project.
- Timely compensation shall be provided to the Project affected persons (PAPs), if acquisition is required.
- Arrangements for timely and judicious compensation and payment process shall also be made.
- In-case of acquisition, the availability of productive land shall be ensured as land mechanism for land compensation.
- A sound grievances redress mechanism shall also be established.

Table 9.1 Consultation with relevant departments

Sr. No.	Name	Designation	Department	Contact No.
1.	Raja Abid Ali	Director	CKNP Skardu	0346-9691386
2.	Mehmood Ghaznavi	Conservator	Forest Skardu	0344-5400322
3.	Syed name Abbas	DFO DNP	Deosai National Park Skardu	0312-9701447
4.	Dr. Jibran	DFO	Forest Skardu	0355-5126126
5.	Dr. Salar	A/P Environment Dept	Baltistan Univ	0345-2769557
6.	Tariq Umar	Director	PCSIR Skardu	0331-8581551
7.	Yasir Abbas	Ecologist	CKNP Skardu	0346-9235510
8.	Shezad Shigri	Director	EPA Gilgit	0300-3689340
9.	Rehmat Ali	Head Environment Section	WWF Gilgit	0346-9751659
10.	Muhammad Zaman	Senior NRM	AKRSP Gilgit	0346-8114431
11.	Ijlal Ahmed	Conservator	Parks & Wildlife Gilgit	-
12.	Muhammad Hussain	DOM	GBRSP Skardu	0346-8113747
13.	Altaf Hussain	Program Coordinator	WWF Skardu	0355-5402967



Consultation with Conservator Forest Skardu



Consultation with DFO Deosai National Park & DFO Forest Skardu



Consultation with Assistant Professor Environment Department Baltistan University Skardu



Consultation with Director PCSIR Skardu



Consultation with Director & Ecologist of CKNP Department Skardu



Consultation with Director EPA Gilgit



Consultation with Environment Section Head
WWF Gilgit



Consultation with Senior NRM of AKRSP Gilgit



Consultation with Conservator Parks & Wildlife
and Director ICUN Gilgit



Consultation with DOM of GBRSP Skardu



Consultation with WWF Officials Skardu

Figure 9.1: Institutional Consultations Photographs

9.5.2 Consultations with People from Project-Affected Villages

The social baseline survey of the proposed affected area (Satpara region) was conducted during July 2022 and September 2023. Being the main affected region, it further comprises of the five sub-villages i.e., Malpain, Miriaq & Dhari, Satpara Bara (Chohar) village, Satpara Center (Skildrong) village. A participatory and consultative approach was adopted to collect data from five affected villages. The PES Consultant's

team assisted the MMP consultant's team in each and every aspect of data collection regarding the social profile. The inventory of land and socio-economic household survey were used as main instruments for data collection from the proposed affected persons (PAPs) in the project area. In addition to the collection of quantitative data, qualitative data was also acquired through Focus Group Discussions (FGDs) with groups of the proposed affectees (group of farmers, business group and youth) in each of five villages. Three FGDs were conducted with each of the above groups in all villages. In addition, one more FGD was conducted with the members of the Skardu city Ulema council.

The MMP and PES consultant's socio-environmental team has made several visits to the proposed affected area. Various consultation meetings were held with the local population. The detail of each interview sessions is discussed in the following manner:

- A collaborative meeting was held with the stakeholder on 19 September, 2022. Initially during the meeting, the local people were introduced with the planning design and implementation phase of the project. The different concerns and worries of the local people about the project were properly listened and also addressed in return.
- All the visits to five affected villages were made with different time durations and schedules. The three villages (Satpara Bara (Chohar) village, Satpara Center (Skildrong) village and Malpain village) were visited on 6th & 7th July, 2023. While the remaining two (Miriaq & Dari village) were visited on their respective dates of 8th and 9th July, 2023.
- Enlisting with the profiles and socio-economic status, the consultant's team took consultative and participative sessions (one each) at all the five villages. During meetings, the local people were also known to share their concerns and worries about the planning and designing of the project.
- An informal consultative session was also held with the inhabitants of Satpara villages by being visited to the proposed affected site.
- Detailed information of all the village profiles was also collected. The local people also shared important information on horticulture, drinking and irrigation water, local agriculture, women status and empowerment, the civic,

socio-economic facilities and political dynamics etc. with the MMP & PES socio-environmental team.

The following are the main points which were discussed in the public consultation process:

- The information was shared with the local population about the feasibility and pre-construction phase of the project.
- The socio-environmental team obtained information about the concerns, worries, needs and priorities of the local people.
- The major concern of the local community was that the existing flow in Satpara nullah causes erosion to our agriculture land and residential structures especially during high flow season. They aware of the view that as the quantity of water will be increased in the nullah due to diversion of shatung water more devastation is expected in our villages. They all were in extreme favor of diversion of shatung nullah but demanded the construction of a concrete wall or provide riprap at reaches along villages where the Satpara nullah causes more destruction.
- Residents of all the villages which consultant's E&S team visited equally demanded that preference should be given to their respective village regarding hiring of labor during project construction.
- The local population also made pledges to the socio-environmental team that full cooperation and participation shall be made with respect to each and every aspect in the resettlement planning.
- It was promised from both the consultant's team and local population that transparency with respect to the sharing information will be ensured in all its forms and manifestations.
- There shall also be established a proper and effective grievance redressal mechanism for concerns of the local people about the affected area.
- There is also a need for creating a sense of ownership regarding activities among all the stakeholders of the project.

Table 9.2: Concerns and Issues Raised by the Local Community

A judicious and genuinely fixation of price for land, if acquisition is required	Immediate compensation/ payments shall be provided for loss of land, assets and structures	The local population is required to be employed on priority basis than to be dependent on outsiders.
Due compensation shall be initiated before the project is started	Erosion of land is big concern for the local population	The use of heavy machinery might affect the status of their grazing land
In case of floods, the agriculture land should be protected by safety walls	Compensation for land should be fixed in accordance with the rates of Skardu District	The local population is in dire need for the construction of a bridge over the Satpara Nullah
Good rates for compensation of agriculture land, if acquired	In case of any resettlement issue, the local population shall be provided with alternatives, by either being posted/ or settled at convenient places.	There might occur damage to the natural habitat and bio-diversity
Security issues might arise with the presence of the outsiders	The Satpara Nullah might be affected with heavy flow of water during floods, and so as the land of the local population might also be affected	Food scarcity with loss of land
Any short fall of electricity or load shedding shall be avoided in the proposed affected villages	Loss of irrigation channels with the heavy flow of water in the Satpara Nullah	Dumping should be avoided at productive/ grazing/ pasturing land

	
<p>Group consultation at Satpara Bara village (Chohar village)</p>	<p>Concerns of PAPs are being marked at Satpara Bara village</p>
	
<p>FGD participants at Satpara Bara village</p>	<p>Group discussions at Satpara Center (Skildrong) village</p>
	
<p>Local concerns discussion at Satpara Center (Skildrong) village</p>	<p>A group photo with the local people of Satpara center (Skildrong) village</p>
	
<p>Views about the project are being shared with local people at Dari village</p>	<p>Group Consultation at Dari village, July, 2023</p>

Figure 9.2: Public Consultations Photographs



Figure 9.3: Locations Map of Community Consultations

Table 9.3: Schedule of Consultation Meetings

Sr. No.	Stakeholder	Consultation Method	Date	District	UC	Village/Venue	Coordinates		No. of Participants
							Easting	Northing	
1	Locals/ residents	Informal meeting, individual interviews	09-07-2023	Skardu	Shigri Khurd	Mailpain	35°11'38.33"N	75°37'22.18"E	13
2	Locals/ residents	Focus group discussion	05-07-2023	Skardu	Shigri Khurd	Bara	35°11'45.24"N	75°37'11.99"E	13
3	Locals/ residents	Informal meeting, individual interviews	07-07-2023	Skardu	Shigri Khurd	Skildrong	35°11'36.74"N	75°36'50.52"E	13
4	Locals/ residents	Informal meeting, individual interviews	06-07-2023	Skardu	Shigri Khurd	Chohar	35°10'59.58"N	75°37'15.28"E	13
5	Locals/ residents	Informal meeting, individual interviews	08-07-2023	Skardu	Shigri Khurd	Dari	35°10'36.11"N	75°37'9.35"E	13

9.6 Information Disclosure

The ESIA shall be made available at key accessible and convenient locations such as the offices of WAPDA, district administration, city government and other convenient places. The WEC of WAPDA and Consultant of the project held several meetings to make the stakeholders aware of important aspects of the Report through face-to-face communication. Continued consultation and participation during Implementation Stage

- A continued process of consultation will be followed to ensure transparency and to keep the stakeholders informed and receiving their feedback at various stages of project implementation. It will provide a good measure to improve the social acceptability of the project and ensure effective participation of the stakeholders especially the permanent affectees. Public consultation will facilitate obtaining cooperation from stakeholders, to avoid cost and time in dealing with complaints. As per the requirement of the World Bank OP 4.12, a strategy for public consultation during implementation of the project works is delineated. **Table 9-4** provides a consultation plan to be implemented by the PMU during the implementation through the project Consultant and the WEC of WAPDA. The WAPDA and PMU will continue public consultation process by taking following steps:
 - Organize public meetings and apprise about progress particularly payment of compensation/resettlement assistance, social activities;
 - Detail and outcome of all consultation activities will be included in Bi-Annual and Annual Monitoring Reports.
 - Disclose all monitoring reports in the same manner as that of the ESIA.

