USAID
FROM THE AMERICAN PEOPLE

INITIAL ENVIRONMENTAL EXAMINATION (IEE) OF ADDITIONAL WATER RESOURCES SATPARA

Aga Khan Rural Support Programme

USAID
FROM THE AMERICAN PEOPLE

INITIAL ENVIRONMENTAL EXAMINATION (IEE) OF ADDITIONAL WATER RESOURCES SATPARA

Aga Khan Rural Support Programme

INITIAL ENVIRONMENTAL EXAMINATION (IEE) OF ADDITIONAL WATER RESOURCES SATPARA

Final Report

May, 2017

Aga Khan Rural Support Programme

EXECUTIVE SUMMARY

The Initial Environmental Examination (IEE) has been prepared in compliance with the requirement under Section 16 of Gilgit Baltistan Environmental Protection Act, 2014 (GB-EPA 2014). The GB-EPA 2014 empowers the GB-EPA as the principal authority for environmental management in Gilgit-Baltistan, Pakistan. It has also established the requirement of environmental assessment of any project in place prior to commencement of work.

The proposed project of "Additional Water Resources" at Satpara falls under Schedule-I of EIA/IEE Regulation 2000 requiring an IEE at planning stage. Accordingly an IEE report has been developed and submitted to GB-EPA for review and approval.

Aga Khan Rural Support Program (AKRSP) being the project developers planned to conduct the IEE for the proposed project prior to construction activities in order to obtain environmental compliance. The study has taken all the relevant national legislations and regulations into consideration followed by site visits and details of constructional and operational activities of proposed project. Environmental and socio-economic baselines are taken through field surveys and from previous reports, books and other literature available specifically for the area. The baseline has been further investigated and confirmed during field visits.

The main purpose of this Initial Environmental Examination (IEE) study is to ensure:

- All major and minor; positive and negative impacts on the environment (physical, biological and social) during the different stages inception as well as pre-construction, construction and operation of proposed construction of water resources are identified;
- Appropriate and adequate mitigation measures are suggested to reduce or eradicate the adverse impacts and practical procedures for their implementation are provided;
- Environmental Management Plan (EMP) for sustainable operation of the project forms an essential part of the IEE document;

The assessment has primarily focused on the construction activities and later on the operation activities. The major areas covered in the impact analysis include water governance, geology, air and noise, solid waste, occupational safety and socio-economic factors.

The findings of impact study and visual inspections of the existing environment of the project area in the present scenario, indicates main impacts for ***the construction and operational phase*** along with simultaneous relevant and appropriate measures.

PURPOSE OF THE PROJECT

Satpara Development Project (SDP) is currently planning to build irrigation infrastructure on the existing water flow channels for identified additional water sources which exist above left bank canal (LBC) and right bank canal (RBC), the basic idea is to bring in more water to developed or proposed tertiary channels so that water needs which are unmet due to non-functionality of LBC and RBC can be met. The newly build irrigation infrastructure on additional water sources will bring more land under irrigation network. Thayoure, Hussainabad and Burgaiy Nallahs are being studied under the proposed scheme.

PROPONENT INTRODUCTION

Aga Khan Rural Support Programme (AKRSP) was established against a backdrop of newly abolished feudal institutions, declining traditional systems of community cooperation and weak or non-existent public and private sector services. It was required to work with all the communities living in GBC, help double the per capita income and develop a replicable model for participatory rural development.

AKRSP is one of many institutions and initiatives of the Aga Khan Development Network (AKDN) active in the program area.
Simultaneously and increasingly through collaboration with one another, AKDN institutions are contributing to significant development gains in the sectors of resource development, education, health, cultural revitalization, water and sanitation, building and construction, tourism, enterprise development, microfinance and disaster preparedness and relief.

The Programme has attracted keen interest and scrutiny from independent observers and its work is acknowledged as pioneering and a rare success in a difficult environment. The experiment has also contributed to creating enabling policy and institutions in Pakistan.

PROJECT DESCRIPTION

Skardu, the headquarters of Baltistan, lies on the left bank of River Indus at about 7750 feet above sea level. Satpara Dam is located downstream of the Satpara Lake approximately four kilometres south of Skardu City. USAID has already funded the construction of Satpara Dam having storage capacity of 93,310 acre feet of water. The Dam was built to generate 17.3 MW power from 04 power houses in addition to providing water for drinking and bringing more area under irrigation. The dam will also

help in controlling and mitigating floods. Reliable availability of water for irrigation and power generation would help boost the economy of the area besides improving livelihood and living standards of people. The Satpara Dam Project includes irrigation system, which consists of a Diversion Weir on the Satpara Nallah, Left Bank Canal, Right Bank Canal and their distributaries and minor canals in Skardu town between the villages of Hoto Ranga in the West and Thorgo Bala in the East.

In order to deliver the above mentioned objectives, the project interventions have been framed by AKF under four inter-related components, such as:

(i) Improved irrigation system to achieve maximum efficiency of irrigation water,

(ii) Increased production, productivity and value of horticulture and dairy products,

(iii) Processing and marketing of value-added horticulture and dairy products in local, national and international markets, and

(iv) Creating an enabling environment for growth of commercial agriculture in project area.

PHYSICAL ENVIRONMENT

The proposed project scope lies within the existing water courses and natural hydrogeology. No change in land-use or landscape has been identified. Satpara is part of one of the aesthetic and environmentally sound northern area of Pakistan, Skardu, which is generally considered as less developed. The area is generally mountainous and fertile land which has natural availability of water, furthermore, a dam located upstream provides better water governance opportunities to the area.

BIOLOGICAL ENVIRONMENT

Data for the IEE was assembled from both primary and secondary sources. Baseline field surveys were conducted in 2016. Minimal floral habitat was found that may need special attention, the project will be carefully executed to eliminate unnecessary damage to vegetation. No endangered or threatened species were found to be existent within the proposed project areas. Since the project activities are not intense in magnitude that may disrupt any biological aspect, the environment itself sustains good ecological niche.

SOCIOECONOMIC ENVIRONMENT

The livelihood of the people of the Satpara Town is usually of lower class population with rural and semi-urban culture. The source of income in the region is generally from agriculture and skilled laborers. The main source of drinking water is from the water courses of the project area. Local water governance authorities are responsible for equitable distribution of water among the community. More options for better water governance are being explored through this project.

As far as the educational facilities are concerned especially universities and colleges, are not enough to facilitate the communities of the rural part of area although the developed part which are located at distance from the project areas has a good number of schools, colleges and universities as well . The proposed project area have poor health and other essential facilities that do not have enough expertise and well equipment to cater the serious health problem. The major identified source of transportation in the vicinity of proposed project area is their own vehicles, while few public transport vehicles are also available for the residents of the area.

IMPACT ASSESSMENT & MITIGATIONS

The assessment has primarily focused on the construction activities and later on the operation activities. During the initial construction phase there can be considerable environmental impacts mainly due to civil works such as site preparation, vehicle movement etc. Construction phase impacts are usually temporary and localized phenomenon, while impact sources and the potential impacts on the environment during the construction phase are identified and are evaluated for their mitigation measures.

During operation phase there are no significant impacts as there are no environmental deteriorating aspects involved in the project rather it is going to enhance the quality as well as evolve the area socially. Similar to the construction phase, the net impact on each environmental element due to various sources have been identified and evaluated for their mitigation measures. The mitigations for the identified impacts due to the proposed project are summarized in the Environmental Management Plan given below.

CONCLUSION

The IEE of the proposed project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;
- Identification of the environmental features of the project area including the physical, biological and social disturbance and likely impact of the project on the environment;
- Recommendation of appropriate mitigation measures that AKRSP will incorporate and ensure as per this IEE into the project to minimize the adverse environmental impacts.

"If the activities are undertaken as proposed and described in this report and the recommended mitigation measures and environmental management plan is adopted, it is concluded that the proposed project will increase the existing water sources capacity to supply more water for more agricultural lands without causing any negative impact. The proposed project is favorable in all respects which include irrigation capacity, economics and environmental impacts."

Environmental Monitoring during Construction Phase

S. N	Environmental Aspect	Scope of Monitoring	Method	Frequency of Monitoring / Auditing	Responsibility	Budget
1	**Air Quality**	Parameters as per GB EQS	Ambient Air Analyzer	Monthly	Project Manager/ Contractor	100,000/-
2	**Noise Levels**	Noise levels at various locations in and around the project site	Using sound pressure level meter	Monthly	Project Manager/ Contractor	80,000/-
3	**Land Use and Soil**	Soil erosion/ degradation	Visual assessment Photographic evidences	From beginning till completion of project	Project Manager/ Contractor	-
4	**Geology**	No egress of land due to project activities	Project area being demarcated	From beginning till completion of project	Project Manager/ Contractor	-
5	**Landslides**	Slopes and Land stability	Protective measures are in place	From beginning till completion of project	Project Manager/ Contractor	-
6	**Agriculture and Vegetation**	Equal water distribution Agriculture activities are uninterrupted	Local water governing bodies maintain log for distribution Community feedback log is maintained	From beginning till completion of project	Project Manager/ Contractor	-
7	**Water**	Water borne diseases Water scarcity Ensure Spills prevention plan is available	Check water drainage system Ensure the plan is being implemented	Monthly	Project Manager	-

S. N	Environmental Aspect	Scope of Monitoring	Method	Frequency of Monitoring / Auditing	Responsibility	Budget
8	**Solid Waste**	Health hazards Property loss Unaesthetic conditions Hazardous waste will not be mixed with non-hazardous Transfer of hazardous solid waste will be done by GB-EPA approved contractors	Solid waste management Designated areas for solid waste storage Safe disposal and segregation Waste disposal through contractors to be kept in record. Record of solid waste generated	Monthly	Project Manager/ Contractor	120,000/-
9	**Terrestrial Ecology**	Replantation program to be implemented by local communities	On-site inspection	Quarterly	Project Manager	-
10	**Temporary labor camps**	Resource Conservation practices (water & electricity consumption) Solid waste segregation and storage Adequate water supply and drainage system Housekeeping	Records of resource consumption Visual assessments Waste Management	Weekly	Project Manager/ Contractor	100,000/-

Environmental Monitoring during Operation Phase

S.N	Environmental Aspects	Scope of Monitoring / Auditing	Method	Frequency of Monitoring	Responsibility	Budget
1	Soil and Land-use	Channels will be inspected for durability	On-site inspection, community awareness questionnaires	Monthly	AKRSP	
2	Water Resources	Equal distribution of water resources	Complaint Register; Community Awareness questionnaires	Monthly	AKRSP	
3	Climate	None Required	Nil	N/A	None	
4	Agriculture and Vegetation	Good Water governance by equal and legal distribution to agriculture lands	Water distribution log by local water departments	Monthly	AKRSP	

LIST OF CONTENTS

9.0 CONCLUSION

ANNEXURE

LIST OF EXHIBITS

Chapter: 6 SOCIO-ECONOMIC ENVIRONMENT

Chapter: 7 ENVIRONMENTAL IMPACTS AND MITIGATIONS

Chapter: 8 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Chapter 1

INTRODUCTION

1.1 PROJECT TITLE

Construction of Additional Water Sources at Left Bank Canal and Right Bank Canal of Satpara Development Project

1.2 PROJECT PREAMBLE

Skardu, the headquarters of Baltistan, lies on the left bank of River Indus at about 7750 feet above sea level. Satpara Dam is located downstream of the Satpara Lake approximately four kilometres south of Skardu City. USAID has already funded the construction of Satpara Dam having storage capacity of 93,310 acre feet of water. The Dam was built to generate 17.3 MW power from 04 power houses in addition to providing water for drinking and bringing more area under irrigation. The dam will also help in controlling and mitigating floods.

Reliable availability of water for irrigation and power generation would help boost the economy of the area besides improving livelihood and living standards of people. The Satpara Dam Project includes irrigation system, which consists of a Diversion Weir on the Satpara Nallah, Left Bank Canal, Right Bank Canal and their distributaries and minor canals in Skardu town between the villages of Hoto Ranga in the West and Thorgo Bala in the East.

The Cooperative Agreement for implementing the US$ 19.75 million worth of Satpara Development Project (SDP) was signed between USAID and the Aga Khan Foundation on 12th March 2012. The strategic objective of the project is to consolidate the impact of investment in Satpara Dam on the community living within the command area through improved income generating and employment opportunities. This will be materialized by downstream development of irrigation infrastructure which will result in efficient use of available irrigation water for horticulture and dairy development at a commercial scale. Over 9,000 households will directly benefit from the project activities with at least 35% of the women population.

In order to deliver the above mentioned objectives, the project interventions have been framed by AKF under four inter-related components, such as:

(i) Improved irrigation system to achieve maximum efficiency of irrigation water,

(ii) Increased production, productivity and value of horticulture and dairy products,

(iii) Processing and marketing of value-added horticulture and dairy products in local, national and international markets, and

(iv) Creating an enabling environment for growth of commercial agriculture in project area.

The Aga Khan Rural Support Program (AKRSP) is responsible for overall project implementation; Aga Khan Foundation Pakistan (AKF-P) is responsible for inter-agency coordination, monitoring and grant management and being the Executing Agency, it bears the ultimate responsibility for project results and reporting to USAID.

1.3 PROPONENT INTRODUCTION

Aga Khan Rural Support Programme (AKRSP) was established against a backdrop of newly abolished feudal institutions, declining traditional systems of community cooperation and weak or non-existent public and private sector services. It was required to work with all the communities living in GBC, help double the per capita income and develop a replicable model for participatory rural development.

Since its inception in 1982, AKRSP has been working in partnership with local communities, government agencies in Northern Pakistan and other development actors. Some of its development approaches has become a model for rural programs throughout the country and other parts of the world. For more than two decades AKRSP has been engaged in a creative effort of building community capacity to pursue local development in the remote, mountainous and resource-scarce Northern Pakistan. This pioneering effort has led to dramatic progress in economic and social sectors in the region, including a tripling of income levels, reduction in infant mortality, improved levels of education especially for women, and reduced gender disparities.

AKRSP is one of many institutions and initiatives of the Aga Khan Development Network (AKDN) active in the program area. Simultaneously and increasingly through collaboration with one another, AKDN institutions are contributing to significant development gains in the sectors of resource development, education, health, cultural revitalization, water and sanitation, building and construction, tourism, enterprise development, microfinance and disaster preparedness and relief. The foundation for many of these achievements has been the network of community-based organizations (more than 4,000 Village Organizations and 1,500 Women's Organizations) which AKRSP has fostered throughout the programme area. These VOs and WOs identified the development

needs of their respective communities, planned specific initiatives/projects with AKRSP's assistance, established linkages with government, and implemented more than 8,000 projects throughout the programme area. AKRSP's encouragement of a nascent, socially responsible private sector – applying social mobilization techniques to create farmers' associations, farmer-based service companies, fair trade initiatives, and businesses more inclusive of women – have further broadened the developmental horizons of the program area.

The Programme has attracted keen interest and scrutiny from independent observers and its work is acknowledged as pioneering and a rare success in a difficult environment. The experiment has also contributed to creating enabling policy and institutions in Pakistan.

Globally, major donors have followed AKRSP's model closely and mainstreamed many of its lessons into their own development strategies and programmes. The World Bank has tracked AKRSP's experiment for nearly two decades and helped globalize many of its innovations, including social intermediation techniques, community stewardship of natural and cultural resources, public-community partnership role models and stakeholder ship approaches at the grassroots level. The Programme has been cost effective and created long-term assets.