A common future consultation plan is given below in **Table 9.4 below**:

Table 9.4: Consultation Plan

Activity	Target Stakeholder	Type of Consultation	Objectives of the Activity	Responsible Unit/Persons	Time Frame	Budget Source
At least 13 to 15 meetings should be conducted for sharing key aspects of Project	PAPs	Information sharing, consultation on development regarding use of	disclose updated documents by sharing key aspects and also distribution of	WEC, & Consultant	Q1 of Year 1 (1 st month)	Project

Activity	Target Stakeholder	Type of Consultation	Objectives of the Activity	Responsible Unit/Persons	Time Frame	Budget Source
and planning for grazing land rights		grazing land for cattle	information brochure			
Twice a month meeting with PAPs at project site	PAPs	To get feedback on social, project related issues	immediate resolution of social issues before they become serious or turn into grievances	WEC, & Consultant	On-going	Project

10. CONCLUSION AND RECOMMENDATIONS

Following are the major conclusion drawn from ESIA study:

1. The proposed project requires ESIA in accordance with the requirements of Schedule II of PEPA-1997 as well as the requirements of other international financing agencies;
2. Impact assessment for construction and operation phases reveals that most of the adverse environmental impacts are associated with the construction phase of the Project. The impacts can be minimized and controlled by adopting mitigation measures as suggested in the ESMP;
3. The project area falls in the Protected Area of Daosai National Park, where construction activities will be taken up with extreme care according to the Code of Conduct related to Sensitive areas for National Parks, Wildlife Sanctuaries, Game Reserves, Reserved Forests and Protected Wetlands.
4. As the construction activities will be carried out in the Protected Area, a Biodiversity Action Plan (BAP) is also prepared. The budget for BAP has been allocated to be utilized for the protection of the biodiversity of the area, especially for Brown Bears and Migratory Birds.
5. The project traverses through the Uncultivated Range land / Riverine areas of District Skardu.
6. No trees will be cut for project construction.
7. No land compensation will be made, as the land is owned by GoGB.
8. In the proposed alignment, there will be no effect on residential structures, community structures or any other infrastructures.
9. Local communities having the rights of grazing only have shown some concerns, which need to be addressed to the maximum possible extent by the Project Authorities.
10. Their major concern was to build a concrete wall or provide rip rap along critical reaches of Satpara Nullah where there are chances of damage to their agriculture lands and residential structures during high flow season. With the diversion of Shatung Nullah, they are fearing that the situation might become worse. These works have been included in the Project estimate under the head of improvement of access road infrastructure.

11. The Project must have a functional and an effective GRM setup in place before start of construction works.
12. The project must employ a proactive communication strategy to ensure management of Daosai National Park and the local population must be made aware of project works, its benefits, and its impacts in a manner that is easy to understand. These awareness campaigns must be taken up in a timely manner.
13. ESMP provides a detailed mitigation matrix that covers impacts, measures, roles/ responsibilities and timings. Monitoring plan for both the phases has also been separately given in the ESMP.
14. Surface and groundwater are available in and around the project area. Nearest potable water source for construction and other uses are the active streams in the area.
15. The water quality in the project area is also fit for drinking purpose.
16. Objectives of this scheme is augment the supplies to Satpara Dam reservoir for:
 - Irrigation supplies for a total command area of 15,000 acres
 - Drinking water supplies for Skardu up to 20 million gallons per day
 - Energy generation for supplies to Skardu valley and its surroundings

11. REFERENCES

- Policy, procedures and filling of Environment Assessment, 1997
- Environment Act 2014, Go GB
- GoGB Environment Rule, 2019
- GoP NEQS, 1993
- GoP NEQS, 2010
- GoP Review and Regulation IEE & EIA, 2000
- Go GB Wildlife Act 1975
- GO GB Forest Act, 1975
- GoGB DNP Notification, 1993
- Contribution To the Red List of The Plants of Pakistan: Endemic Phanerogams of Gilgit and Baltistan, Final Technical Report, 2006.
- IUCN Pakistan, Northern Areas Strategy for Sustainable Development, 2003
- IEE Herpo HPP, 2023
- Dosai Management Plan for National Park 2020 to 2025

ANNEXURE

Annex I. Environmental and Social Codes of Practices (ESCP)

The ESCPs consist of environmental and social management guidelines and OHS practices to be followed by the contractors for sustainable management of all environmental, social, health and safety issues.

Contractors will prepare site specific management plans, namely Construction Environmental and Social Action Plan (CESAP) and Occupational Health and Safety Plan, in compliance with World Bank and Government guidelines and based on the guidance given in the ESCPs. The CESAP and OHS Plan will form the part of the contract documents and will be used as monitoring tool for compliance.

- ESCP 1: Waste Management
- ESCP 2: Fuels and Hazardous Goods Management
- ESCP 3: Water Resources Management
- ESCP 4: Drainage Management
- ESCP 5: Soil Quality Management
- ESCP 6: Erosion and Sediment Control
- ESCP 7: Topsoil Management
- ESCP 8: Topography and Landscaping
- ESCP 9: Quarry Areas Development and Operation
- ESCP 10: Air Quality Management
- ESCP 11: Noise and Vibration Management
- ESCP 12: Protection of Flora
- ESCP 13: Protection of Fauna
- ESCP 14: Road Transport and Road Traffic Management
- ESCP 15: Construction Camp Management
- ESCP 16: Cultural and Religious Issues
- ESCP 17: Community and Workers Health and Safety
- ESCP 18: Construction and Operation Phase Security
- ESCP 19: Operation of Heavy Equipment Management
- ESCP 20: Excavation
- ESCP 21: Transportation of Oversized Equipment
- ESCP 22: Lifting and Materials Handling
- ESCP 23: Stringing conductors at road, river, and existing transmission line crossings

ESCP 1: Waste Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Develop site specific waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to supervision consultant for approval. • Organize disposal of all wastes generated during construction in the designated disposal sites. • Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route. • Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. • Provide refuse containers at each worksite. • Request suppliers to minimize packaging where practicable. • Place a high emphasis on good housekeeping practices. • Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal. • Potable water should be supplied in bulk containers to reduce the quantity of plastic waste (plastic bottles). Plastic bag use should be avoided.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Collect chemical wastes in sealed containers appropriately labelled for safe transport to an approved chemical waste depot. • Store, transport and handle all chemicals avoiding potential environmental pollution. • Store all hazardous wastes at a fair distance from water courses. • Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. • Construct concrete or other impervious flooring to prevent seepage in case of spills.

ESCP 2: Fuels and Hazardous Goods Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and hazardous goods.	<ul style="list-style-type: none"> • Materials used in the construction have a potential to be a source of contamination. • Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers. 	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare spill control procedures and submit them for supervision consultant approval. • Train the relevant construction personnel in handling of fuels and spill control procedures. • Store dangerous goods on top of a sealed plastic sheet away from watercourses. • Refueling shall occur only within safe areas. • Store and use fuels in accordance with material safety data sheets (MSDS). Make available MSDS for chemicals and dangerous goods on-site. • Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored; and ensure personnel trained in the correct use. • Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. • Make sure all containers, drums, and tanks that are used for storage are in good condition and are labelled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. • Store hazardous materials above flood level considered for construction purposes • Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. • Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. • Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials.

ESCP 3: Water Resources Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall <ul style="list-style-type: none"> Follow the management guidelines proposed in ESCPs 1 and 2. Minimize the generation of sediment, oil and grease, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways or storm water systems.
Discharge from construction sites	Construction activities, sewerage from construction sites and work camps may affect the surface water quality.	The Contractor shall <ul style="list-style-type: none"> Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials. Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site. Stockpile materials away from drainage lines Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, approved waste disposal site or recycling depot. Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall <ul style="list-style-type: none"> Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as
		<p>practicable following earthwork to minimize erosion.</p> <ul style="list-style-type: none"> Ensure that roads used by construction vehicles are swept regularly to remove dust and sediment. Water the loose material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g., high winds).
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor Shall <ul style="list-style-type: none"> Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site. Monitor the water quality in the runoff from the site or areas affected by dredge/excavation plumes, and improve work practices as necessary. Protect water bodies from sediment loads by silt screen or other barriers. Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways or storm water systems. Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
Drinking water	Untreated surface water is not suitable for drinking purposes due to presence of suspended solids and ecoli.	The Contractor Shall <ul style="list-style-type: none"> Provide the drinking water that meets NEQS standards. Drinking water to be chlorinated at source, and ensure presence of residual chlorine 0.1 ~ 0.25 ppm as minimum after 30 minutes of chlorine contact time.

ESCP 4: Drainage Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare drainage management procedures and submit them for supervision consultant approval. • Prepare a program to prevent/avoid standing waters, which supervision consultant will verify in advance and confirm during implementation. • Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line. • Rehabilitate road drainage structures immediately if damaged by contractors' road transports. • Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to NEQS, before it is being discharged into the recipient water bodies. • Ensure that there will be no water stagnation at the construction sites and camps. • Protect natural slopes of drainage channels to ensure adequate storm water drains. • Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem.
Ponding of water	Health hazards due to mosquito breeding	<ul style="list-style-type: none"> • Do not allow ponding of water especially near the waste storage areas and construction camps. • Discard all the storage containers that are capable of storing of water, after use or store them in inverted position.

ESCP 5: Soil Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall <ul style="list-style-type: none"> • Strictly manage the wastes management plans proposed in ESCP1 and storage of materials in ESCP2. • Construct appropriate spill contaminant facilities for all fuel storage areas. • Establish and maintain a hazardous material register detailing the location and quantities of hazardous substances including the storage, and their disposals. • Train personnel and implement safe work practices for minimizing the risk of spillage. • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site. • Remediate the contaminated land using the most appropriate available method.
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall <ul style="list-style-type: none"> • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds.

ESCP 6: Erosion and Sediment Control

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Clearing of construction sites	Cleared areas and slopes are Susceptible to erosion of topsoils, which affects the growth of vegetation and causes ecological imbalance.	The Contractor shall <ul style="list-style-type: none"> • Prepare site specific erosion and sediment control measures and submit them for supervision consultant approval. • Reinstate and protect cleared areas as soon as possible. • Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turf/tree plantations.
Construction activities and material stockpiles	The impact of soil erosion are destruction of aquatic environment by erosion and/or deposition of sediment	The Contractor shall <ul style="list-style-type: none"> • Locate stockpiles away from drainage lines. • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds. • Remove debris from drainage paths and sediment control structures. • Cover the loose sediments of construction material and water them if required. • Divert natural runoff around construction areas prior to any site disturbance. • Install protective measures on site prior to construction, for example, sediment traps. • Observe the performance of drainage structures and erosion controls during rain and modify as required.
Soil erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall <ul style="list-style-type: none"> • Stabilize the cleared areas not used for construction activities with vegetation • Ensure that roads used by construction vehicles are swept regularly to remove sediment. • Water the material stockpiles, access roads and bare soils as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds).

ESCP 7: Top Soil Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. Remove unwanted materials from top soil like grass, roots of trees and similar others. Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites. Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bunding of the soil layers, water penetration and revegetation
Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	<ul style="list-style-type: none"> Limit equipment and vehicular movements to within the approved construction zone. Plan construction access to make use, if possible, of the final road alignment.

ESCP 8: Topography and Landscaping

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Prepare plantation plan and submit the plan for supervision consultant approval. Ensure the topography of the final surface of all raised lands are conducive to enhance natural draining of rainwater/flood water. Undertake mitigation measures for erosion control/prevention by tree plantation. Cover immediately the uncovered open surface that has no use of construction activities with grass- cover and tree plantation to prevent soil erosion and bring improved landscaping. Reinstate the natural landscape of the ancillary construction sites after completion of works.

ESCP 9: Quarry Areas Development and Operation

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	Borrow areas will have impacts on local topography, landscaping and natural drainage.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Prepare quarry area management plan and submit the plan for supervision consultant approval. Use only approved quarry and borrow sites Reuse excavated or disposed material available in the project to the maximum extent possible. Store top soil for reinstatement and landscaping. Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ESCP 10: Air Quality Management Noise and vibration control by ESCP 11: Noise and Vibration Management.

ESCP 10: Air and Dust Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be affected by vehicle exhaust emissions and combustion of fuels.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare air quality management plan (under the Pollution Prevention Plan) and submit the plan for supervision consultant approval. • Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Operate the vehicles in a fuel-efficient manner. • Cover hauls vehicles carrying dusty materials moving outside the construction site. • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions. • Water construction materials prior to loading and transport. • Service all vehicles regularly to minimize emissions.
Construction machinery	Air quality can be affected by emissions from machinery and combustion of fuels.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors. • Focus special attention on containing the emissions from generators. • Machinery causing excess pollution (e.g., visible smoke) will be banned from construction sites. • Service all equipment regularly to minimize emissions. • Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations.
Construction activities	Dust generation from construction sites, material stockpiles and access roads are a nuisance in the environment and can be a health hazard, and also can affect the local crops;	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g., high winds). Stored materials such as sand shall be covered and confined to avoid their being wind drifted. • Minimize the extent and period of exposure of the bare surfaces. • Restore disturbed areas as soon as practicable by vegetation/grass-turfing.
		<ul style="list-style-type: none"> • Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations. • Not permit the burning of solid waste.

ESCP 11: Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be affected due to vehicular traffic	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a noise management plan (under the Pollution Prevention Plan) and submit the plan for supervision consultant approval. • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures. • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. • Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site.
Construction machinery	Noise may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Appropriately site all noise generating activities to avoid noise pollution to local residents. • Use the quietest available plant and equipment. • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment. • Avoid the unnecessary use of alarms, horns and sirens.
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Notify adjacent landholders prior any typical noise events outside of daylight hours. • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions. • Employ best available work practices on-site to minimize occupational noise levels. • Install temporary noise control barriers where appropriate. • Plan activities on site and deliveries to and from site to minimize impact. • Monitor and analyze noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas.

ESCP 12: Protection of Flora

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a plan for protection of flora and submit the plan for supervision consultant approval. • Minimize disturbance to surrounding vegetation. • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from supervision consultant for clearance of vegetation. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Control noxious weeds by disposing of at designated dump site or burn on site. • Clear only the vegetation that needs to be cleared in accordance with the engineering plans and designs. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles etc. • Not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. • Ensure excavation works occur progressively and re-vegetation done at the earliest • Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction • Supply appropriate fuel in the work camps to prevent fuel wood collection.

ESCP 13: Protection of Fauna

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a plan for protection of fauna and submit the plan for supervision consultant approval. • Limit the construction works within the designated sites allocated to the contractors. • Check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal.
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Restrict the tree removal to the minimum numbers required. • Fell the hollow bearing trees in a manner which

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unremoved overnight to allow animals to move of their own volition.
Construction camps	Illegal poaching	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching. • Ensure that staff and Subcontractors are trained and empowered to identify, address and report potential environmental problems.

ESCP 14: Road Transport and Road Traffic Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffic and safety of the road- users.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a traffic management plan and submit the plan for supervision consultant approval. • Strictly follow the Project's 'Traffic Management Plan' and work with close coordination with the Traffic Management Unit. • Prepare and submit additional traffic plan, if any of his traffic routes are not covered in the Project's Traffic Management Plan, and requires traffic diversion and management. • Include in the traffic plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary diversions, warning signs / lights, road signs etc. • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Country's Traffic Regulations.
	Accidents and spillage of fuels and chemicals	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Restrict truck deliveries, where practicable, to day time working hours. • Restrict the transport of oversize loads. • Operate vehicles, if possible, to non-peak periods to minimize traffic disruptions. • Enforce on-site speed limit.

ESCP 15: Construction Camp Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a construction camp management plan ensuring labor influx management and submit the plan to NHA and supervision consultant for approval. • Locate the construction camps within the designed sites or at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the supervision consultant for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		surveillance over public health, social and security matters.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>Contractor shall provide the following facilities in the campsites</p> <ul style="list-style-type: none"> • Adequate housing for all workers. • Safe and reliable water supply, which should meet NEQS. Drinking water to be chlorinated at source, and ensure presence of residual chlorine 0.1 ~ 0.25 ppm as minimum after 30 minutes of chlorine contact time (WHO guideline). • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by location. The minimum number of toilet facilities required is one toilet for every ten persons. • Storm water drainage facilities.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Ensure proper collection and disposal of solid wastes within the construction camps. • Insist waste separation by source; organic wastes in one container and inorganic wastes in another container at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	Increased risk of communicable diseases and burden on local health services to be transmitted including malaria, exacerbated by inadequate health and safety practices.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. • Initial health screening of the laborers coming from outside areas. <p>Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work.</p>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during rainy season in offices and construction camps and yards.
		<ul style="list-style-type: none"> • Not dispose food waste openly as that will attract rats and straydogs. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices.
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide appropriate security personnel (police or private security guards) and enclosures to prevent unauthorized entry into the camp area. • Maintain register to keep a track on a head count of persons present in the camp at any given time. • Provide appropriate type of firefighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors.
Social and cultural aspect for Camp setup	Labor Influx in the project area will have risk of social conflict, illicit behavior and crime, burden on and competition for public service provision	<p>The Contractor will</p> <ul style="list-style-type: none"> • The Contractor will schedule construction time particularly near the settlements, to cause least disturbance to the local population, particularly women. • Contractor will hire labor preferably form the project area based on adjacency principles. • Contractor will ensure training of staff and signing of a Code of Conduct. Training will focus on awareness on local customs, traditions, behaviour towards women and children, and prevention of GBV/SEA/SH. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions. <p>The Contractor will carry out the construction activities in such a way that the open defecation timings by the local community should not be affected. The normal defecation timings are early in the morning and at late in the evening. So, the Contractor will have to take care of these timings.</p> <ul style="list-style-type: none"> • During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner to make some arrangements. Similarly, Contractor will take care as much as possible that the construction activities should not affect the privacy. • The Contractor will also ensure that noise and light pollution from the labor camp is kept at minimal levels especially at night.
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Dismantle and remove from the site all facilities established within the construction camp including

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>the perimeter fence and lockable gates at the completion of the construction work.</p> <ul style="list-style-type: none"> • Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed. • Give prior notice to the laborers before demolishing their camps/units. • Maintain the noise levels within the national standards during demolition activities. • Different contractors should be hired to demolish different structures to promote recycling or reuse of demolished material. • Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site. • Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner.