Currently, AKRSP is working around the following development paradigm to reduce poverty and gender inequalities from Gilgit-Baltistan and Chitral;

a) Institutional development; through institutional development AKRSP has been forming village and women's organizations and now local support organizations (a union council based supra organization with the membership of VOs, WOs and other NGOs in the UC), building capacity of community people and other development partners in the area, creating linkages of community organizations with other development agencies including government line departments, and initiating targeted poverty projects for very poor households.

b) Gender and development; in order to reduce gender gap and inequalities AKRSP has been fostering WOs, enhancing their capacities, increasing women's mobility and income, including women in bigger forums and creating gender awareness among communities, elected reps, government officials and other development partners.

c) Resource development; resource development is one of the major development initiatives of AKRSP and is mainly to strengthen local institutions, increase income, and improve environment through initiating infrastructure (irrigation projects, link roads, micro hydels, water supply schemes and community buildings) and natural resource management packages such as plantation, seed improvement, breed improvement, fruit improvement etc.)

d) Market development; the main thrust of market development is to develop the local market and link them with national and international market. Furthermore,

under the market development programme local people are trained to produce quality products. Production is followed by grading, package designing, packaging, accumulation and bulk marketing.

1.4 DETAILS OF IEE TEAM

The Consultants involved for this project are as follows:

Sr.	Name	Position	Capacity
1.	Dr. Najam Khurshid	Biodiversity Specialist & Hydro-Ecology Expert	Consultant (Team Leader)
2.	Mr. Abdul Basit Khan	Environmental Assessment Specialist	Consultant
3.	Mr. Ilyas Hussain	Environmentalist	SDP-AKRSP
4.	Ms. Naik Bano	Assistant Environmentalist	SDP-AKRSP
5.	Mr. Raza Muhammad	Assistant Environmentalist	SDP-AKRSP
6.	Mr. Muhammad Iqbal Khan	Sr. Social Mobilizer	SDP-AKRSP

1.5 JUSTIFICATION OF THE PROJECT

SDP is currently planning to build irrigation infrastructure for identified additional water sources which exist above left bank canal (LBC) and right bank canal (RBC), the basic idea is to bring in more water to developed or proposed tertiary channels so that water needs which are unmet due to non-functionality of LBC and RBC can be met. The newly build irrigation infrastructure on additional water sources will bring more land under irrigation network. Thayoure, Hussainabad and Burgaiy Nallahs are being studied under the proposed scheme.

1.6 LEGISLATIVE REQUIREMENT

The IEE of the Proposed Project activity will be subjected to the pertinent legislative and regulatory requirements of the Government of Gilgit-Baltistan including State laws. Legislation presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

The proposed project requires an IEE under the project category of **SCHEDULE I "Water management, dams, irrigation and flood protection"** as per the guidelines issued by the Pakistan Environmental Protection Agency (Pak-EPA) followed by Gilgit-Baltistan Environmental Protection Act 2014 (GB-EPA 2014).

According to these guidelines, projects under this category require an IEE to be conducted. GB-EPA 2014 is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. The Act is broadly applicable to air, water, soil, marine and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act.

The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the provincial EPA and adherence with National Environmental Quality Standards (NEQS).

Under section 16 of GB-EPA 2014;

“No proponent of a project shall commence construction or operation unless he has filed with the EPA an IEE or EIA, and has obtained from the EPA approval in respect thereof”.

1.7 PURPOSE OF THE STUDY

The purpose of this IEE study is to evaluate the proposed project activities against Pakistan Environmental Protection Agency (PEPA) standards and that USAID for Environmental Assessments.

The specific objectives of this IEE are to:

- Assess the existing environmental conditions in the proposed project area, including the identification of environmentally sensitive areas and receptors;
- Assess the various activities to identify their potential impacts on environment, evaluate these impacts, and determine their significance;
- Propose appropriate mitigation measures that can be incorporated into the rehabilitation plans of the proposed project to minimize damaging effects or lasting negative consequences identified by the environmental assessment;
- Assess the proposed activities and determine whether they comply with the relevant environmental regulations in Pakistan;
- Prepare an IEE report for submission to the GB-EPA.

1.8 SCOPE OF THE IEE

For the IEE study, the scope of work is as under:

- Description of physical, environmental, socio-economical and cultural conditions in the proposed project area;
- Project impact identification, prediction, and significance based on proposed project activities;
- Identification and assessment of the workability of mitigation measures to offset or minimize negative project impacts on environment.

1.9 APPROACH AND METHODOLOGY

The IEE was performed in five main phases, which are described below.

1.9.1 Scoping

The key activities of this phase included:

Project Data Compilation: A generic description of the proposed activities (i.e. construction and operation), within the proposed project area relevant to environmental assessment, was compiled with the help of PEPA Guidelines.

Literature Review: Secondary data on weather, soil, water resources, and wildlife vegetation was reviewed and compiled.

Legislative Review: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.

Identification of Potential Impacts: The information collected in the previous steps was reviewed, and potential environmental issues were identified.

1.9.2 Baseline Studies

Following the scoping exercise, the proposed project area was surveyed to collect primary data. During the field visits, information was collected on ecologically important areas, ambient air quality, surface and groundwater resources, existing infrastructure, local communities, public services, and sites of archaeological or cultural importance. The following specific studies were conducted as part of the IEE.

Wildlife Study: A wildlife expert has conducted wildlife study, which consist of a thorough literature review and field data collection. During the fieldwork, the faunal species of the area were documented. The diversity of avian, large and small mammals, and reptile species were determined. Information was collected on the species found in the area.

Floral species of the area were also identified through fieldwork and literature review.

Physical Environment: Environmental Assessment Specialists conducted physical environmental study and information also extracted from secondary data including, ambient air, noise, water sampling, surface water resources and the groundwater resources of the areas. Specialists also carried out the impact of proposed project on soil and water resources.

Socioeconomic Study: A sociologist conducted socioeconomic and cultural study in the proposed project area. The study team through participatory technique collected data from the locals of the proposed project area as well as the local governing bodies. The

profile included livelihood, culture, leadership, gender issues, spiritual and temporal leadership, demographic information based on field data and published sources, the existing use of land resources, community structure, employment, distribution of income, goods and services, public health, local religious and cultural values, and local customs, aspirations, and attitudes.

1.9.3 Impact Assessment

The environmental, socioeconomic and cultural, gender and project information collected in previous phases was used to assess the potential impacts of the proposed activities. The issues studied included potential project impacts on:

- Groundwater and surface water quality;
- Ambient air quality;
- Ecology of the area, including flora and fauna;
- Local communities.

Wherever possible and applicable, the discussion covers the following aspects:

- The present baseline conditions;
- The change in environmental parameters likely to be effected by proposed project related activities;
- Identification of potential impacts;
- Likelihood and significance of potential impacts;
- Mitigation measures to reduce impacts to as low as possible;
- Prediction of impacts, including all long-term and short-term, direct and indirect, and beneficial and adverse impacts;
- Evaluation of the importance or significance of impacts (The significance of each impact has been judged on the basis of available local, national, and international standards. Where such standards were not available, the best practice elsewhere has been referred to);
- Implementation of mitigation measures (i.e., environmental management);
- Determination of residual impacts;
- Identification of controls and monitoring of residual impacts.

1.9.4 Documentation

At the end of the assessment, a report is prepared according to the relevant guidelines of PEPA and USAID. This report includes the findings of the assessment, proposed project impacts, and mitigation measures to be implemented during the execution of the proposed activities.

Components of this Report are:

Chapter: 1 Introduction

Chapter: 2 Project Description

Chapter: 3 Institutional, Legislation and Policy Framework

Chapter: 4 Environmental Baseline: Physical

Chapter: 5 Environmental Baseline: Biological

Chapter: 6 Environmental Baseline: Socio-economic

Chapter: 7 Environmental Impacts Assessment

Chapter: 8 Environmental Management and Monitoring Plan

Chapter: 9 Conclusion

Chapter 2

PROJECT DESCRIPTION

2.1 PROJECT TITLE

This chapter discusses the overview of the proposed project describing its purpose, proposed design and its plan of development. It entails the proposed project's location and the activities involved in the development of the project and its operation phases.

2.2 OBJECTIVES OF SDP

The specific objectives of SDP are to establish a community managed irrigation system which will ensure;

- Efficient use of irrigation water by modernization of existing centuries old irrigation systems;
- Construction of a system for new area to be brought under irrigation, introducing modern practices to boost farm productivity;
- Encouraging private sector to enhance processing and marketing of value added agricultural products; and
- Creating an overall enabling environment to support the functioning of irrigation infrastructure and agricultural enterprises.

The SDP broadly covers the following four components that are designed to contribute in achieving the ultimate objectives of the project. All these components are mutually reinforcing and interactive for achieving long term sustainable results.

1. Efficient Use of On-Farm Irrigation Water
2. Enhanced Productivity of Higher Value Horticulture and Dairy Products
3. Enhanced Processing and Marketing Capacity of the area
4. Creation of an Enabling Environment for the Agriculture Sector to Grow.

2.3 NEED OF THE PROJECT

Agriculture is an important component of the Skardu's economy. An area of more than 15,500 acres is available for farming but considerable part of which could not be cultivated due to shortage of irrigation water. In order to augment irrigation water for the area, the Sadpara Dam Project on the Sadpara Lake was constructed. The major allied infrastructures developed along with Dam are Right Bank Canal (RBC) and Left Bank Canal (LBC) which meant to irrigate additional land with the increased supply of water after the construction of the Dam.

SDP is a USAID funded project implemented by AKF (P) / AKRSP and it is in continuation of previous two (02) projects i.e. Construction of Satpara Dam and Main Canals on both banks (LBC and RBC). SDP has four components and Component-I is efficient use of irrigation water at farm level by improving existing and construction of new irrigation infrastructures at primary, secondary and tertiary level. SDP irrigation infrastructures are of two types i.e. from LBC and RBC to the villages (i.e. primary and secondary channels), and within the village to various farms i.e. tertiary channels.

It was found that a large amount irrigation water is absorbed in the soil due to the unlined irrigation system thus at present the irrigation water is not sufficient enough to irrigate the entire command area under RBC and LBC but by lining of the canals, quantity of irrigation water can be enhanced. The livelihood of the people of this area strongly depends on agriculture but its full potential could not be evolved due to less availability than required quantity of irrigated water. In order to assess ground reality and to propose solutions to the issue, a study was conducted by the AKF (P) through the University of Agriculture, Peshawar. One of the recommendations of the study is to use alternate sources of irrigation water available in the area to include in the system for optimum utilization of RBC and LBC and to increase area for cultivation

2.3.1 Feasibility Assessment of Water Sources

Initially thirteen (13) water sources were identified but eventually seven (07) were selected for detailed study as discharge of other six (06) sources is very nominal and only sufficient for the existing land. The discharge of selected seven (07) sources is not only in

excess quantity but owners are also ready to share the extra irrigation water with non-water right holders. Therefore, a detailed study of the seven (07) additional sources available in the surroundings of command area of SDP is being conducted to find the water availability from these sources. The water sources that are identified are listed in
Exhibit 2.1.

Exhibit 2.1: Water sources identified for feasibility studies

S. No.	Name of Water Source	Type
1	Nullah Thorgu Bala	Seasonal
2	Thorgo Payeen Nulla	Seasonal
3	Hussain Abad Nullah 1 & 2	Perennial
4	Burgay Nullah	Perennial
5	Shigari Nullah	Seasonal
6	Thayur Nullah	Perennial
7	Chunda Spring	Seasonal

It was calculated that by connecting these sources with the existing system, around 2000 acres can be easily irrigated. Due to budget constraints, channels of only three (03) sources can be constructed (highlighted in **Exhibit 2.1**) that will cover around 1200 acres for cultivation.

It would be better to construct all seven (07) channels mentioned in **Exhibit 2.1** but for the time being, three channels (Hussain Abad Nullah, Thayur Nalluh and Burgay Nullah) are selected for improvement.

2.4 PROPOSED PROJECT LOCATION

The proposed project will be implemented within the command area of Left Bank Canal (LBC) and Right Band Canal (RBC) of the Satpara Dam in Skardu town between the villages of Hoto Ranga in the West and Thorgo Bala in the East with Skardu Town in the middle. Location maps of Thayur Nullah, Burgay Nullah and Hussain Abad Nullah can be seen in **Exhibits 2.2, 2.3** and **2.4** respectively.