ESCP 17: Worker Health and Safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	The population in the proximity of the construction site and the construction workers are exposed to several (i) biophysical health risk factors, (e.g., noise, dust, chemicals, construction material, solid waste, wastewater, vector transmitted diseases etc.), (ii) road accidents from construction traffic.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare an Occupational Health and Safety plan and submit the plan for supervision consultant's approval. Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g., International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with National Standards. • Provide the workers with a safe and healthy work environment, considering inherent risks in construction activity and specific classes of hazards in the work areas. • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job. • Appoint an environment, health and safety manager to look after the health and safety of the workers. • Inform the local authorities responsible for health, safety and security duly informed before commencement of civil works and establishment of construction camps to maintain effective surveillance over public health, social and security matters.
	Child labor	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Not hiring of children below the age of 14 for any non-hazardous type of labour, and below the age of 18 for hazardous work. • Project staff will monitor sites to check for child labour, and will hold regular consultations to keep a check on forced labour at project sites • No child under 18 years will be allowed to reside in project-related accommodation and camps
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Ensure health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work. • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards, in a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>that may be life-threatening and provide necessary preventive and protective measures.</p> <ul style="list-style-type: none"> • Provide awareness to the construction drivers to strictly follow the driving rules.
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ESCP 16 Construction Camp Management</p> <ul style="list-style-type: none"> • Adequate ventilation facilities • Safe and reliable water supply. • Hygienic sanitary facilities and sewerage system. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ESCP 2 • Solid waste collection and disposal system in accordance with ESCP1. • Arrangement for trainings • Paved internal roads. • Security fence at least 2 m height. <p>Sick bay and first aid facilities</p>
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	<p>The contractor shall</p> <ul style="list-style-type: none"> • Provide portable toilets at the construction sites, if about 10 people are working the whole day for a week. Location of portable facilities should be at least 6 m away from storm drain system and surface waters. These portable toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. <p>Provide safe drinking water facilities to the construction workers at all the construction sites.</p>
Other ESCPs	Potential risks on health and hygiene of construction workers and general public	<p>The Contractor shall follow the following ESCPs to reduce health risks to the construction workers and nearby community</p> <ul style="list-style-type: none"> • ESCP 2: Fuels and Hazardous Goods Management • ESCP 4: Drainage Management • ESCP 10: Air Quality Management • ESCP 11: Noise and Vibration Management • ESCP 15: Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. <p>Train all construction workers in general health and safety matters, and on the specific hazards of construction sites.</p>

ESCP 18: Construction and Operation Phase Security

Project Activity/ Impact Source	Impacts /Concerns	Mitigation Measures/ Management Guidelines
Construction Phase	<p>Inadequate construction site security poses a significant risk to assets, construction materials and property.</p> <p>Theft/vandalism of assets, materials and property would increase construction costs and cause delays in project completion.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Provide appropriate security personnel (i.e., security guards) to prevent unauthorized entry into the camp area. • Employ night watchman for periods of significant on-site storage or when the area necessitates. • Ensure all assets (i.e., tools, equipment, etc.) and construction materials at construction site are identified, inventoried and tracked as closely as possible. All assets should be clearly labelled and marked. Keep records of tool serial numbers and check inventory on a regular basis. • All tools and equipment should have a check out/in system, if not in use should be secured and stored in a proper place to prevent theft or loss. • Provide storage sheds for the secure storage of equipment and tools when not in use. • Ensure there is proper fencing around the construction site perimeter. Fencing should be chain-link at least 2.4 m high and secured with a steel chain and lock. If possible, the entire site should be fenced; if this is not possible, make sure the construction trailer and any equipment storage areas are fenced. • Ensure construction site has controlled access points (one or two entry points at most), allowing for close monitoring of comings and goings from the site. • Workers should be easily identified and have credentials that indicate site access. • Ensure job site is properly lighted at night. Well-lit areas should include any office trailers and equipment storage trailers. Floodlights operated by sensors should also be installed where appropriate. • Pre-employment screening investigations should be used to verify the applicants relating to their employment, education and criminal history background. • Provide awareness training to security guards/personnel on community relations and GBV/SEA/SH prevention
	<p>Improper security measures may pose security risk for construction workers and especially foreign staff on construction sites.</p>	<p>The Contractor shall:</p> <ul style="list-style-type: none"> • Prepare site specific security plan. • Maintain register to keep track of number of persons present in the camp at any given time. • Provide appropriate security personnel at job sites as mentioned above. • Ensure proper fencing as mentioned above. • Ensure controlled access points to job site as mentioned above.
Operation Phase	<p>Vandalism/damage and theft of infrastructure (i.e., metals and etc.).</p>	<ul style="list-style-type: none"> • Ensure strategic infrastructure sites are secure and fenced with controlled access points. Fencing should be chain-link at least 2.4 m high and secured with a steel chain and lock.

ESCP 19: Operation of Heavy Equipment Management

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Heavy machinery	Hazards associated with heavy machinery movement are:	<p>The Contractor shall</p> <ul style="list-style-type: none"> • All above listed hazards shall be prevented through safe working procedures, training of the operators and workers and exclusion of the operation, ensuring visibility and providing signaller etc. where applicable.
Before Operations	<ul style="list-style-type: none"> • Run over • Pinch in / caught in between • Falling of equipment form road edge / into excavations • Falling of loads • Overturning • Driver negligence / poor operations 	<ul style="list-style-type: none"> • All construction equipment shall be maintained, equipped and operated in accordance with manufactures' requirements. • Only authorized and trained personnel shall operate equipment. • Equipment operators and truck drivers shall make a pre-shift safety inspection of their equipment. Any conditions that effect safe operation shall be corrected before use. • All visibility aids like side / back view mirrors will be available with all site vehicles and machinery. • Blocking of side / back wind shields will not be allowed by any means like curtains, posters, wall papers etc. • Use 3 points mounting and dismounting technique off of heavy equipment - NEVER JUMP OFF HEAVY EQUIPMENT.

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
During Operation		<ul style="list-style-type: none"> • Designate the route for earth moving machinery; avoid reversing where possible by providing in – out route. • Separate routes will be established for site vehicles and pedestrians where applicable. • All site staff will be trained for the following: • Always try to walk on the driver side of equipment as the passenger side has a larger blind spot. • Arrange to provide enough space to allow the equipment and workers to perform the planned tasks safely otherwise safe distance will be maintained from all sides of the heavy equipment while they are in use. • Use of high visibility vest for all site personnel. • Prohibition of cell phone use while operating any equipment. • Restriction in transporting workers on equipment or vehicles that are not equipped with seats for passengers. • Deployment of flagman when heavy equipment are in motion, especially where machinery and workers are working at close distance to ensure communication between the operator and flagman to maintain safe movement. • Cordon of swing radius of vehicles in danger zones with warning tape of barriers. • Restriction of work under any suspended or overhead load. • Restrictions in overloading of dumpers and insurance of offloading at level ground with rear wheels stop logs at the edges. • Insurance of reverse alarm with the site vehicles. • Ensure three main principles at site to avoid any mishap. • Exclusion: exclusion will be done by specifying the work area by barricades / fencing/isolating from pedestrian / worker. • Visibility: best view around machinery directly from the operator position will be ensured by adequate visibility aids (clear front, side and rear screens with side / back view mirrors covering all blind areas). • Signallers: A signaller will be provided in a safe position to direct operation and any pedestrian movements in danger zones.
After Operations		The Contractor shall
		<ul style="list-style-type: none"> • Never leave any machinery / vehicle unattended in running position or key inside. • After completion of operation all equipment shall be switched off and doors locked where applicable. • Bucket of excavator, loader shall be grounded. • All power transmission shall be neutral. • All equipment shall be parked in secured ground.

ESCP 20: Excavation

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Sloping and benching	<ul style="list-style-type: none"> • Landslides, cave-ins, excavation collapse • Falling, rolling or dislodging material • Personal Falls, machinery falls into excavated area or trenches • Water accumulation • Confined Space • Being struck or crushed by a workplace vehicle, • Machinery Hazards; Loading and dumping hazards, e.g. struck by or pinch in between object, crushed by when reversing, overloading, overturning of the vehicles while unloading. 	<p>The slopes and configurations of sloping and benching systems will be selected and constructed by contractor and will be in accordance with the approved design following applicable code and designed by a registered professional engineer.</p> <ol style="list-style-type: none"> i. Allowable configurations and slopes: Excavations will be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the contractor follows other applicable design procedures approved by the engineer. ii. Sloping and benching systems not utilizing previous options will be approved by a registered professional engineer. Designs shall be in written form and shall include at least the following: <ol style="list-style-type: none"> (a) The magnitude of the slopes that were determined to be safe for the particular project; (b) The configurations that were determined to be safe for the particular project; (c) The identity of the registered professional engineer approving the design; and (d) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the PMU upon request.
Design of support systems, shield systems, and other protective systems		<p>Designs of support systems, shield systems, and other protective systems shall be selected and constructed by contractor and shall be in accordance with the approved design specifications following applicable code and designed by a registered professional engineer.</p> <ol style="list-style-type: none"> i. Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer. ii. Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval. iii. Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the PMU upon request. iv. Support systems, shield systems, and other protective systems not utilizing Option i, Option ii or Option iii, above, shall be approved by a registered professional engineer. v. Designs shall be in written form and shall include the following: <ol style="list-style-type: none"> a. A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and b. The identity of the registered professional engineer approving the design. c. At least one copy of the design shall be maintained

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		<p>at the jobsite during construction of the protective system. After that time, the design may be stored off the jobsite, but a copy of the design shall be made available to the PMU</p>
<p>Selection of Materials and equipment.</p>		<p>Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function. Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent</p>
		<p>With the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards.</p> <ol style="list-style-type: none"> i. When material or equipment that is used for protective systems is damaged, the competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such material or equipment shall be removed from service and shall be evaluated and approved by a registered professional engineer before being returned to service. ii. Installation and removal of support - Members of support systems shall be securely connected together to prevent sliding, falling, kick outs, or other predictable failure. iii. Support systems shall be installed and removed in a manner that protects workers from cave-ins, structural collapses, or from being struck by members of the support system. iv. Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand. v. Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system. vi. Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation. vii. Backfilling shall progress together with the removal of support systems from excavations. viii. Additional requirements for support systems for trench excavations: <ol style="list-style-type: none"> a. Excavation of material to a level no greater than 2 feet (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
		support system. b. Installation of a support system shall be closely coordinated with the excavation of trenches.
Shield systems		<ul style="list-style-type: none"> • Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand. • Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads. • Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields. • Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically. <p>Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.</p>

ESCP 21: Transportation of Oversized Equipment

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Movement of transportation	Hazards associated with transportation of oversized equipment: <ul style="list-style-type: none"> • Traffic disruptions along the way • Traffic accidents • Impact on infrastructure, roads, bridges • Nuisance to people along the transportation route 	The Contractor shall: <ul style="list-style-type: none"> • Identify the appropriate special vehicles depending on the characteristics of the load • Ensure that special vehicles are maintained, in good operating condition and have all permits required under the national laws • Ensure that the drivers are trained for the particular type of vehicles • Ensure that drivers are in good physical condition • Ensure that the equipment is loaded appropriately and secured on the vehicle • Ensure that the transportation route avoids schools, hospitals, mosques, markets or other places of concentration of people, as far as possible • Ensure that the vehicle route is surveyed and that its geometric design and condition is appropriate for the transportation of the big and heavy load. • Ensure that turning curves are appropriate for the special vehicles. • Ensure that the necessary clearance is available, i.e., bridges, transmission lines along the way • Ensure that a pilot vehicle is available to inform people on the coming load and to inform the vehicle driver on likely obstacles • Liaise with the traffic police to inform on the dates and the route of the transportation, and request their permit • Liaise with the communities along the route, at least a week before, to inform them on the dates of the transportation

ESCP 22: Lifting and Materials Handling

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Mechanical Handling	Injuries associated with mechanical handling of loads may result from: <ul style="list-style-type: none"> • Unsafe operating practices • Inappropriate condition of equipment • Improper loading • Carrying too heavy a load • Improper training 	General Requirements <ul style="list-style-type: none"> • Lifting equipment selection shall be based on a risk assessment and shall be suitable for the task for which it will be used. • Lifting equipment selection should also consider the various operating environments under which the equipment may be used. • All lifting equipment used will comply with the necessary legal requirements. • All lifting equipment must be clearly marked with its safe working load as well as a unique identification number. Where the load capacity is variable, a table of load to conditions must be affixed. • Testing, including non-destructive testing where relevant, must be carried out by accredited contractors. • No equipment may be used if proof of inspection and test is not available (as recorded in the register). • No purpose made or adapted lifting equipment will be used, unless the special adaptation has been approved (after risk assessment) by the respective Responsible Engineer and the approval as well as limitations on use or special instructions are held with the register and communicated to the user. • Only employees who have been tested, found competent and authorized will be allowed to operate lifting equipment.
Manual handling	Injuries associated with manual handling of loads may result from: <ul style="list-style-type: none"> • Unsafe working habits • Improper lifting • Carrying too heavy a load • Incorrect gripping • Failure to wear correct personal protective equipment • Improper training 	<ul style="list-style-type: none"> • Training in safe manual handling methods. • Inspect material for the physical size and weight, and sharp or jagged edges, rough or slippery surfaces, splinters or burrs. • Adequate supervision. • Wearing of the correct personal protective equipment. • Pre-employment medical examinations and periodic examinations may reveal a hernia, knee or back injuries. • Consider physical matters such as small worker – heavy load. • Keep fingers away from pinch points, especially when setting down material. • When handling timber, pipes or other long objects, keep the hands away from the ends to prevent them from being pinched. • Wipe off grease, wet, slippery or dirty objects before handling them. • Keep hands free from oil and grease. • When possible, use holders, containers, handles or tongs when manually handling material.

ESCP 23: Stringing conductors at road, river, and existing transmission line crossings

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
Stringing conductors at road crossings	Hazards associated with stringing conductors at road crossing are; <ul style="list-style-type: none"> • Traffic disruptions along the way • Traffic accidents • Damage to equipment • Accidents and 	The Contractor shall: <ul style="list-style-type: none"> • Prepare and submit a traffic management plan for approval at least 30 days before commencing work on any project component involved in traffic diversion and management. • Coordinate with local administration to communicate traffic closures for the construction work, along with traffic closure schedules. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
	spillage of fuels and chemicals <ul style="list-style-type: none"> • Less working time 	detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, and road signs. <ul style="list-style-type: none"> • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Country's Traffic Regulations. • Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information: <ul style="list-style-type: none"> • Location: Chainage and village name • Duration of construction period • Period of proposed detour / alternative route • Suggested detour route map • Name and contact address/telephone number of the concerned personnel • Name and contact address / telephone number of the Contractor • Inconvenience is sincerely regretted.
Conductors at river crossings	<ul style="list-style-type: none"> • Hazards associated with the stringing at river crossings; • Risk of drowning of worker and machinery • Corrosion of material and equipment • Electrocution • Slip trips and fall • Chemical Spillage • Flood in rivers • Slope failure • Cold-water shock and immersion 	The contractor shall; <ul style="list-style-type: none"> • Ensure the provision of Lifejackets/buoyancy aids worn by workers with risk of falling into water. Lifejackets/buoyancy aids should conform to BS EN ISO 12402-1, 2, 3 or 4, or other equivalent international standards according to working conditions. • Ensure the checking of Lifejackets thoroughly by the user before each use • Provide a lifebuoy with sufficient lifeline (not less than 30 metres) and the locations of the lifebuoys should be at less than 50-metre intervals along the edges of places where work is being carried out over side. To avoid any delays to rescue operations, lifebuoys should not be tightly tied to posts. • Provide safety harnesses with continuous and effective anchorage system when it is impracticable to provide a suitable working platform, access and egress and safe place of work. • Ensure the provision of Rescue facilities, including sufficient stretcher(s), portable resuscitation equipment and first aid facilities, and kept readily accessible for emergency use. • Ensure the presence of Shelters, vessels for evacuation from adverse weather, etc. in the vicinity of workplaces over/near water. • Ensure the Job specific safety training and regular refresher training to workers to enhance/maintain their safety awareness of potential hazards associated with work over water/near water. • Ensure the safe handling of the chemicals while transporting or using. • Ensure the implementation of the safety standards. Ensure the usage of PPEs by the Workers
Stringing conductors at existing transmission line crossings	Hazards associated with the stringing over existing transmission line includes; <ul style="list-style-type: none"> • Electrocution • Electromagnetic interference 	The contractor shall; <ul style="list-style-type: none"> • Coordinate with the transmission line staff/concerned or NHA to plan the work • Take necessary approval from the concerned department • Take necessary shutdown on the live transmission lines • Provide training and appropriate personal

Project Activity/ Hazard Source	Hazard Risks	Preventive Measures
	<ul style="list-style-type: none"> • Falling of existing line/conductor 	<p>protection equipment for workers;</p> <ul style="list-style-type: none"> • Maintain construction equipment in good condition; • Test structures for integrity prior to undertaking work; • Ensure Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; among others; • Ensure hoisting equipment should be properly rated and maintained and hoist operators properly trained; • Ensure the specs of safety belts which should be of not less than 16 millimeters (5/8inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident; • Ensure when operating power tools at height, workers should use a second (backup) safety strap; • Provide safe working space for workers when working at properties with additional structure around the power poles.