Exhibit 2.2: Location map of Thayur Nullah

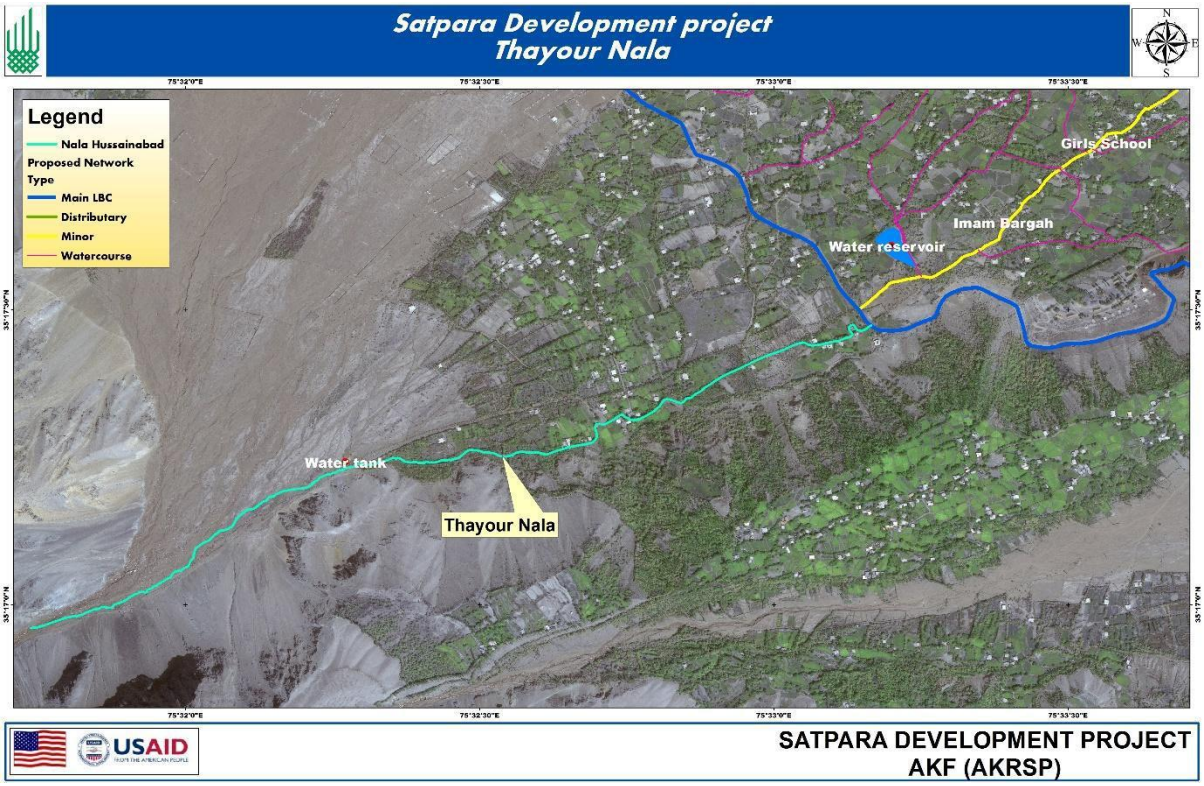


Exhibit 2.3: Location map of Burgay Nullah

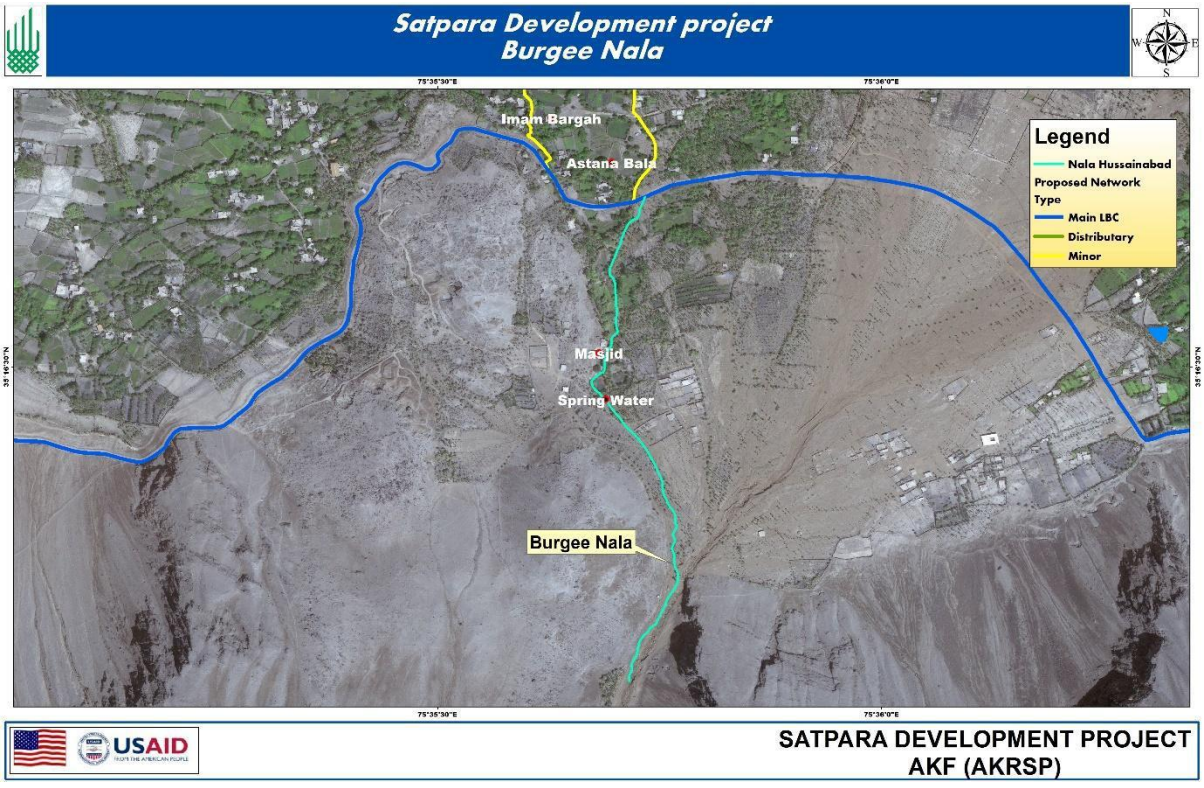
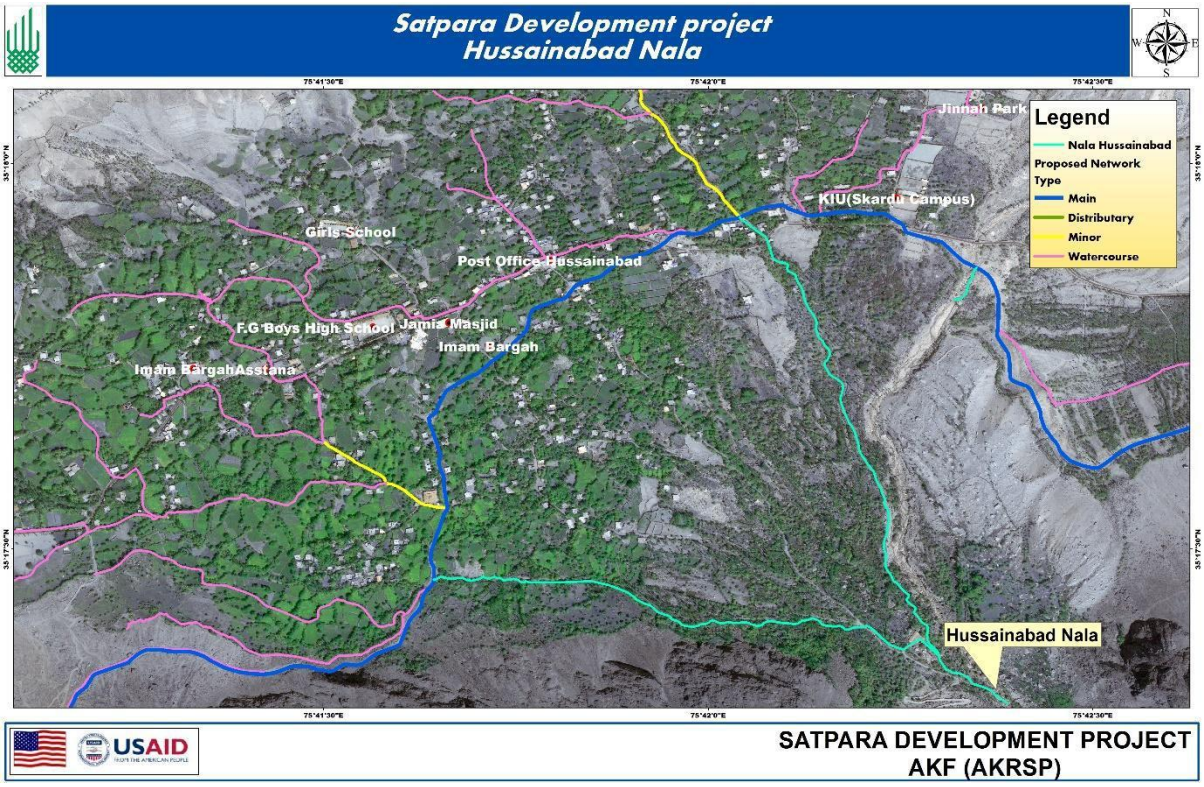


Exhibit 2.4: Location map of Hussain Abad Nullah



2.5 SALIENT FEATURES OF PROPOSED PROJECT

The proposed project will include construction of primary channels by rectangular stone masonry and PCC. This project is to support SDP in which the no. of huseholds that are direct beneficiaries will be 8547 while the total beneficiary population will be 68376. The existing water supply system in SDP covers about 12300 acres of land in Skardu Valley. No quarrying sites will be included in the project area. Salient Features of the proposed project are entailed in **Exhibit 2.5.** The existing water structure systems of the area and the proposed development can be seen in **Exhibit 2.6, 2.7** and **2.8**.

Exhibit 2.5: Salient features of proposed project

Sr. No.	Name of Water Source	Coordinates	Width (m)	Length (m)	Depth (m)	Water Flow (cusecs)	Resultant Cultivated Area (acres)
1.	Thayure Nalla	E: 75.528946 N: 35.282677	1.50	2592	0.900	50.04	88
2.	Burgae Nalla	E: 79.595273 N: 35.269146	1.50	1050	0.900	50.04	341
3.	Hussain Abad-I		1.830	1209	0.900	30.01	1100
4.	Hussain Abad-II		1.830	1250	0.900	30.01	576

Exhibit 2.6: Existing water supply in SDP.

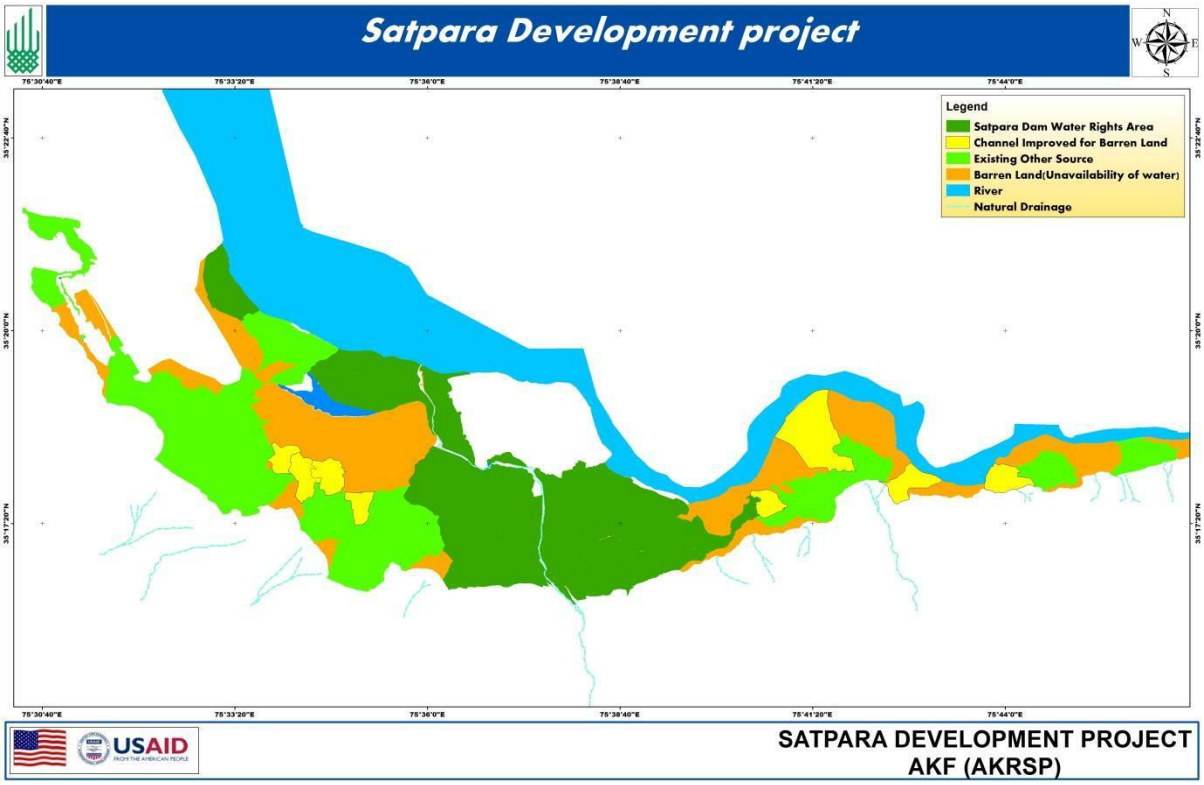


Exhibit 2.7: Minor channel network in SDP

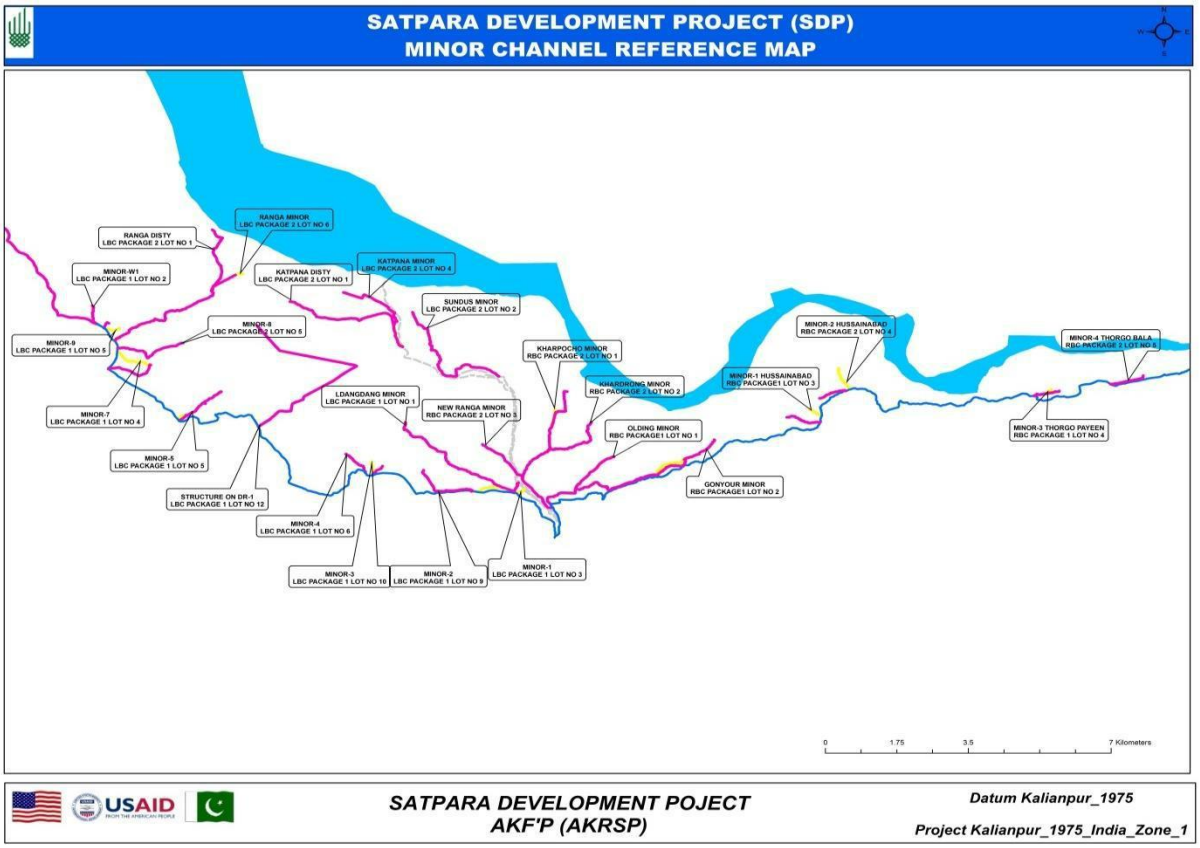
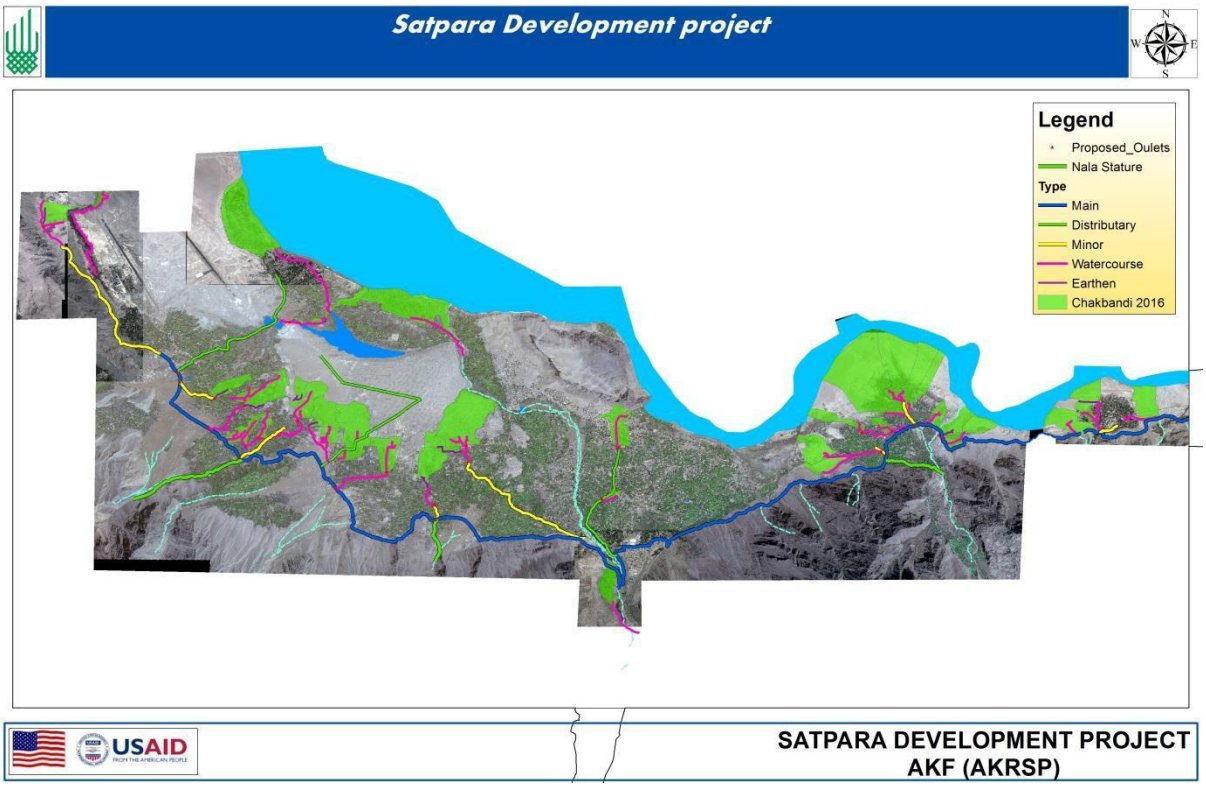


Exhibit 2.8: Water courses and structures layout



Chapter 3

INSTITUTIONAL, LEGISLATION AND POLICY FRAMEWORK

The IEE of the proposed project will be subjected to the pertinent legislative and regulatory requirements of Gilgit Baltistan Government and the Government of Pakistan including State laws. This chapter of the report presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

3.1 NATIONAL ENVIRONMENTAL POLICY, LEGISLATION AND GUIDELINES

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively new and ongoing phenomenon in Pakistan. Whereas, a basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is now in place, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following section presents a brief overview of the existing national policies, legislation and guidelines.

3.1.1 National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary Policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the country's environment.

A midterm review of the achievements of NCS in 2000 concluded that achievements under NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that NCS was not designed and is not adequately focused as a national sustainable development strategy[1]. The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national

[1] Arthur J. Hanson et al, Pakistan's National Conservation Strategy Renewing Commitment to Action, Report of the Mid-Term Review, 2000

environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.

The National Environmental Action Plan was approved by the Pakistan Environmental Protection Council under the chairmanship of the President/Chief Executive of Pakistan in February 2001. NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan.

A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005[2]. This policy has already been endorsed by the Pakistan Environmental Protection Council during 2004. The new policy has total 171 guidelines on sectoral and cross-sectoral issues. The objectives of new policy include assurance of sustainable development and safeguard of the natural wealth of country. The following are the approved Sectoral Guidelines;

- Water Supply and Management;
- Air Quality and Noise;
- Waste Management;
- Forestry;
- Biodiversity and Protected Areas;
- Climate Change and Ozone Depletion;
- Energy Efficiency and Renewable;
- Agriculture and Livestock;
- Multilateral Environmental Agreements.

3.1.2 Gilgit-Baltistan Environmental Protection Act 2014

The Gilgit-Baltistan Environmental Protection Act, 2014 (GB EPA 2014) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The GB EPA 2014 is broadly applicable to air, water, soil, marine and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act.

The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the GBEPA and adherence with Gilgit-Baltistan Environmental Quality Standards (GB EQS).

[2] http://www.mocc.gov.pk/gop/index.php?q=aHR0cDovLzE5Mi4xNjguNzAuMTM2L21vY2xjL3VzZXJmaWxlczEvZmlsZS9NT0MvTmF0aW9uYWxFbnZpcm9ubWVudGFsUG9saWN5MjAwNS5wZGY%3D

3.1.3 Pakistan Penal Code, 1860

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[3].

3.1.4 Pakistan Explosives Act, 1884

This Act provides regulations for the handling, transportation and use of explosives during quarrying, blasting and other purposes. As no blasting or other such activity is involved, therefore, triggering of the Act is not expected.

3.1.5 Land Acquisition Act, 1894

This Act is the primary law for acquisition of land and built-up properties for public interest in Pakistan and also sets out the procedure and rules for acquisition and compensating the land owners, including for any damage caused to their properties, crops and trees by a project, however it lacks the mechanism to address the complex issues of resettlement. The Act comprises 55 sections dealing with area notifications, surveys, acquisition, compensation, appointment awards, disputes resolution, penalties and exemptions.

No land acquisition is involved so this act will not be triggered.

3.1.6 Forest Act, 1927

This Act authorizes provincial forest department to establish forest reserves and protected forests. The Act prohibits any person from: setting fires in the forest; quarrying stone; removal of any forest produce; or causing any damage to the forest by cutting trees or clearing areas for cultivation or any other purpose.

As there is no protected forest in the command area therefore triggering of this Act is also not expected.

3.1.7 The Gilgit – Baltistan Wildlife Preservation Act, 1975

This law was enacted to protect the province's wildlife resources directly and other natural resources indirectly. It classifies wildlife by degree of protection, i.e., animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances. The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife protected areas, i.e., National Parks, Wildlife Sanctuaries, and Game Reserve. The project activities will have to be carried out in accordance with this Act. In

[3] http://www.fmu.gov.pk/docs/laws/Pakistan%20Penal%20Code.pdf

particular, no activities will be carried out inside any protected areas established under the Act.

As per wildlife department Skardu, there are no protected areas with or in the immediate vicinity of project area so this Act will not be triggered.

3.1.8 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the defacto policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.

3.1.9 The Antiquities Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources of Pakistan. The Act is designed to protect '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, national monuments, etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance.

- Under the Act, the project proponents are obligated to:
- Ensure that no activity is undertaken in the proximity of a protected antiquity;
- Report to the Department of Archeology, Government of Pakistan, any archeological discovery made during the course of a project[4].

3.1.10 The Factories Act, 1934

The clauses relevant to the project are those that concern to health, safety and welfare of workers, disposal of solid waste and effluent and damage to private and public property. The Factories Act also provides regulation for handling and disposal of toxic and hazardous materials[5].

3.1.11 Protection of Trees Act, 1949

This Act prohibits cutting or lopping of trees along roads and canals planted by the Forest Department, without permission of the Forest Department.

[4] http://pakistancode.gov.pk/english/UY2FqaJw1-apaUY2Fqa-bpuUY2Ft-sg-jjjjjjjjjjj#11358F

[5] http://pakistancode.gov.pk/english/UY2FqaJw1-apaUY2Fqa-b56X-sg-jjjjjjjjjjj

The irrigation system in the area is being operated and maintained by the community without the involvement of government. The plantation along the irrigation channels belong to community which is very conscious of the loss. Most of the existing irrigation system has been built without proper design which is much wider and shallower than it should be. The new design is going to give a proper shape to the channels requiring comparatively less area and would, therefore, not affect the existing plantation. Improvement will also bring in the alignment, where necessary and possible, in consultation with community without causing any social or economic conflict. Similar is the case with the farm to market roads. This Act is not expected to be triggered during construction of this project.

3.1.12 Motor Vehicle Ordinance, 1965

The Ordinance deals with the powers of the Motor Vehicle Licensing Authorities and empowers other related agencies to regulate traffic rules, vehicle speed and weight limits, vehicle use, to erect traffic signs, and to prescribe special duties for drivers in the case of accidents. It also prescribes powers to police officers to check and penalize traffic offenders. At the same time, the Ordinance empowers the regional transport authority to operate as a quasi-judicial body at district level to monitor road transport, licensing requirements, and compensations for deaths or injuries to passengers on public carriers.

As the project is located in urban and rural areas and include rehabilitation/ up-gradation of roads; therefore, this ordinance will be triggered.

3.1.13 Labor Laws

Labor laws in Pakistan are governed by several legislative tools. However, the principal labor rights are provided by the constitution of Pakistan. In addition to constitutional rights, Acts and Ordinances have been enforced for limiting working hours, minimum working age and conditions of employment. The laws will be applicable to the project construction contractors.

3.1.14 Employment of Child Act, 1977

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 the child labour in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth years of age. The ECA states that no child shall be employed or permitted to work in any of the 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, biri (kind of a cigarette) making, cement manufacturing, textile, construction and others).

During project construction skilled and un-skilled labour will be employed by contractor and this Act may be triggered.

3.2 NATIONAL AND INTERNATIONAL GUIDELINES OR STANDARDS

3.2.1 The Pakistan Environmental Assessment Procedures, 1997

The Pakistan Environmental Protection Agency prepared the Pakistan Environmental Assessment Procedures in 1997. They are based on much of the existing work done by international donor agencies and Non-Governmental Organizations (NGO's)[6]. The package of regulations prepared by PEPA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Guidelines for Public Consultation;
- Guidelines for Sensitive and Critical Areas; and
- Sectoral Guidelines for various types of projects

3.2.2 International Treaties and Conventions

Pakistan is a signatory to a number of Multilateral Environmental Agreements (MEAs). These MEAs impose requirements and restrictions of varying degrees upon the member countries, in order to meet the objectives of these agreements:

- Convention on Biological Diversity,
- Convention on Wetlands (Ramsar),
- UN Framework Convention on Climate Change (UNFCCC),
- Kyoto Protocol,
- Montreal Protocol,
- UN Convention to Combat Desertification,
- Stockholm Convention on Persistent Organic Pollutants (POPs),
- Convention concerning the Protection of World Culture and Natural Heritage (World Heritage Convention), 1972; and
- International Plant Protection Convention, 1951.

[6] http://environment.gov.pk/eia_pdf/B_Fsheet.pdf

3.2.3 USAID Environmental Regulation

The Title 22, Code of Federal Regulations, Part 216 (22 CFR 216) defines the USAID's mandatory environmental compliance procedures established to ensure that environmental factors are integrated into Agency's decision-making on every program, project, activity and that appropriate safeguards are adopted. Environmental sustainability is integral to USAID overall goal and must be mainstreamed into all activities to achieve optimal results.

Environmental Policy. In the conduct of its mandate to help upgrade the quality of life of the poor in developing countries, USAID conducts a broad range of activities. These activities address such basic problems as hunger, malnutrition, overpopulation, disease, disaster, deterioration of the environment and the natural resource base, illiteracy as well as the lack of adequate housing and transportation. USAID provides development assistance in the form of technical advisory services, research, training, construction and commodity support. In addition, USAID conducts programs that are designed to combat hunger, malnutrition and to facilitate economic development. Assistance programs are carried out under the foreign policy guidance of the Secretary of State and in cooperation with the governments of sovereign states. Within this framework, it is USAID policy to:

- Ensure that the environmental consequences of USAID-financed activities are identified and considered by USAID and the host country prior to a final decision to proceed and that appropriate environmental safeguards are adopted;
- Assist developing countries to strengthen their capabilities to appreciate and effectively evaluate the potential environmental effects of proposed development strategies and projects, and to select, implement and manage effective environmental programs;
- Identify impacts resulting from USAID's actions upon the environment, including those aspects of the biosphere which are the common and cultural heritage of all mankind; and
- Define environmental limiting factors that constrain development and identify and carry out activities that assist in restoring the renewable resource base on which sustained development depends.

In line with the Environmental Policy described above, the 22 CFR 216 seeks to prevent adverse environmental impacts on the environment, including the natural environment, negative impacts on the social environment, impacts on anthropological and other cultural artefacts, It helps to identify environmental limiting factors that constrain development and seeks to conserve and insure sustainable use of renewable resources base of host countries upon which sustainable economic and social development depends.

Initial Environmental Examination (IEE): The 22 CFR 216 stipulates preparation of an Initial Environmental Examination (IEE), which is the first review of the reasonably foreseeable significant adverse and beneficial effects of a proposed action on the environment. Its function is to provide a brief statement of the factual basis for a Threshold Decision by a Bureau Environmental Officer (BEO) as to whether an environmental assessment (EA) will be required. The Threshold Decision is a formal Agency decision which determines, based on an IEE, whether a proposed Agency action is a major action significantly affecting the environment. A Positive Threshold Decision shall result from a finding that the proposed action will have a significant effect on the environment.

Chapter 4

PHYSICAL ENVIRONMENT

This section gives the detailed description about the physical environmental condition. The data collected includes the information relating to topography and land use, geology, climate, air and water resources.

4.1 METHODOLOGY

The information and data presented in this part of the report is based on the surveys conducted by the team of experts and supplemented with the secondary data from published literature and previously conducted studies within the project area. The base line data defines the present physical environmental quality of the project site and adjoining areas.

4.2 TOPOGRAPHY OF THE PROJECT AREA

Sadpara town is situated at an altitude of nearly 2,500 m (8,200 ft.) and SDP area has in general steep gradient but flat lands and sand dunes as well. The town is surrounded by grey-brown colored mountains, which hide the 8,000 m peaks of the nearby Karakoram Range. The Deosai plain situated in the southwest of the district is the highest plateau in the world at an altitude of about 4000 m above sea level. **Exhibit 4.1** represents the topographic elevation map of the project area.

4.3 LAND COVER & LAND USE

The right and left bank canals of Satpara Dam Project are built in the footsteps of high mountains. Irrigated agriculture in the areas is practiced through water of Satpara dam, local springs and Nullahs originating from the mountain.

The irrigated area is about 42604 acres, from which 77.8% (33161) is cultivated while 22.2% (9443 acres) is uncultivated, from 9443 acres of uncultivable area, 7370 acres is cultivable waste while 2072 acres is uncultivable area. The details can be seen in
Exhibit 4.2.

Exhibit 4.1: Land Elevation of the project area[1]

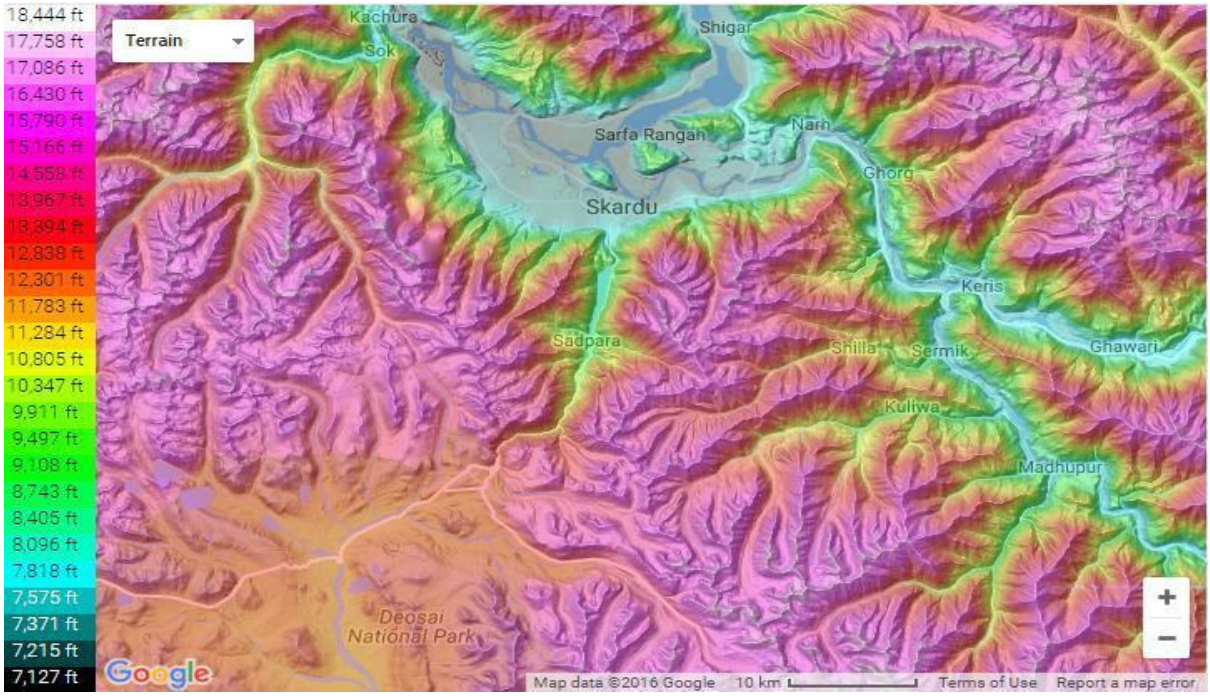


Exhibit 4.2: Detail of total farm area and cultivated/ uncultivated area.