Annex II.National Environmental Quality Standards

National Environmental Quality Standards (NEQS)

Table 1: Effluent Discharge Standards (NEQS 2000) Applicable to the Works

Sr. No.	Determinant	NEQS
1	Temperature	40 °C =≤3 deg.
2	pH	6 – 9
3	BOD5	80 mg/l
4	Chemical Oxygen Demand (COD)	150 mg/l
5	Total Suspended Solid (TSS)	200 mg/l
6	Total Dissolved Solids	3500 mg/l
7	Grease and Oil	10 mg/l
8	Phenolic compounds (as phenol)	0.1 mg/l
9	Ammonia	40 mg/l
10	Chlorine	1.0 mg/l
11	Chloride	1000.0 mg/l
12	Sulphate	600 mg/l
13	Manganese	1.5 mg/l
14	Fluoride	10 mg/l
15	Cyanide (as CN ⁻) total	1.0 mg/l
16	An-ionic detergents (as MB As)	20 mg/l
17	Sulphide (S-2)	1.0 mg/l
18	Pesticides	0.15 mg/l
19	Cadmium	0.1 mg/l
20	Chromium trivalent and hexavalent	1.0 mg/l
21	Copper	1.0 mg/l
22	Lead	0.5 mg/l
23	Mercury	0.01 mg/l
24	Selenium	0.5 mg/l
25	Nickel	1.0 mg/l
26	Silver	1.0 mg/l
27	Total Toxic metals	2.0 mg/l
28	Zinc	5.0 mg/l
29	Arsenic	1.0 mg/l
30	Barium	1.5 mg/l
31	Iron	8.0 mg/l
32	Boron	6.0 mg/l

Table 2: National Environmental Quality Standards (NEQS) for Gaseous Emission (mg/Nm³, Unless Otherwise Defined)

Sr. No.	Parameter	Source of Emission	Existing Standards	Revised Standards
1	2	3	4	5
1.	Smoke	Smoke Opacity not to exceed	40% or 2 Ringlemann Scale	40% or 2 Ringlemann Scale or equivalent smoke number
2.	Particulate Matter (I)	(a) Boilers and Furnaces (i) Oil fired (ii) Coal fired (iii) Cement Kilns (b) Grinding, crushing, clinker coolers and Related processes, Metallurgical Processes, converter, blast furnaces and cupolas.	300 500 200 500	300 500 200 500
3.	Hydrogen Chloride	Any	400	400
4.	Chlorine	Any	150	150
5.	Hydrogen Fluoride	Any	150	150
6.	Hydrogen Sulphide	Any	10	10
7.	Sulphur Oxide (2) (3)	Sulfuric acid/ Sulphonic acid plants Other plants except power plants operating on oil and coal	400	1700
8.	Carbon Monoxide	Any	800	800
9.	Lead	Any	50	50
10.	Mercury	Any	10	10
11.	Cadmium	Any	20	20
12.	Arsenic	Any	20	20
13.	Copper	Any	50	50
14.	Antimony	Any	20	20
15.	Zinc	Any	200	200
16.	Oxides of Nitrogen (3)	Nitric acid manufacturing unit. Other plants except power plants operating on oil or coal: Gas fired Oil fired Coal fired	400 - -	400 600 1200

Sr. No.	Properties/Parameters	Standard Values for Pakistan	WHO Standards	Remarks
12	Beta Emitters	01	01	
CHEMICAL				
Essential Inorganics		mg/litre	mg/litre	
13	Aluminum (Al) mg/l	≤0.2	0.02	
14	Antimony (Sb)	≤0.005	0.02	
15	Arsenic (As)	≤0.05	0.01	Standard for Pakistan similar to most Asian developing Countries
16	Barium (Ba)	0.7	0.7	
17	Boron (B)	0.3	0.3	
18	Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing Countries
19	Chloride (Cl)	<250	250	
20	Chromium (Cr)	≤0.05	0.05	
21	Copper (Cu)	2	2	
Toxic Inorganics		mg/litre	mg/litre	
22	Cyanide (CN)	≤0.05	0.07	Standard for Pakistan similar to most Asian developing Countries
23	Fluoride (F)	≤1.5	1.5	
24	Lead (Pb)	≤0.05	0.01	Standard for Pakistan similar to most Asian developing Countries
25	Manganese (Mn)	≤0.5	0.5	
26	Mercury (Hg)	≤0.001	0.001	
27	Nickel (Ni)	≤0.02	0.02	
28	Nitrate (NO ₃)	≤50	50	
29	Nitrite (NO ₂)	≤3	3	
30	Selenium (Se)	0.01	0.01	
31	Residual Chlorine	0.2-0.5 at consumer end 0.5-1.5 at source	---	
32	Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing Countries
Organics				
33	Pesticides mg/L	---	PSQCA No. 4629-2004, Page No. 4, Table No. 3, Serial No. 20-58 may be consulted	Annex-II
34	Phenolic Compounds (as Phenols) mg/L	---	≤0.002	

Sr. No.	Properties/Parameters	Standard Values for Pakistan	WHO Standards	Remarks
35	Poly nuclear aromatic hydrocarbons (as PAH) g/L		0.01 (By GC/MS method)	

***PSQCA: Pakistan Standards Quality Control Authority

Explanations: -

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1 percent sulphur content in fuel. Higher content of Sulphur will case standards to be pro-rated.
3. In respect of emissions of sulphur dioxide Nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to National Environmental Quality Standards (NEQS) specified above, comply with the following standards.

Table 3: National Environmental Quality Standards (NEQS, 2009) for Vehicular Emission

Sr. No.	Parameter	Standard (Maximum permissible Limit)	Measuring Method	Applicability
1	Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance of 6 meters or more	Immediate effect
2	Carbon Monoxide (CO)	6%	Under idling condition: Non-dispersive infrared detection through gas analyzer.	
3	Noise	85 dB(A)	Sound Meter at 7.5 meters from the source	

Table 4: National Environmental Quality Standards (NEQS, 2010) for Noise

Sr. No.	Category of Area / Zone	Effective from 1 st July, 2010		Effective from 1 st July, 2013	
		Limit in dB (A) Leq*			
		Daytime	Night-time	Daytime	Night-time
1	Residential Area (A)	65	50	55	45
2	Commercial Area (B)	70	60	65	55
3	Industrial Area (C)	80	75	75	65
4	Silence Zone (D)	55	45	50	45

Note:

1. Daytime hours: 6:00 a.m. to 10:00 p.m.
2. Night-time hours: 10:00 p.m. to 6:00 a.m.
3. Silence Zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters round hospitals, educational institutions and courts.
4. Mixed categories of areas may be decided as one of the four above mentioned categories by the competent authority.

*dB (A) Leq: Time weighted average of the level of sound in scale "A" which is relatable to human hearing.

Table 5: National Environmental Quality Standards (NEQS, 2010) for Drinking Water

Sr. No.	Properties/Parameters	Standard Values for Pakistan	WHO Standards	Remarks
BACTERIAL				
1	All water is intended for drinking (E.Coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100ml sample	Must not be detectable in any 100ml sample	Most Asian Countries also follow WHO Standards
2	Treated water entering the distribution system (E.Coli or Thermotolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100ml sample	Must not be detectable in any 100ml sample	Most Asian Countries also follow WHO Standards
3	Treated water entering the distribution system (E.Coli or Thermotolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100ml 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 100ml 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				
4	Colour	≤15 TCU	≤15 TCU	
5	Taste	Non Objectionable/ Acceptable	Non Objectionable/ Acceptable	
6	Odour	Non Objectionable/ Acceptable	Non Objectionable/ Acceptable	
7	Turbidity	<5 NTU	<5 NTU	
8	Total hardness as CaCO ₃	<500mg/l	---	
9	TDS	<1000	<1000	
10	pH	6.5-8.5	6.5-8.5	
RADIOACTIVE				
11	Alpha Emitters bq/L or pCi	0.1	0.1	

Table 6: National Environmental Quality Standards (NEQS, 2010) for Ambient Air

Pollutants	Time-weighted average	Concentration in Ambient Air		Method of Measurement
		Effective from 1st July 2010	Effective from 1 st January 2013	
Sulphur Dioxide (SO ₂)	Annual Average*	80µg/m ³	80µg/m ³	Ultraviolet Fluorescence Method
	24 hours**	120µg/m ³	120µg/m ³	
Oxides of Nitrogen as (NO)	Annual Average*	40µg/m ³	40µg/m ³	Gas Phase Chemiluminescence
	24 hours**	40µg/m ³	40µg/m ³	
Oxides of Nitrogen as (NO ₂)	Annual Average*	40µg/m ³	40µg/m ³	Gas Phase Chemiluminescence
	24 hours**	80µg/m ³	80µg/m ³	
Ozone (O ₃)	1 hour	180µg/m ³	130µg/m ³	Non disperse UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	400µg/m ³	360µg/m ³	High Volume Sampling, (Average flow rate not less than 1.1m ³ /minute)

Annex III. WHO Standards

Sr. No.	Parameter	Unit	WHO Guideline
1	Temperature	0C	----
2	pH	--	6.5-8.5
3	Total Dissolved Solids (TDS)	mg/l	1000
4	Total Suspended Solids (TSS)	mg/l	---
5	Chloride	mg/l	250
6	Fluoride	mg/l	1.5
7	Taste	Object. /Unobj.	Unobject
8	Odour	Object. /Unobj.	Unobject.
9	Colour	TCU	15
10	Iron	mg/l	0.3
11	Sodium	mg/l	200
12	Nitrate (as NO ₃)	mg/l	50
13	Nitrite (as NO ₂)	mg/l	3
14	Ammonia	mg/l	1.5
15	Hydrogen Sulphide (H ₂ S)	mg/l	0.05
16	Sulphate	mg/l	250
17	Lead	mg/l	0.10
18	Total Hardness as CaCO ₃	mg/l	500
19	Turbidity	NTU	5
20	Zinc	mg/l	3
21	Manganese	g/l	0.1
22	Benzene	mg/l	10-120
23	Aluminum	mg/l	0.2
24	Molybdenum	mg/l	0.070
25	Chromium	mg/l	0.050
26	Cadmium	mg/l	0.003
27	Boron	mg/l	0.300
28	Barium	mg/l	0.700
29	Antimony	mg/l	0.005
30	Arsenic	mg/l	0.010

Sr. No.	Parameter	Unit	WHO Guideline
31	Cyanide	mg/l	0.070
32	Mercury	mg/l	0.001
33	Nickel	mg/l	0.020
34	Total Coliform	Number/100ml	0/100 ml
35	E. Coli	Number/100ml	0/100 ml

Annex IV. Photolog





















Annex V. Environmental Monitoring & Testing Results



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 Registered from EPA Certificate No: PA/Lab-Cer/SEL/002

Water Quality Report

Report reference No: A-20230702

Date: 12/07/2023

Name of Project: Shatung Nullah Diversion Project

Sample Location: Shatung Nullah

Nature of sample: Water

Sample collected sent by: STEPS

Date of sample analysis: 02-03/07/2023

Date of completion of analysis: 03/07/2023

Sr.#	Parameter	Method	Unit	MDL	NEQS Limit	Results
1.	Taste	Sensory Evaluation	-	-	Not objectionable	Acceptable
2.	Odor	Sensory Evaluation	-	-	Not objectionable	Acceptable
3.	Color	APHA 2120 C	Pt/Co	≤ 5	≤ 15	< 5
4.	Turbidity	APHA 2130 B	NTU	≤ 5	< 5	< 5
5.	pH Value @ 25 °C	APHA 4500 H'B	pH Unit	0.01	6.5-8.5	7.73
6.	Conductivity	APHA 2510 B	μS/cm	-	N.S	110
7.	Total Dissolved Solids (TDS)	APHA 2540 C	mg/L	5.0	< 1000	60
8.	Fluoride	APHA 4500 D	mg/L	0.02	≤ 1.5	N.D
9.	Nitrates NO ₃	APHA 4500 NO ₃ E	mg/L	0.04	≤ 50	N.D
10.	Nitrite, NO ₂	APHA 4500 NO ₂ B	mg/L	0.001	≤ 3	N.D
11.	Residual Chlorine	APHA 4500 Cl G	mg/L	0.01	N.S	N.D
12.	Cyanide	APHA 4500 CN E	mg/L	0.002	≤ 0.05	N.D
13.	Total Hardness (as CaCO ₃)	APHA 2340 C	mg/L	4.0	< 500	43
14.	Chloride	APHA 4500 Cl B	mg/L	1.0	< 250	07
15.	Phenolic Compound	APHA 5330 D	mg/L	0.05	N.S	N.D
16.	Aluminium (Al)	APHA 3111 / 3120 B	mg/L	0.1	≤ 0.2	N.D
17.	Antimony (Sb)	APHA 3111 / 3120 B	mg/L	0.005	≤ 0.005	N.D
18.	Arsenic (As)	APHA 3111 / 3120 B	mg/L	0.01	≤ 0.05	N.D
19.	Barium (Ba)	APHA 3111 / 3120 B	mg/L	0.1	0.7	N.D
20.	Boron (B)	APHA 3111 / 3120 B	mg/L	0.1	0.3	N.D
21.	Cadmium (Cd)	APHA 3111 / 3120 B	mg/L	0.003	0.01	N.D
22.	Chromium (Cr)	APHA 3111 / 3120 B	mg/L	0.01	< 0.05	N.D

"Note: This report state the result of the test performed for the sample received by the laboratory from the above stated "Client/Organization". Verification or acknowledgement of the origin on association of the sample being tested to particular site is beyond the responsibility of STEPS Environmental Laboratory."



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 Website: www.stepspakistan.com

Registered from EPA Certificate No: PA/Lab-Cer/SEL/002

Sr.#	Parameter	Method	Unit	MDL	NEQS Limit	Results
23.	Copper (Cu)	APHA 3111 / 3120 B	mg/L	0.5	2.0	N.D
24.	Iron (Fe)	APHA 3111 / 3120 B	mg/L	0.1	8.0	N.D
25.	Lead (Pb)	APHA 3111 / 3120 B	mg/L	0.01	< 0.05	N.D
26.	Manganese (Mn)	APHA 3111 / 3120 B	mg/L	0.1	< 0.5	N.D
27.	Mercury (Hg)	APHA 3112 / 3120 B	mg/L	0.001	< 0.001	N.D
28.	Nickel (Ni)	APHA 3111 / 3120 B	mg/L	0.01	< 0.02	N.D
29.	Zinc (Zn)	APHA 3111 / 3120 B	mg/L	0.5	5.0	N.D
30.	Selenium (Se)	APHA 3111 / 3120 B	mg/L	0.005	0.01	N.D
31.	Sodium (Na)	APHA 3111 / 3120 B	mg/L	1.0	N.S	11.06
32.	Potassium (K)	APHA 3111 / 3120 B	mg/L	1.0	N.S	N.D
33.	Total Coliform	APHA 9222 B	Cfu/10 0ml	-	Absent	Absent
34.	Fecal Coliform	APHA 9222 D	Cfu/10 0ml	-	Absent	Absent
35.	Fecal Streptococci / Enterococci	APHA 9230 C	Cfu/10 0ml	-	Absent	Absent

Note:

NEQS = National Environmental Quality Standards
 MDL = Method Detection Limit
 mg/L = milligram per liter
 APHA = American Public Health Association
 N.D = Not Detected
 N.S = Not Specified

1. **Sample analyzed by:**

Imdad Ullah

**STEPS ENVIRONMENTAL
 LABORATORY**
 Sheikh Maltoon Town Mardan

2. **Countersigned by:**

Director Admin & Finance

Note: This report state the result of the test performed for the sample received by the laboratory from the above stated "Client/Organization". Verification or acknowledgement of the origin on association of the sample being tested to particular site is beyond the responsibility of STEPS Environmental Laboratory.



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Registered from EPA Certificate No: PA/Lab-Cer/SEL/002

Noise Level Report

Report reference No: A-20230703

Date: 12/07/2023

Name of Project: Shatung Nullah Diversion Project

Sample Location: SNDP Weir Site

Nature of sample: Noise

Sample collected sent by: STEPS

Date of sample analysis: 02/07/2023

Date of completion of analysis: 02/07/2023

S. No.	Parameters	NEQS Limits	Noise Level Weir Site	Noise Level Camp Site	Method used
A. Field Analysis					
01	Noise level	75 dB (A)	49.1	40.9	BS 7445:2003
B. Lab Analysis					

National Environmental Quality Standards:

National Environmental Quality Standards (NEQS)

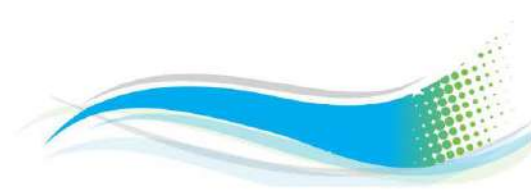
1. **Sample analyzed by:**

Imdadullah

**STEPS ENVIRONMENTAL
LABORATORY**
Sheikh Maltoon Town Mardan

2. **Countersigned by:**

Director Admin & Finance



"Note: This report state the result of the test performed for the sample received by the laboratory from the above stated ""Client/Organization"". Verification or acknowledgement of the origin on association of the sample being tested to particular site is beyond the responsibility of STEPS Environmental Laboratory."