Farm size (Acres)	Total Farm	Cultivated Area	Uncultivated Area	Cultivable Area	Uncultivable Waste
Under 1.0	4779	4443	336	152	184
1.0 to under 2.5	13102	11626	1476	1025	451
2.5 to under 5.0	10307	8157	2150	1659	491
5.0 to under 12.5	8830	6085	2744	2217	527
12.5 to under 25.0	3455	1886	1569	1294	275
25.0 &above	2131	964	1167	1024	143
Overall	**42604**	**33161**	**9443**	**7370**	**2072**

Source: Agricultural Census Report, 2000

4.4 GEOLOGY

The terrain is mountainous, rugged with little vegetation, very large scree cones and boulder moraine. The region is characterized by pattern of high and steep hills, which are high towards north. The general elevation of the land gradually increases towards

[1] en-gb.topographic-map.com

west of valley. The peaks are mostly covered with snow. The geology of the project area mainly consists of morainic material on the surface with bed rock of Greenstone / schist. It is fine texture / metamorphic rock of light greenish-grey color, medium hard, generally breaks along schistocity plane, highly fractured and jointed. Most of the project area covered with slope deposits, terraces, flood plain and morainic deposits.

Abundant glacial deposits overlie in the valley. Intense avalanches / weathering have taken place in the area, which has formed terraces. Avalanches in the area have been common. There are flat fields on the both sides of the river upstream. The texture of the soil consists of silt, clay and sand. Soil survey of the project area was carried out by WAPDA under the Skardu Dam Feasibility studies in August 2006. Ten (10) samples were taken from representative sites for physical and chemical soil analysis of the area. The analysis results can be seen in **Exhibit 4.3**. The results show that the soil is non-saline, non-sodic which is categorized as very good soil requiring no reclamation. It was concluded in the survey that area is very good for growing of crops and raising of orchards.

Exhibit 4.3: Physical and Chemical Properties of Soils of the Area

Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	Avg.
Saturation (%)	28	32	43	38	40	45	45	33	40	45	39
pH	7.9	8.0	8.0	7.9	8.0	8.1	8.0	7.9	8.0	8.0	8.0
EC (mS/cm)	1.0	1.0	5.6	1.1	0.6	1.2	0.8	0.9	1.0	1.2	1.3
Ca+Mg (mg/l)	5.5	6.0	7.5	9.0	4.0	10.5	4.5	15.0	9.0	17.0	8.8
Na (mg/l)	3.0	2.1	33.0	2.1	1.2	2.3	3.0	1.5	1.2	3.3	5.3
K (mg/l)	0.1	0.1	0.6	0.8	0.1	0.1	0.0	0.1	0.1	0.9	0.3
HCO_3 (mg/l)	4.5	4.0	8.0	2.0	3.0	4.5	4.0	4.5	2.5	5.0	4.2
Cl (mg/l)	2.0	1.0	10.5	2.5	1.0	1.6	1.0	2.5	1.5	2.5	2.6
SO_4 (mg/l)	2.1	3.1	2.5	7.4	1.3	6.9	2.5	9.5	6.3	13.7	5.5

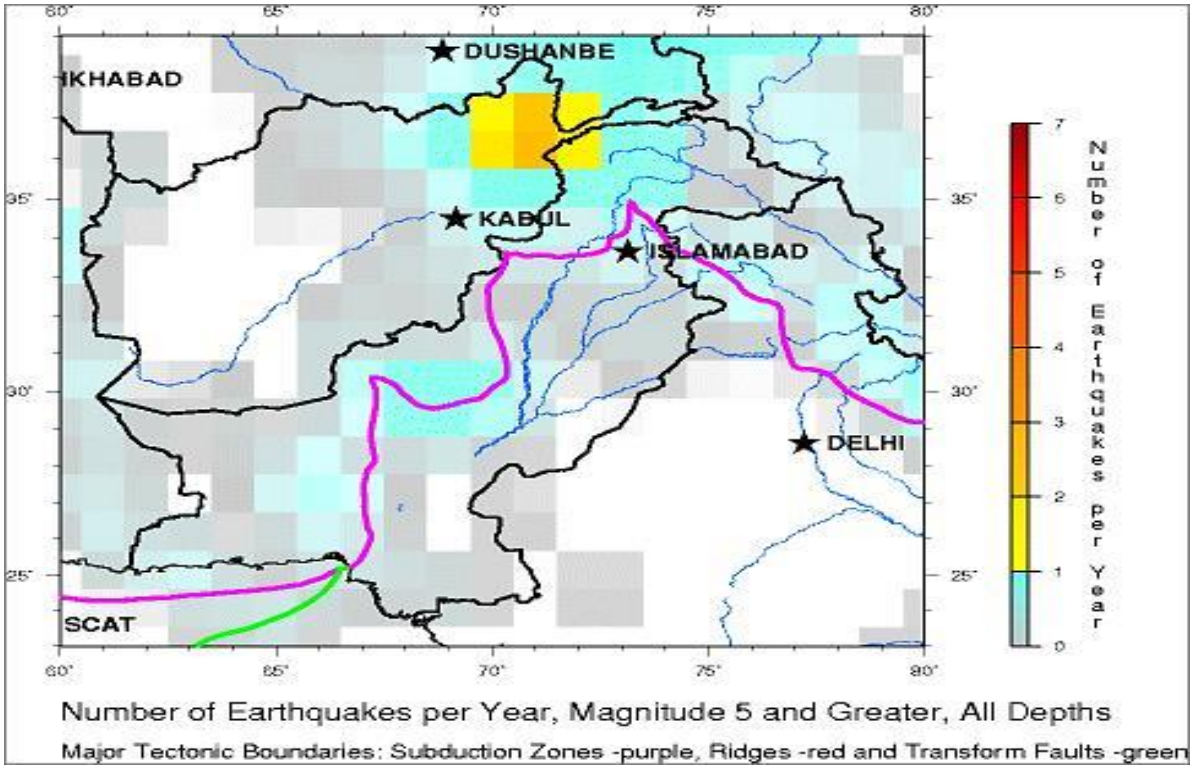
S-1 to S-10 = Sample No. 1 to 10
Source: Pre – Feasibility Study Skardu Dam Project, WAPDA 2006

4.5 FAULTS, EARTHQUAKES AND SEISMIC HAZARD

Being located close to the collision boundary of the Indian and Eurasian plates, Pakistan lies in a seismically active zone. Pakistan is located in the Indus-Tsangpo Suture Zone, which is roughly 200 km north of the Himalaya Front and is defined by an exposed ophiolite chain along its southern margin. The country has the highest rates of seismicity and largest earthquakes in the Himalaya region, caused mainly by movement on thrust faults. Seismic zone mapping of Pakistan has divided the country into four seismic zones ranging in term of major, moderate, minor and negligible zones with

respect to ground acceleration values. The project area is located adjacent to an active tectonic setting, and is approximately 190 km east of the triple continental junction between the Arabian, Eurasian and Indian plates. **Exhibit 4.4** represents Earthquake Density of Pakistan accordingly.

Exhibit 4.4: Earthquake Density of Pakistan



The number of earthquakes recorded by instruments in a given area depends upon the distribution of observation stations and sensitivity of the installed instruments. In Pakistan, the network of seismicity monitoring system (Karachi, Quetta, Tarbela and Peshawar) is far from being adequate. There is no observatory in the seismically active belt of Chitral and Gilgit and same is the case with a wide active belt of Makran and Chaghai districts. These regions are sparsely populated and very little attention has been given to their development in the past and as such the need for a seismic hazard data was hardly realized. Now when major development schemes involving sizeable engineering works are being planned and are underway, an accurate knowledge of seismicity is essential especially in the wake of recent earthquakes.

The Karakoram Zone is situated along a portion of the southern boundary of the Eurasian Plate. It is located north of the Indus Suture Line that marks the zone of crustal convergence between Eurasia and the Indo-Pakistan subcontinent. One feature associated with this seismotectonic zone is the Karakoram fault – a major right lateral strike split fault.

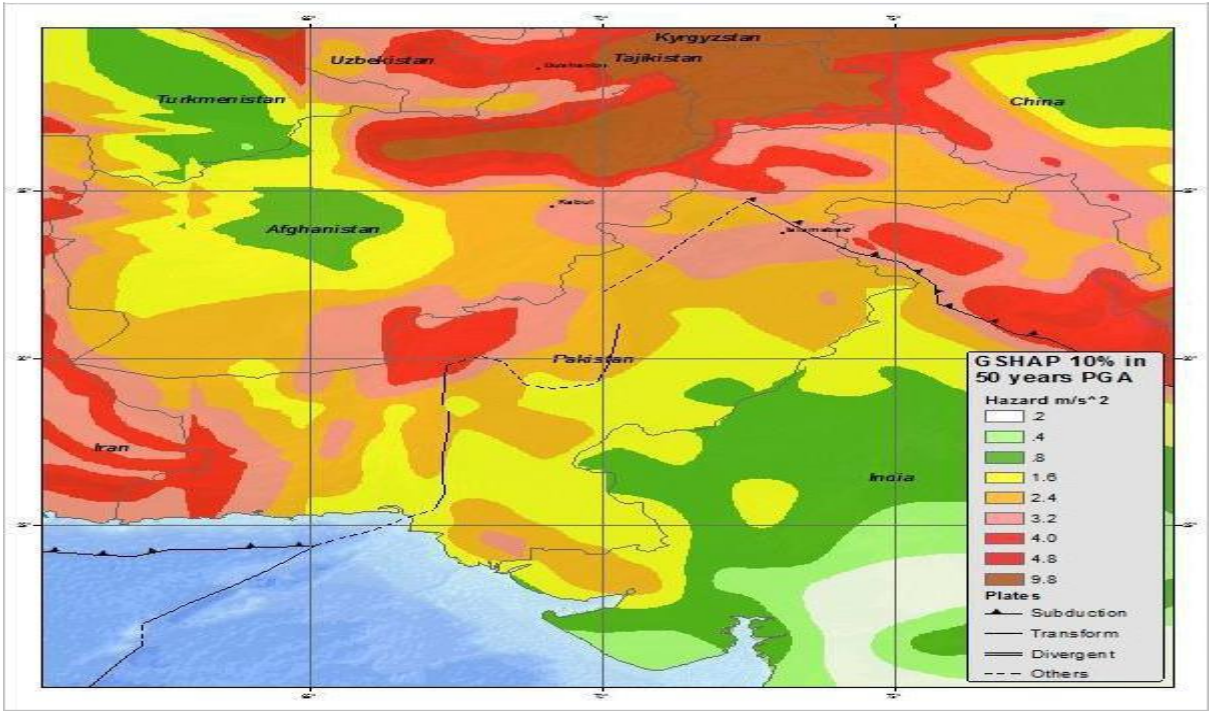
The level of modern teleseismic activity associated with this zone varies. Near the Indus suture, activity is moderate to high in number with the largest surface wave magnitudes

being between 6.0 and 7.0. This activity is aligned in a northeasterly direction paralleling the large scale structural trends of the region. Elsewhere the level of activity is low, particularly along the Karakoram fault.

In recent, historical times many large earthquakes have occurred in the mountainous northern areas and adjacent plains separating the South Asian subcontinent (Indo-Pak) from the Eurasian continent.

The seismic assessment of the region conducted by Pakistan Meteorological Department, Geophysical Centre, Quetta, indicates that the area lies in a very active seismic zone and the seismic factor in this zone has been evaluated as “Zone of noticeable seismic danger” with acceleration values of 0.05 to 0.15 g. and to the immediate north and north-west lies the “Zone of significant seismic danger” with acceleration value of 0.15 to 0.2 g. **Exhibit 4.5** represents seismic hazard map of Pakistan.

Exhibit 4.5: Seismic Hazard Map of Pakistan[2]



4.6 GLACIERS AND GLACIATION

The glaciers of Northern Areas especially Gilgit and Baltistan are disposed longitudinally or transversely. The longitudinal glaciers are remarkable for their larger length, greater volume and higher snow-line while the transverse ones are shorter in length, have lower snowline, and the position of the snow fluctuates more quickly with changes of temperature.

[2] *United States Geological Survey (USGS), “Seismic Hazard Map of Pakistan” (based on GSHAP), accessed 15 September 2014, http://earthquake.usgs.gov/earthquakes/world/pakistan/density.php*

The important glaciers in the Kailas Range are the Harmosh group of glaciers, Rakaposhi group of glaciers and Kobar Gunge glaciers. Most of the valleys in Gilgit and Baltistan show evidences of past glaciations. The Yasin and Ishkuman are also examples of typical glaciated valleys. They are U-shaped and have a hump like gradient. Almost all the rivers and torrential streams in the area are nourished by the numerous snow fields and glaciers of the area. Passu, Batura and Batoro glaciers are considered to be the largest outside the polar region. Unasserted accumulation of boulders, distribution of erratic, the presence of hanging valleys and lateral moraines, snow dissected by streams and the old glacial lakes can be seen all over the area. Occasionally, landslides and glacier dams have been breaking up into devastating floods affecting the Indus plain downstream.

4.7 CLIMATE

The climate of the area is very cold during winter with scarce rainfall as the monsoon cannot cross the Himalayan Mountains. The area is semi-arid with rugged mountain landscape, it receives about 244 mm of average annual precipitation. **Exhibit 4.6** shows mean climatic data, precipitation, mean monthly maximum and minimum temperature, relative humidity, wind speed and snowfall for Skardu for 13 years, from 2000 to 2012.

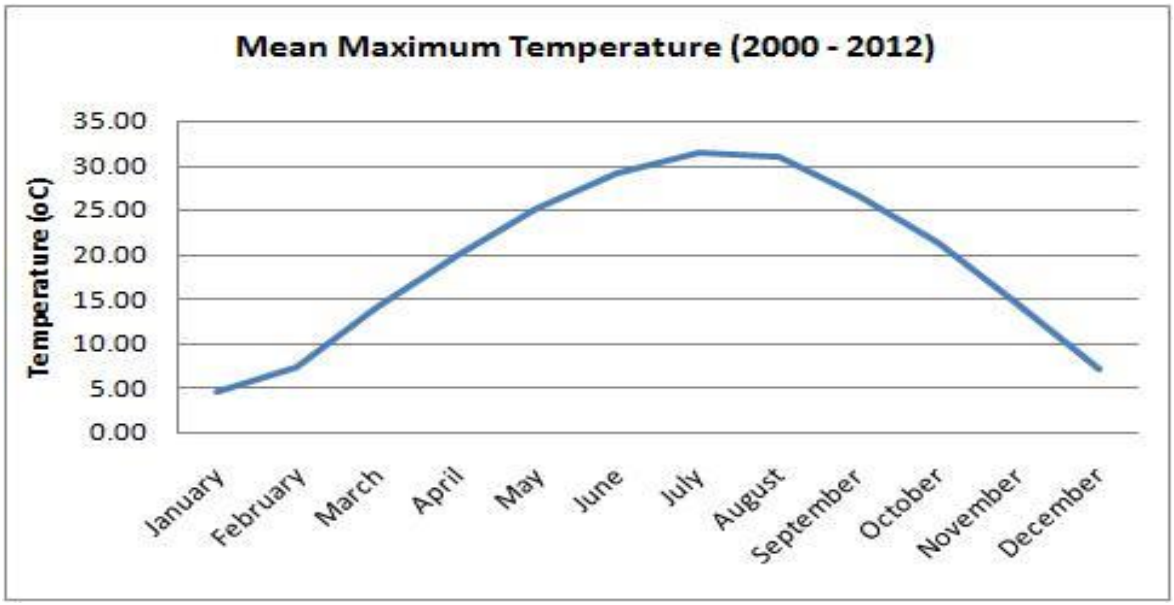
Minimum temperature recorded during winter, November to February ranges -2.64 to - 8.25, whereas maximum temperature during summer May to July ranges between 25.08^{o}C to 31.40^{o}C. The climatic parameters are also shown graphically in **Exhibit 4.7** to **4.10**.

Exhibit 4.6: Climate Data from 2000 to 2012

Month	Precipitation (mm)	Temperature (˚C)		Relative Humidity (%)	Wind Speed (km/hr.)	Snowfall (inches)
		Mean Maximum	Mean Minimum			
January	27.18	4.45	-8.25	71	11	14.53
February	42.68	7.28	-3.74	64	33	13.13
March	33.28	13.92	1.14	50	89	4.42
April	41.88	19.84	6.38	37	103	3.21
May	23.91	25.08	9.55	38	89	-
June	8.94	29.04	12.93	34	85	-
July	10.71	31.40	15.67	38	89	-
August	14.75	30.96	15.39	44	85	-
September	12.23	26.62	10.27	41	74	-
October	3.25	21.08	3.30	44	59	-
November	2.98	14.30	-2.64	58	30	0.44
December	22.40	27.04	-5.93	68	15	5.37
Total	**244.19**	**-**	**-**	**-**	**-**	**41.1**

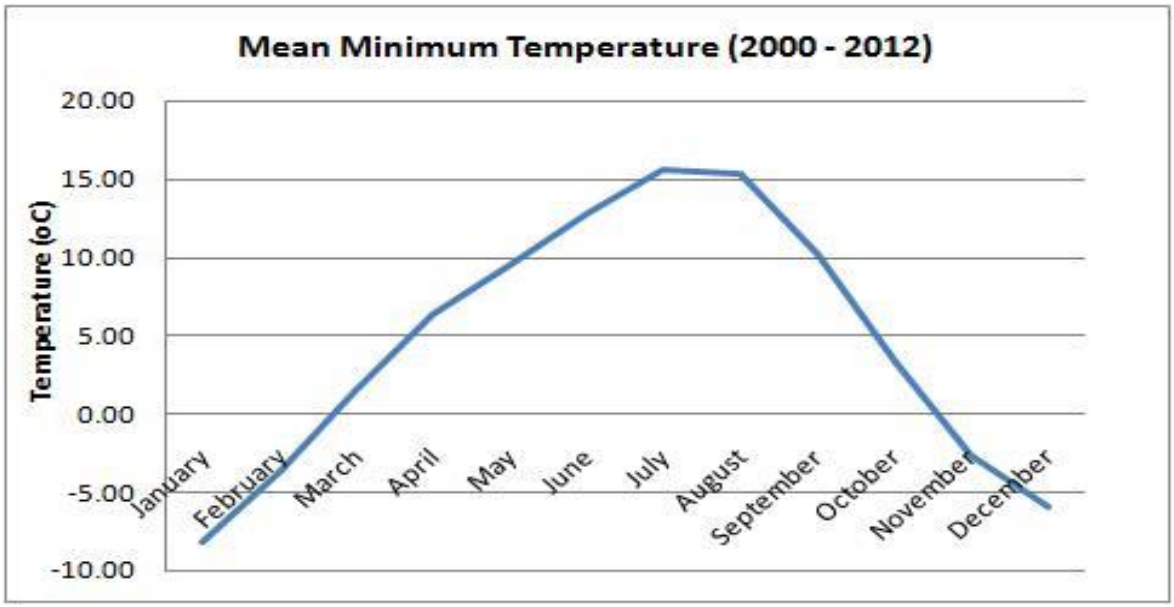
Source: Pakistan Met department.

Exhibit 4.7: Mean Maximum Temperature (2000 – 2012)



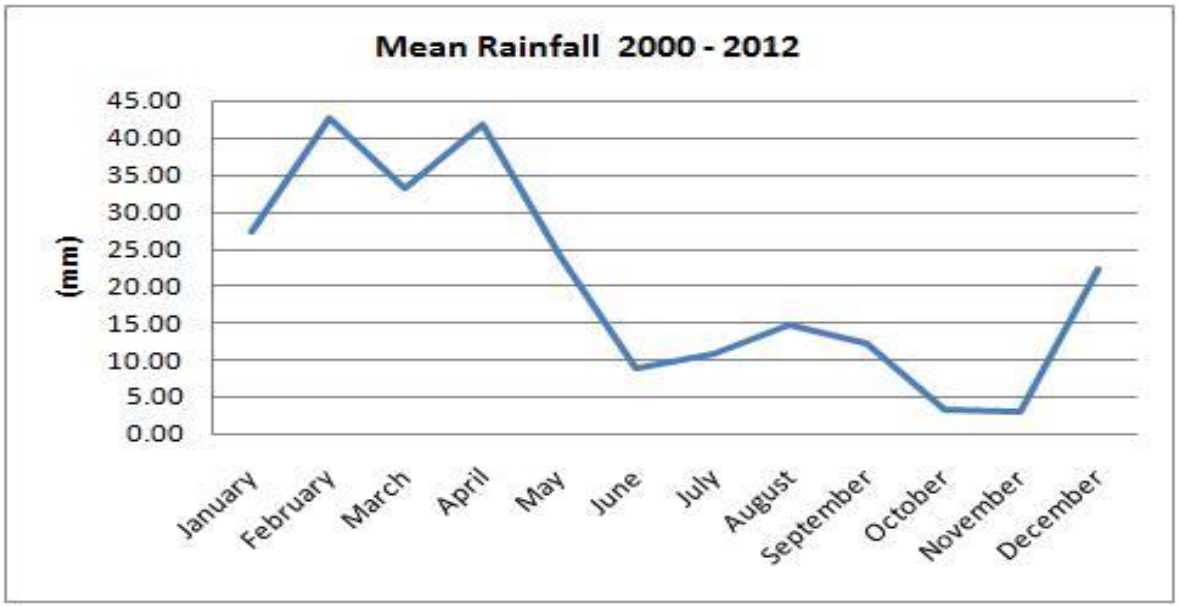
Source: Pakistan Met department

Exhibit 4.8: Mean Minimum Temperature (2000 – 2012)



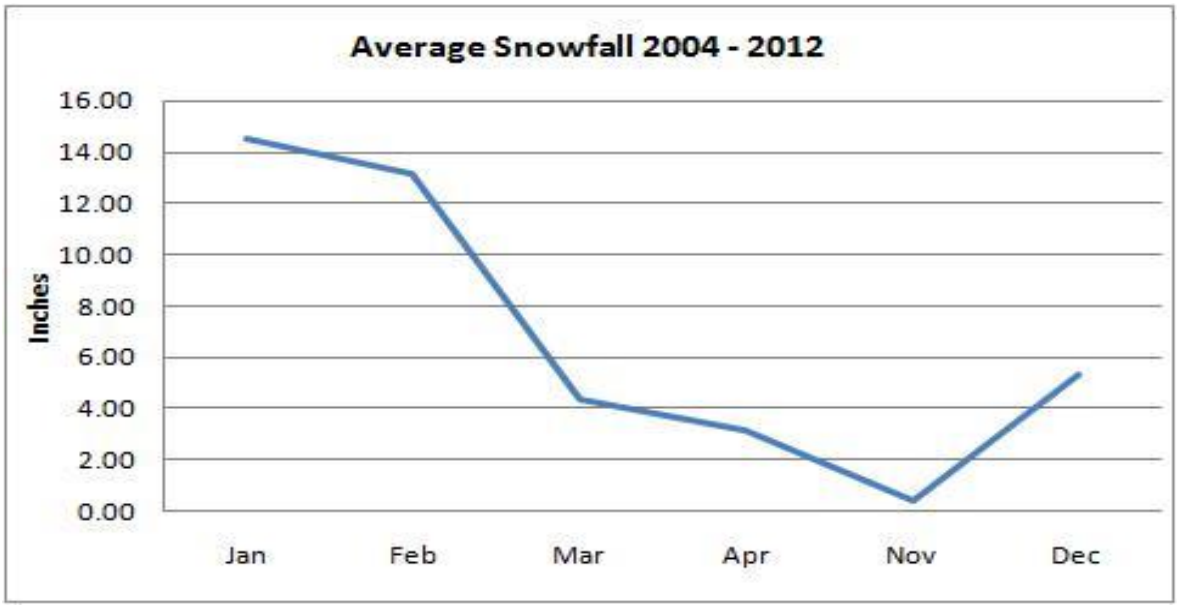
Source: Pakistan Met department

Exhibit 4.9: Mean Rainfall (2000 – 2012)



Source: Pakistan Met department

Exhibit 4.10: Average Snowfall (2004 – 2012)



Source: Pakistan Met department

4.8 WIND

The wind in the Skardu generally valley blows from North to South side. The local meteorology is characterized by high frequency of wind during winter season as southern winds occur about 40% of the year. The maximum wind velocity recorded at Kachura site was 219 miles/hour in the month of September 1970 by Surface Water Hydrology (SWH) organization of WAPDA. According to climatic data, the mean

maximum and minimum wind speed ranges from 103 km/hr during the month of April and 11 km/hr during the month of January. The wind in the area is the major source of erosion and dust[4]. Given the recorded conditions, wind erosion of exposed ground is likely to be significant source of airborne dust.

4.9 WATER RESOURCES

This section details the water resources of the proposed project area. Data was obtained from secondary sources and through field observation.

4.9.1 Ground Water Resources

Mostly, groundwater depths in the project area is found to be high, therefore, its exploitation has been very limited in the area. During the baseline survey (in May 2013) locals were asked about the ground water level and quality of drinking water. The groundwater level was reported to be up to 80 - 90 feet (even up to 250 feet in one village). Secondary sources also confirm the data obtained during the interview with the local community. As per Skardu Dam feasibility study conducted in August 2006, the seasonal rainfall is low which to the relatively impermeable rock.

4.9.2 Surface Water

Majority of the communities in SDP area have access to Satpara lake water for drinking purposes supplied after preliminary treatment through pipes from large storage tanks system.

Fresh water samples were collected from Satpara Nullah during October, 2013 and complete water quality tests were arranged by using the services of Pakistan Council of Research in Water Resources (PCRWR), Islamabad. The test results are provided in **Exhibit 4.11**. It is evident from the results that all parameters are within permissible limit of NEQS for drinking water

Exhibit 4.11: Water Quality Results of Satpara Nullah

Sr. #	Water Quality Parameter	Units	Permissible Limit (NEQS)	USEPA	Results
Physical Parameters					
1	Colour	-	Colourless	15 (colour units)	Colourless
2	Electrical Conductivity (EC)	µS/cm	-		146
3	pH	-	6.5 - 8.5	6.5 - 8.5	6.98
4	Turbidity	NTU	< 5		BDL

Sr. #	Water Quality Parameter	Units	Permissible Limit (NEQS)	USEPA	Results
Chemical Parameters					
5	Ammonia	ppm	-		62
6	Bicarbonate	ppm	-		62
7	Calcium	ppm	-		17
8	Carbonate	ppm	-		BDL
9	Chloride	ppm	250	250 mg/l	2
10	Hardness	ppm	500		67
11	Magnesium	ppm	-		6
12	Potassium	ppm	-		1.1
13	Sodium	ppm	-	20 mg/L (for individuals on a 500 mg/day restricted sodium diet).	BDL
14	Sulphate	ppm	-	250 mg/l	5
15	Nitrate	ppm	10	10	BDL
16	TDS	ppm	1000	500 mg/L	80
17	Arsenic	ppb	50	0.01 MCL (mg/L)	14.99
18	Copper	ppm	2	1.3 MCGL (mg/L)	BDL
19	Iron	ppm	0.3	0.3 mg/L	BDL
20	Manganese	ppm	0.5	0.05 mg/L	BDL
21	Zinc	ppm	5	5 mg/L	BDL
Biological Parameters					
22	Total Plate Count at $22^{O}C$	CFU/ml	< 100/ ml		18
23	Total Plate Count at $35^{O}C$	CFU/ml	< 20/ ml		22
24	Total Coliforms	CFU/ml	0	0	0
25	Faecal Coliforms	CFU/ml	0		0
26	E-Coli	-	0		0

4.10 WATER QUALITY FOR IRRIGATION PURPOSES

Three parameters of water i.e. Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are generally considered for evaluation of any water for irrigation purposes (US department of Agriculture, Hand Book 60).

The water samples were collected from different sites and were analyzed in WAPDA's SMO Laboratory. The EC ranges from 162 – 653, SAR varies from 9-38 and RSC is Below Detection Limit (BDL) indicating that all parameters are quite below the hazardous limits. WAPDA Standards of Irrigation Water Categorization are provided in **Exhibit 4.12**. The quality of water available in the Irrigation Command Area of Satpara Dam is of Category-I considered as most suitable for irrigation purpose. The water is snow melt and almost no salinity with negligible concentration of contaminants that it can be rated as good irrigation water quality. The water testing results are attached as **Annexure-I**.

Exhibit 4.12: WAPDA Standards of Irrigation Water Categorization

Category	EC	SAR	RSC
I Useable (good quality)	< 750	< 6	< 2.5
II Marginal	750 – 1500	6 – 10	2.5 – 5.0
III Hazardous	>1500	>10	> 5.0

Source: Pre-Feasibility of Skardu Dam Project; Pakistan Water and Power Development Authority E&S Directorate; December 2006

COMMUNITY WATER RIGHTS

The communities living downstream to the channels at Hussainabad include 15 Hamlets of Hussainabad village. The stream water is deviated for agricultural purposes at Ispichoong in Hussainabad and carried to fields through a traditional katcha channel. The existing capacity of 20 cusecs is being enhanced to 60 cusecs which would enable additional water for more area to be cultivated. The Thayoure Nallah water is shared amongst villages including Thayoure, Malakhor, Grongstod, Burdo, Khlankhong, Goma Malakhor, Mondoq, Monepa, Monkhor, Gamba Soq, Haiderabad, Hassanabad and Biangthang. The existing capacity of 25 cusecs would be enhanced to carry 50 cusecs. Burgaiy Nallah water is shared by the villages of Fapa, Kharpito, Chorsopi, Astana, Madina Colony. The existing capacity of channel at Burgaiy is 10 cusecs which would be enhanced to carry 50 cusecs.

BIOLOGICAL ENVIRONMENT

This section gives the detailed description about the biological environment. The data collected includes the information relating to the ecology, flora and fauna of the area.

5.1 METHODOLOGY

The information and data presented in this part of the report is based on the surveys conducted by the team of experts by visual observation, identification of habitats supplemented with the secondary data from published literature and previously conducted studies within the project area.