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Registered from EPA Certificate No: PA/Lab-Cer/SEL/002

Ambient Air Quality Report

Report reference No: A-20230701

Date: 12/07/2023

Name of Project: Shatung Nullah Diversion Project

Sample Location: SNDP Weir Site & SNDP Camp Site

Nature of sample: Air

Sample collected sent by: STEPS

Date of sample analysis: 02-03/07/2023

Date of completion of analysis: 03/07/2023

S. No.	Parameters	NEQS Limits	Weir site	Camp Site	Method used	Remarks
01	PM 2.5	35 ug/m ³	19.8	21.2	-β Ray Absorption method	Satisfactory
02	PM 10	150 ug/m ³	53.4	35.1	-β Ray Absorption method	Satisfactory
03	CO ₂	400-600 mg/m ³	121	119	40 CFR Part 50, App. D(US-EPA)	Satisfactory
04	CO	10 mg/m ³	1.34	1.03	Non-Dispersive Infra-Red (NDIR) method	Satisfactory
05	NO ₂	80 ug/m ³	23.1	19.6	Gas Phase Chemiluminescence	Satisfactory
06	SO ₂	120 ug/m ³	12.01	09.01	UV fluorescence (UVF)	Satisfactory
07	NO	40 ug/m ³	26.19	22.12	Gas Phase Chemiluminescence	Satisfactory
08	O ₃	180 ug/m ³	0.00	0.00	Non-Dispersive UV Absorption method	Satisfactory

National Environmental Quality Standards (NEQS)

1. Sample analyzed by:

Imdadullah

**STEPS ENVIRONMENTAL
LABORATORY**
Sheikh Maltoon Town Mardan

2. Countersigned by:

Director Admin & Finance

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Annex VI. Comments of Stakeholders about Shatung Nullah Project

Mr. Mahmood Ghaznavi (Conservator Forest)

Naeem Abbas (DFO DNP)

Dr. Jibran (DFO Skardu)

- Endemic fish “Snow Trout” is found at certain sites of the Nullah when diversion will be done it may move to further ahead, we want a mechanism to contain it on the site where it is actually found. Mr. Shabbir Khan replied a provision of fish ladder may be added to facilitate the movement of fish back to its original habitat.
- Construction work should be started from tail of tunnel and then eventually proceed to head in order to minimize its impact on National Park.
- Protocols of National Park must be followed by all during construction
- No material should be extracted from park site, and if unavoidable the extracted material should be dumped outside the park premises.
- An Environmental Management Plan must be developed before construction starts and recommendations should be added for monitoring of Management Plan and precautionary measures mentioned in Deosai Management Plan and ESIA report.
- Free electricity rights may be given to Satpara community as a mitigation measure to conserve Juniper trees which are extensively used as fuel wood.

Zahid Hussain (Project Coordinator) WWF Skardu

- 12 villages have water rights over Satpara Lake who have to be involved in consultation process. There is Jheel Committee having 12 representatives i.e. 1 from each village and headed by Deputy Commissioner Skardu.

Muhammad Hussain (DOM) GBRSP

- Now first time in Skardu due to water shortage the water supply schedule is introduced which is from 2pm afternoon to 6pm evening. So, the future of Skardu regarding both water and energy production depends on diversion of water from Shatung Nullah.

- Climate change is badly affecting the economy of Skardu as last year snow started to fall in the month of April which is a season in which fruit trees bear fruit, so the fruit production was badly affected.
- Melting of snow which used to start in the month of March in past now starts during May or June which is again an impact of Climate Change. Due to this shift of weather pattern farmers don't get water to grow their crops on time and as a result last year most of the farmers didn't harvest their crops as grass for their cattle as it didn't grow as proper crop.
- He further mentioned that there are three Divisions of Skardu District which are:
 - ✚ Gilgit Division
 - ✚ Dyameer Division
 - ✚ Baltistan Division

In Ganchay lives Noor Bakhshi Community (95%), followed by Shia, Sunni (5%)

In Shigar 98% people belong to Shia Community similarly in Kharang and Skardu town people belonging to Shia sect are 98% and 95% respectively.

Shahzad Shirazi (Director EPA) Gilgit

- Thorough Hydrological Investigations should be done in order to calculate that how much quantity of water is available and how much is required for power production, agriculture use, drinking purposes and environmental flow and prove the justification of the project.
- Full quantity of 10 cumecs of water as suggested in project proposal would only be available for shorter duration of time i.e. from July to August which would not be available during May and June. As the cropping season starts from March so the water will not be available for agriculture usage. This indicates that project feasibility and actual local water demand are conflicting with each other
- Another issue is that will the project meet the water demand round the year as just demand of local community is not enough to justify such a huge expense.
- He added in my opinion the actual problem of local community is water availability for agriculture purposes and not for drinking and electricity shortage.

- He mentioned that almost 4 hydropower projects are already approved and are at tender stage and their construction is about to start which include Kachura Nullah (2MW), Shigar (3MW), Gwari (20MW) and Hapro (30MW). Another hydropower project of Atabad Lake is already approved and will supply electricity to whole Gilgit Baltistan Province.
- Another reason of power shortage is deterioration of old power houses and switch yards in Skardu which are not repaired or managed in due course of time by WADA and now have become ineffective with the passage of time.
- If we compare the estimated cost of Shatung Nullah diversion project and Gwari hydropower project the ensuing project which is at tender stage will be completed well before the preceding project.
- He further added that drinking is used for watering house lawns and for washing vehicles at wash stations in Skardu, which is wastage and we have already sealed 30 wash stations in Skardu and people don't go for conservation and ask for more water to waste.
- He suggested in order to meet the requirement of water for agriculture purposes local community should install Tube Wells to extract underground water. Another option is to install Solar Power units along Tube wells to uplift agriculture water and timely meet their agriculture requirements without interruption.
- He gave a suggestion as alternative to Shatung Nullah project to consider Shila Nullah present on upstream of Shatung Nullah, which has more quantity of water available than Shatung and has longest water shed area could be diverted to get sufficient quantity of water. Another positive aspect of Shila Nullah is that it does not depend on glacial melt for water as it also receives spring water.

Muhammad Zaman (Sn. NRM) AKRSP

- He mentioned that if we consider the option of Shila Nullah its water shed would be disturbed as there are almost 200 households which depend on it. It could only be possible if they are engaged in a dialogue, otherwise there would be conflict over usage of natural resources. He added that if a social support program may be offered only then it may be possible.

- He highlighted that now a days it is observed that water quantity is reducing due to global warming and small lakes around pastures are also drying. Temperature is increasing globally which has risen to almost 46 degrees centigrade in GB.
- He highlighted that there are also Chatpa Nullah, Dappa Nullah in the water shed area of Deosai except Shatung Nullah where there are adjoining villages who may have their water rights and could easily be diverted.
- He added that at the moment there is conflict between people of Hunza and Nagar over Atabad hydropower project over land rights.

Ijlal Ahmad (Conservator Parks and Wildlife) Gilgit

- All protocols of a National Park should be observed while working in a protected area.
- 8.5 Km of area will be deprived of water in case of diversion of water. Mr. Shabbir Khan explained that firstly not all the quantity of water available in the Nullah will be diverted secondly the Environmental flow will also be maintained, hence it will not affect the habitat.

Contacts List of Stakeholders

Sr. No.	Name	Designation	Department	Contact No.
1.	Raja Abid Ali	Director	CKNP Skardu	0346-9691386
2.	Mehmood Ghaznavi	Conservator	Forest Skardu	0344-5400322
3.	Syed name Abbas	DFO DNP	Deosai National Park Skardu	0312-9701447
4.	Dr. Jibran	DFO	Forest Skardu	0355-5126126
5.	Dr. Salar	A/P Environment Dept	Baltistan Univ	0345-2769557

6.	Tariq Umar	Director	PCSIR Skardu	0331-8581551
7.	Yasir Abbas	Ecologist	CKNP Skardu	0346-9235510
8.	Shezad Shigri	Director	EPA Gilgit	0300-3689340
9.	Rehmat Ali	Head Environment Section	WWF Gilgit	0346-9751659
10.	Muhammad Zaman	Senior NRM	AKRSP Gilgit	0346-8114431
11.	Ijlal Ahmed	Conservator	Parks & Wildlife Gilgit	-
12.	Muhammad Hussain	DOM	GBRSP Skardu	0346-8113747
13.	Altaf Hussain	Program Coordinator	WWF Skardu	0355-5402967