5.2 FLORA

Skardu is located in the 10 kilometers (6 miles) wide by 40 kilometers (25 miles) long Skardu valley, at the confluence of the Indus and Shigar Rivers. Skardu is at an altitude of nearly 2,500 meters (8,202 feet). The town is surrounded by grey-brown colored mountains. Skardu is located in between the Karakoram and Himalayas. The Indus River separates Karakoram with Himalayas. Skardu valley is one of the naturally enriched regions of high mountains in the Karakorum- Himalayan ranges that make it unique with traditional cultural heritage but equally challenging to its community. As other areas of Baltistan Skardu also have small patches of natural and dry forests. Forest department is making effort to raise artificial plantation and afforestation work in the Skardu valley. It is notable that there are no natural forests exist within or in the immediate vicinity of the project areas.

The vegetation in Skardu and associated Satpara valleys generally consists of agro-ecosystem with crops and orchards. Normally local farmers are planting trees in the surroundings of their agriculture lands and harvest them according to their need.

The wild flora of the area includes[1]; *Rhodiola Tibetica, Saxifraga sp, Erigeron Acer, Cerastium sp, Caparis Spinosa, Androsace Alpina, Pedicularis Bicornuta, Rhodiola Cf. Geranium Pratense, Cicer Microphyllum, Dactylorhiza Hatagirea, Iris Lactea, Peganum Harmala, Primula Denticulata, Lentopodium Sp, Aquilegia, Fragrans, Solanum Surattense, Epilobium Latifolum, Rosa Webbiana* and *Codonopsis Clematide*.

There is very little published data on the flora and fauna of the project area is available. As per Rober T.J (1997)[2] Skardu falls in the Dry Alpine and Cold desert zone and the floral species found in this area is provided in the **Exhibit 5.1.** As per IUCN categorization, none of the floral species within the Irrigation Command Area of the project falls in the category of endangered, threatened or vulnerable.

1Source: District Census Report Baltistan

2 Source: TJ Roberts . The Mammals of Pakistan. Revised Edition:Printed by Oxford University Press

Exhibit 5.1: List of Flora of surrounding area.

Sr. #	Common Name	Scientific Name
1	Red Sedum	*Rhodiola Tibetica*
2	Yellow Spotted White	*Saxifraga sp*
3	Blue Fleabane	*Erigeron Acer*
4	Mouse-ear Chickweed	*Cerastium sp*
5	Flinders Rose	*Caparis Spinosa*
6	Rock Jasmines	*Androsace Alpina*
7	-	*Pedicularis Bicornuta*
8	Golden Root	*Rhodiola Cf.*
9	Meadow cranesbill	*Geranium Pratense*
10	Wild Chickpea	*Cicer Microphyllum*
11	Spotted orchid	*Dactylorhiza Hatagirea*
12	-	*Iris Lactea*
13	Esfand	*Peganum Harmala*
14	Drumstick Primula	*Primula Denticulata*
15	-	*Lentopodium Sp*
16	Columbine	*Aquilegia*
17	Fragrant Osmanthus	*Fragrans*
18	Thai Eggplant	*Solanum Surattense*
19	Dwarf Fireweed	*Epilobium Latifolum*
20	Webb's Rose	*Rosa Webbiana*
21	Asian Bellflower	*Codonopsis Clematide*
22	Meadow-grass	*Poa genus*
23	-	*Draba trinervia*
24	Himalayan Fleece Flower	*Polygonum affine*
25	Pekinensis	*Saxifraga sibirica*
26	Boiss	*Euphorbia kanaorica*

FAUNA

Sampling Plan and Methodology

A field survey was undertaken by the wildlife experts. The existing habitat was assessed by looking after available burrows, foot prints or tracks, eggs, faecal pellets or droppings and direct spotting. Literature and local information supported the existence of the species.

The Forest Department of Skardu is responsible for the protecting and management of forest and wildlife in the district. According to the wildlife the important wildlife found

in the immediate vicinity and adjoining mountains includes wolf (*Canis lupus*) and red fox (*Vulpus vulpus*) These animals are shy and hardly seen the day time but there are possibility to watch them in the night. They are also sensitive to the human disturbance and avoid human habitations. However, the other significant wild species such as Snow Leopard (*Panthera uncia*) also found in district Skardu but at higher altitudes between 3,000 to 4,500 meters[1]. Himalayan Ibex (*Capra ibex sibirica*), and Red Bear (*Ursus arctos*) are found in areas like Central Karakoram National Park and Deosai National Park. The closest national park is Deosai National Park which is also 27 km from the Irrigation Command Area. None of the wild mammal and Bird found within the Irrigation Command area falls in the category of endangered, threatened or vulnerable as per IUCN categorization.

Exhibit 5.2: Mammalian fauna of Skardu District & Adjoining Areas

Sr. #	Common Name	Scientific Name
1	Wolf	*Canis lupus*
2	Red Fox	*Vulpus vulpus*
3	Snow Leopard	*Panthera uncia*
4	Himalayan Ibex	*Capra ibex sibirica*
5	Red Bear	*Ursus arctos*
6	Long-tailed Marmot	*Marmota caudata*
7	Lesser Shrew	*Sorex thibetanus*
8	Ryle's High Mountain Vole	*Alticola roylei*
9	Ermine	*Mustela erminea*
10	Chinese Birch Mouse	*Sicista concolor*

Exhibit 5.3: Bird fauna of Project area

Sr.#	Scientific name	English name	Status
1	*Psitacula krameri*	Rose ringed parakeet	Common
2	*Coracius garrulus*	Kashmir roller	Common
3	*Alcedo athis*	Common kingfisher	Common
4	*Upupa epops*	Hoopoe	Common
5	*Eudynamys scolupacea*	Koel	Common
6	*Strix leptogramica*	Himalyan brown owl	Common
7	*Hrundo rustica*	Common swallow	Common
8	*Motacila citreola*	Yellow headed wagtail	Common(W.V)

[1] http://www.wwf.org.uk/what_we_do/safeguarding_the_natural_world/wildlife/snow_leopard/top_10_snow_leopard_facts.cfm

9	*Motacila alba*	White wagtail	Common (W.V)
10	*Motacila maderspatensis*	Large pied wagtail	Common
11	*Pycnonotus cafer*	Red vented bulbul	Common
12	*Pycnonotus leucogenys*	White checked bulbul	Common
13	*Rhyacornis fuliginosus*	Plumbeous redstart	Common
14	*Myophonus caeruleus*	Whistling thrush	Common
15	*Saxicola caprata*	Pied bush chat	Common
16	*Oenanthe oenanthe*	Wheatear	Common(W.V)
17	*Phylloscopus collybita*	Brown chiffchaff	Common (W.V)
18	*Lanius schach*	Rufous backed shrike	Common (W.V)
19	*Corvus macrorhynchos*	Jungle crow	Common
20	*Dendrocitta vagabunda*	Indian tree pie	Common (W.V)
21	*Acridotheres tristis*	Common myna	Common
22	*Sturnus pagodarum*	Brahminy myna	Common
23	*Passer domesticus*	house sparrow	Common
24	*Alectoris chukor*	Chakor	Common
25	*Tetlaogallus himalayensis*	Ram chakor	Common
(W.V)= Winter visitor			

Sensitive Habitats

According to the Forest Department and Central Karakoram National Park department no Wildlife Sanctuary or Game Reserve (Critical and Sensitive Habitats) exists within the irrigation command area or Project area.

Chapter 6

SOCIO-ECONOMIC ENVIRONMENT

This chapter represents the assessment of the socio-economic baseline of the project area based on social surveys. The assessment includes the administrative, demographic and social structures, amenities, health, education, livelihood, and economics of the project area. The assessment also includes a focus on the gender aspects.

6.1 METHODOLOGY

A team of experts comprising of a sociologist and an environmental assessment specialist carried out a comprehensive study of socio economic and cultural environment of the project area. The approach and methodology during data gathering was a combination of qualitative and quantitative data gathering techniques. The data collection addresses the primary requirements of an IEE report preparation, incorporating the Pakistan Environmental Assessment Procedures 2000.

6.1.1 Tools for Data Collection

The specific tools used for primary data collection in the project area included direct observations, open and close ended questionnaires and interviewers from local community representatives and government officials. The secondary data was obtained from internet and published reports including previously conducted EIAs in the project area.

The socio-economic assessment was focused on evaluation of population, languages, literacy rate, educational facilities, public and private health facilities, contagious diseases, available utilities, access to social amenities, road access, availability and medium of transport, occupational statistics, water resources and availability, and basic needs of the people living in the area. The information gained, helped in the measurement and determination of the impacts (positive and negative) on social services, livelihood and cultural pattern of the population under study**.**

6.1.2 Local Consultations Process

As mentioned earlier, consultations were done to gain as much relevant information and valuable suggestions by the local stakeholders and community. The list of departments / offices visited along with the names of Head of the Department / Resource Person (s) met are presented in **Exhibit 6.1.**

Exhibit 6.1: Stakeholder Consultations List

Department	Resource Persons
Deputy Commissioner Office, Local Government Department, Skardu	Deputy Commissioner
Aga Khan Rural Support Program, Skardu, Baltistan	Nazir Ahmed, RPM Sajjad Akram, M&E Specialist
Department of Agriculture, Skardu Baltistan	Zahid Ali Khan, Deputy Director
On-farm Water Management Department, Skardu, Baltistan	Ghulam Ullah, Deputy Director
Office of Satpara Dam Project, WAPDA, Skardu	Sultan Nadeem, Project Director Ansar Ahmed, Site-Engineer
Consultants Office, Satpara Dam, Skardu (Pakistan Engineering Services)	Muhammad Farooq, CRE
Pakistan Council of Scientific and Industrial Research (PCSIR), Satpara Road, Skardu, Baltistan	Tariq Umar Khan, Senior Scientific Officer / Office In charge
Pakistan Agriculture Research Council (PARC)	Muhammad Ayub, Senior Scientific Officer

6.2 PHYSICAL INFRASTRUCTURE

The Satpara Dam, at present, is the source of electricity for 12 of the settlements and 07 of these reported that power outages have declined as a result of the Satpara reservoir improvement. The Canals that are included in the proposed project for development as discussed in earlier chapters are distributed from the reservoir. These canals support some villages located adjacent to them that have households that utilize its water for irrigation purposes.

Wood or crop residue and animal dung are the main sources of cooking fuel in all the settlements and some of them reported cylinder gas or LPG to be an important part of their energy consumption as well. All villages have access to mobile / wireless phone and majority of the villages have access to fixed landlines for internet and television services.

All settlements have at least one irrigation channel or water course. However, 15 percent of the settlements regard the quality of the irrigation water as poor, 15 percent as good and the remaining as average. None of the settlements have concrete drainage

systems and with the exception of some households in two villages, none of the households in the other settlements have access to a sewage system.

6.3 DEMOGRAPHICS

There were above 300 households surveyed for the baseline of SDP, it had a population of 2,887 people, including 1,425 children under the age of 18. Hence, the average size of a household in the Satpara region is 9, which is relatively large. Of note, the Population Census of 1998 reported an average number of household members of 7.77 for Skardu. Enumeration of households that are being benefited from the canals proposed for development in the area at present are enlisted in **Exhibit 6.2**. The proposed project will focus on capacity building of these villages and households to govern the water sources and enhance their livelihood by productive agriculture methods.

Exhibit 6.2: Households recorded with the Water Sources

S. No.	Name of Water Source	Name of Village	No. of Households
1.	Thayure	Boordo	100
		Hlangkhong	90
2.	Hussainabad Minor 1	Brakhchan	20
		Jafaria	10
		Rejing	15
3.	Hussainabad Minor 2	Razvia	8
		Biafo	3
		Gomadrong	4
4.	Burgey Nallah	Burgey	55

The heads of households are typically men; only 3 percent of households reported having a female head. Male heads are on average 47 to 50 years old while female heads were on average 37 to 40 years old. Children and young adults who are less than 20 years old make up 54 percent of the population. This indicates the growth rate of the population is relatively high.

About two thirds of all adults (aged 18 years or more) are married and a further 4 percent are either divorced or bereaved spouses. Only 21 percent of adults have never been married. The incidence of individual being away from home for travel, work or education was low with 91 percent of individuals reporting being present at home most of the time.

6.4 NETWORKING AND COMMUNICATION

The difficult topographic conditions, frequent landslides and movement of glacier moraine greatly hamper the construction of roads in the area. The Karakoram Highway and Gilgit-Skardu roads are the most important roads, which connect major towns of the areas with rest of Pakistan. The other existing roads are all rough surfaced, narrow with poor grades and sharp curved. Most of these roads are dangerous and risky. The project area is accessed through small road metalled or unmetalled road networks that have an airbase which has been connected with Islamabad through an air service in form of small aircrafts which operates throughout the year subject to weather conditions. From the airport still there are limitations for movement in all areas. Government looks forward to develop the area to enhance economic activities.

6.5 EDUCATION

The schools in the settlements are categorized based on gender and ownership parameters, in addition to grade based classifications of schools as primary, middle, and high schools. In terms of ownership, the schools are classified as government schools, private schools, NGO run schools, NGO supported schools, and madrasahs. There are limitations on literacy rate of the area as they are willing to learn but they don't have enough access to good quality education from trained professionals in a better academic environment. On average, there is a school within a 1.34 kilometer radius of the settlements.

Settlements are satisfied with private schools, Madrasahs, and NGO-run schools but expressed limited satisfaction with government schools. Satisfaction is lowest with public high schools for girls. The main reasons for poor rating of government schools are poor training of teachers as well as low attendance of them.

6.6 HEALTH

The settlements are on average 4.8 kilometers away from a health provider or facility, which also supports a fact that those which are available are equipped with unqualified health practitioners. Basic health units (BHU) or Rural Health Centers (RHC) are on average 1.7 kilometers or 24 minutes away from the settlements. District and Tehsil Headquarter Hospitals (DHQ/THQ) are further away at about 8.8 kilometers. Even though maternal and child health centers (MCH) are, on average, only 18 minutes away, family planning services are not provided in more than half of the settlements.

According to the NGO's there is a critical need to support the communities with better health facilities and the Government has an important role to play as it can provide better facilities for the communities. NGOs themselves are dependent on the budgets they are provided. Access to medicines, drugs, important pharmaceuticals and clinical apparatus is a basic necessity which must be available for all emergency health conditions and regular treatments.

6.7 RELIGION AND CULTURE

The ethnic history of the area is complicated. The facial features of the people indicate their Mongolian and Greek origin mingled with South Asian Peoples. Sociological data collected during the reconnaissance survey indicated that village families traced their origins to ancestors from such regions as Afghanistan, Turkistan, Kazakhstan and Ladakh. Many came from neighboring areas such as Chitral and Chilas. The dominant religion is Islam and mostly belongs to Ismaili and Shia sects, the languages spoken in the area include Shina, Balti, Broskhuski, Chitrali, Urdu, Persian, Tibetan and Turki.

6.8 ROLE OF WOMEN

Women of the area are one of the economy drivers as they are socially responsible and supporters of their families. Household activities like cooking food, washing, raising children and collecting water are performed by women of the area. They also look after farming activities where mending the land for crops and harvesting of those crops in different seasons is a regular activity. They assist the men in small businesses like helping them stock the crops for sale and assist in buying things for regular use. The literacy rate indicates that they are learned women who teach in schools and colleges and help students in educating themselves to be good citizens of the country. The women are also willing for skill development such as weaving, tailoring, crafting and pottery. There are more skills which the women are willing to learn and practice regularly.

Chapter 7

ENVIRONMENTAL IMPACTS AND MITIGATIONS

7.1 OVERVIEW

This section describes the identification and assessment of potential environmental impacts from various components of proposed project development and their feasible mitigations. The assessment covers the construction and operational phases of the project. The project decommissioning (at the end of the proposed project lifecycle) are not discussed separately as it will be a development project for the area whereas minor maintenance activities might be required in future.

In addition to the impacts identified, this section includes the residual impacts from the projects taking into account various mitigation measures incorporated (through design, procurement, construction, operation, maintenance and monitoring) during the construction and operation phases of the proposed project and the cumulative environmental impacts from the proposed project.

7.2 METHODOLOGY

The identification and assessment of environmental impacts is based on the local and international guidelines mentioned in Chapter 03 and includes the following steps:

- Identification of major activities during the construction and operational phases of the proposed project;
- Identification of potential environmental aspects from the project activities;
- Identification of potential impacts from the project considering the environmental aspects identified and various environmental elements/ sensitivities (receptors) which are likely to be impacted due to the proposed project;
- Assessment of environmental impacts considering the severity of impact and likelihood of its occurrence.

Each major activity of the project during the construction and operation are identified. The associated environmental aspects are identified based on the proposed project description (Chapter 2). The resulting impacts are identified by combining the information with the environmental baseline (Chapter 4, 5 and 6). Wherever interactions exist between the identified aspects and sensitivities, they are further

analyzed to determine potential impacts from the project. Impacts may be classified as beneficial/adverse, direct/indirect, reversible/ irreversible and short term /long term. It may be noted that more than one activity may contribute to an impact.

The assessment of potential impacts is carried out utilizing both qualitative and quantitative assessment techniques. In qualitative assessment, impacts are rated as
'low', 'medium' or 'high'.

For impacts arising from planned aspects, rating is based on two parameters, i.e., severity of impact and duration of its occurrence. Severity of any impact will depend on the nature and duration of the activity/aspect and the environmental/ social sensitivity. An Impact Assessment Matrix (IAM), presented in **Exhibit 7.1**, is used for combining the two assessment criteria.

Exhibit 7.1: Impact Assessment Matrix for Planned Aspects

Duration Severity	Momentary < 1 Week	Short Term < 1 Year	Medium Term 1 – 10 Years	Long Term 10 – 50 Years	Long Term > 50 Years
Positive Effect			+	++	+++
Slight Effect	Negligible				
Minor Effect		LOW			
Moderate Effect			MEDIUM		
Major Effect				HIGH	
Massive Effect					

For impacts resulting from unplanned and accidental aspects and activities, assessment is based on consideration of the impact severity and the likelihood of its occurrence. While the impact severity depends on the nature and duration of the activity and the environmental and social sensitivity, the likelihood depends upon the nature of the activity/aspect and the control measures in place. An IAM, is presented in **Exhibit 7.2**, is used for combining the two assessment criteria, i.e., the severity of impact and the likelihood of its occurrence.

Exhibit 7.2: Impact Assessment Matrix for Unplanned Aspects

Likelihood Severity	Very Unlikely	Unlikely	Likely	Very Likely	Certain
Slight Effect					
Minor Effect		LOW			
Moderate Effect			MEDIUM		
Major Effect				HIGH	
Massive Effect					

In reviewing the impact assessment, it is to be noted that the project activities, related environmental aspects and associated impacts are presented together to facilitate subsequent rating. The ratings are primarily based on qualitative assessment of the situation and its interaction with the environmental elements.

The impacts, which are rated as low, are considered to be acceptable. Further control measures are not required to mitigate these impacts. For impacts, which are rated as medium / high, control measures and an Environmental Management System (EMS) is to be implemented to mitigate the impacts. Definition of terms used in the IAM are described in **Exhibit 7.3** and **7.4**.

Exhibit 7.3: IAM terms for Severity of Consequences

Severity	Definition
Massive Effect	• Persistent severe environmental damage or severe nuisance extending over a large area; • Constant, high exceedance of statutory or prescribed limits (representing a threat to human health in both the long and short term); and • In terms of commercial or recreational use or nature conservancy, a major economic loss for the company.
	Potential Consequence • Causing widespread nuisance both on and off site; • Significant, widespread and permanent loss of resource; and • Major contribution to a known global environmental problem with demonstrable effects.
Major Effect	• Severe environmental damage; • Extended surpassing of statutory or prescribed limits; and • The company is required to take extensive measures to restore the contaminated environment to its original state.
	Potential Consequence • Highly noticeable effects on the environment, difficult to reverse. • Widespread degradation of resources restricting potential for further usage; • Significant contribution to a known global environmental problem when compared with oil and gas industry world-wide; • Statutory or prescribed guidelines approaching occupational exposure limits; and • Periodic widespread nuisance both on and off site.

Severity	Definition
Moderate Effect	• Release of quantifiable discharges of known toxicity; • Repeated exceedance of statutory or prescribed limit; and • Causing localized nuisance both on and off site.
	Potential Consequence • Noticeable effects on the environment, reversible over the long term; • Localized degradation of resources restricting potential for usage; and • Elevated contribution to global air pollution problem partly due to preventable releases.
Minor Effect	• Contamination; • Damage sufficiently large to attack the environment; • No permanent effects to the environment; • Single exceedance of statutory or prescribed criterion; and • Single complaint.
	Potential Consequence • Noticeable effects on the environment, but returning to original condition in the medium term without specific mitigation measures; • Slight local degradation of resources, but not jeopardizing further usage; • Small contribution to global air problem through unavoidable releases; • Elevation in ambient pollutant levels greater than 50 % of statutory or prescribed guidelines; and • Infrequent localized nuisance.
Slight Effect	• Local environmental damage; • Within the fence and within systems; and • Negligible financial consequences.
	Potential Consequence • No noticeable or limited local effect upon the environment, rapidly returning to original state by natural action; • Unlikely to affect resources to noticeable degree; • No significant contribution to global air pollution problem; • Minor elevation in ambient pollutant levels, but well below statutory or prescribed guidelines; and • No reported nuisance effects.

Severity	Definition
Severity	• Activity has a net-positive and beneficial affect resulting in sustainable environmental improvement (such as ecosystem health); • Increase in magnitude or quality of habitat for those species known to naturally occur in the area; • Growth in 'naturally occurring' populations of flora and fauna; • Positive feedback from stakeholders; and • Potential financial gains.

Exhibit 7.4: IAM terms for Likelihood of Occurrence

Likelihood	Definition
Certain	Will occur under normal operating conditions.
Very Likely	Very likely to occur under normal operational conditions.
Likely	Likely to occur at some time under normal operating conditions.
Unlikely	Unlikely, but may occur at some time under normal operating conditions.
Very Unlikely	Very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

Low impacts are considered to be acceptable or within regulatory limits. Further control measures are not required to mitigate these impacts.

Medium impacts are those requiring control measures, an environmental and social management system to be implemented so as to mitigate the impacts to below acceptable levels.

High Impacts are those that require additional studies (such as detailed surveys, predictive modelling, etc.) to further assess such impacts and to determine if alternative activities with lower impacts or alternative locations with lower environmental/social sensitivities need to be considered.

7.3 ASSESSMENT OF IMPACTS DURING CONSTRUCTION PHASE

7.3.1 General

The impacts during construction phase are assessed by assuming general canal and irrigation development activities as the detailed engineering and civil works will be done by the contractor. However, impact sources and the potential impacts on the environment during the construction phase are identified and evaluated for their significance. The net impact on each environmental element due to the various sources / aspects is discussed in the following sections.

7.3.2 Natural Resources

The aspects that may have potential impacts on natural resources are consumption of construction materials such as wood, metal, cement, rocks, aggregates, etc. Further, fuel will be consumed for operation of construction equipment and vehicles.

The supply of construction materials and fuel can be met through authorized suppliers available locally or within the region. Appropriate storage and handling facilities will be established for oils and fuel in order to minimize losses due to leaks and spillages. Further, the consumption of resources will be optimized, minimizing wastage. The food and other materials required for the labor camps will be sourced from local suppliers. The usage/ consumption of such materials will be optimized and wastage minimized. Based on the above, the impacts to natural resources are rated as below.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Natural Resources	Minor Effect	Medium Term	-	Low

Mitigations

- Ensure that only licensed authorized contractors will be hired for supplying the construction materials;
- Unauthorized third party contractors will be discouraged to participate.

Residual Impact	Severity	Impact Rating
Limited natural resource use will be managed	Slight Effect	Low

7.3.3 Existing Water Resources

The existing water resources might be impacted due to construction works as civil works can cause deposits of debris and possible contamination of pollutants into the water flow. This might lead to deterioration of water quality at the consumer end.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Existing Water Resources	Minor Effect	Medium Term	-	Low

Mitigations

- Diversions will be established prior to construction activities;
- Site supervisors will ensure the diversions are made properly so no contamination will occur in the water bodies.

Residual Impact	Severity	Impact Rating
Existing Water Resources will be safe	Slight Effect	Low

7.3.4 Topography and Landscape

No topographical change nor any distinct landscape alteration is envisaged pertaining to the fact that the project is of rehabilitation of existing water channels along the natural hydrological drainage pattern in the area. The changes will be within the limited scale allotted for the drainage channel where civil works will be carried out.

However, where rocks and aggregates for construction activities are concerned, those will be acquired from nearby mountains and boulders will be brought down by small scale blasting with dynamites. This will cause change the landscape in this way, although it will be done in a localize way. No major dislocation of rocks or aggregates is envisaged which may lead to land slide.

Impact	Severity	Duration	Likelihood	Impact Rating
Topography and Landscape; Landslides	Major Effect	Long Term	-	Medium

Mitigations

- Acquisition of rocks and aggregates from nearby mountains must be limited to small quantities on when and where basis. Most of the material available at the site will be used during construction of channels.

- Selected sites will be considered to acquire material for civil works to ensure topography is undisturbed and landslides are avoided.
- The project would build a weir to direct water in to the channels. This weir would reduce risk of landslides.
- Local existing quarry will be used for obtaining construction material.
- Low intensity dynamites must be allowed to avoid unnecessary damage to the topography.
- Permission to be sought from the competitive authority to use it.

Residual Impact	Severity	Impact Rating
Topography will not be disturbed to a larger extent, the same area will be utilized for the constructions. Landslide prevention is ensured	Slight Effect	Low

7.3.5 Ambient Air Quality

No major potential sources of air pollution are identified as no heavy vehicles or standby generators will be used for construction rather civil works will be done by local labors manually. Dust emissions within the area due to construction activities is most likely to occur if concrete batching works will be required on site and some leveling works throughout the channel will be done. However, blasting for rock boulders will cause momentary but high and localize dust dispersion which can affect the nearby communities.

Impact	Severity	Duration	Likelihood	Impact Rating
Ambient Air Quality	Major Effect	Short Term		Medium

Mitigations

- If standby generators are used, ensure maintenance and tuning is done regularly;
- Efficient concrete batching systems (if any) shall be utilized; Levelling
- must be done carefully to avoid dispersal of dust particles;
- Use low intensity dynamite for localized blasting activity; adopt all the precautionary measures like creation of human free zone and informing local communities before blasting activity.
- Ensure that all the small scale blasting activities should be done under the supervision of its experts.
- Sprinkle water throughout the area of work prior to beginning the activities.

Residual Impact	Severity	Impact Rating
Dust emissions will occur but will remain within the working zone.	Slight Effect	Low

7.3.6 Ambient Noise

It is understood that the construction activities will not be intensive or high noise generating but there is an observation that there might be slight higher levels of noise during civil works. Reason being that since the area is mountainous and hilly, a minor echo surrounding effect occurs, this phenomenon might enhance any noise creating activity such as hammering, crushing or concreting etc. Furthermore, nearby residential areas might be affected if the activities are not synchronized according to their magnitude. Specially where blasting activities will take place it will be a great disturbance. If the activities keep continuing throughout day and night, it will result in causing disturbance to the communities. Heavy vehicles or generators are not expected to be used, if those are involved during the construction activities, noise levels might elevate.

Impact	Severity	Duration	Likelihood	Impact Rating
Ambient Noise	Moderate Effect	Medium Term	-	Medium

Mitigations

- Noise levels as per NEQS will be maintained at the construction site;
- Vehicles must be tuned and maintained to reduce their noise levels;
- Also, the construction activities will be scheduled / planned in such a way as to prevent high noise activities during night times and simultaneous operation of multiple high noise equipment will be avoided to the extent feasible.

Residual Impact	Severity	Impact Rating
Construction activities will continue with recommended measure to reduce noise	Slight Effect	Low

7.3.7 Terrestrial Ecology

It can be noted from the findings of the ecological survey that there are no species within or around the site that are classified as rare, threatened, endangered or of significant conservation value. Disturbance to ecology in the area might result from increase in noise during construction activities and vehicle movements. Avifauna in the area is very common and is highly adaptable or can easily recolonize in vacant habitats whenever necessary. The fauna is adaptable to developmental changes and the

ecosystem is not purely natural. This ecological trait will permit them to move from other vegetated areas especially the tree communities surrounding the project site.

Clearing of trees

The trees that are identified throughout the length of the proposed water sources project are indigenous and are planted by the land owners themselves. According to the local practice, the land owners cut down the trees where any development is done in his or her agricultural land, such as recourse of water channel for irrigation, and then replant the trees within the same area or partially away.

Impact	Severity	Duration	Likelihood	Impact Rating
Terrestrial Ecology	Slight Effect	Medium Term	-	Low

Mitigations

- There will be no unnecessary clearing of trees apart from the specific canal route;
- Where clearing of trees will be required along the route of the water course, the land owners or the tree owners will cut the tree as it is his or her property. As a local practice they will plant more tree when the channels construction work will completed;
- Encourage local people to plant indigenous species as they mature in short time and support local avifauna.

Residual Impact	Severity	Impact Rating
The area will sustain ecology	Positive Effect	+++

7.3.8 Wastewater Generation

There will be a limited amount of waste water associated with construction activities. Since there is more use of water in concreting activating, Grey water that may be generated due to concrete batching (if used) will be released. In case it is planned or unplanned, the impacts are rated as follows:

Impact	Severity	Duration	Likelihood	Impact Rating
Wastewater Generation	Medium Effect	Short Term	-	Low

Mitigations

- Wastewater generated will be collected in a temporary sedimentation pond;
- The collected water will allowed to settle for a day and will be reused for sprinkling in the construction site to avoid dust emissions as recommended in section 7.3.4.

Residual Impact	Severity	Impact Rating
Implementation of the proposed mitigation measures is not likely to leave any significant residual impact.	Slight Effect	Negligible

7.3.9 Solid Waste Generation and Management

The construction phase of the proposed project is expected to generate wastes including; packing waste; scrap, excess construction materials and debris, empty containers and drums, used lubricating oils and chemicals etc. Besides being an eyesore, the waste can also pose a health hazard; pollute soil, surface and ground water if disposed of improperly.

Majority of the construction material to be used and waste generated as a result of construction activity will be inherently less reactive and chemically inert under normal conditions however, its handling and storage may pose adverse impacts of minor nature which could easily be controlled by employing the recommended mitigation measures in this report.

Impact	Severity	Duration	Likelihood	Impact Rating
Solid Waste Generation	Moderate Effect	Medium Term	Likely	Medium

Mitigations

A waste management programme will be developed by the contractor after approval of AKRSP supervisors before the initiation of the construction activities. Key elements of the waste management system will be the following:

- A temporary solid waste collection points will be developed separately at an accessible area near the construction site with the approval of local land owner.
- Separate bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton;
- Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling;
- No waste will be dumped at any location outside the proposed temporary waste collection points;
- Training will be provided to personnel for identification, segregation, and management of waste.

Residual Impact	Severity	Impact Rating
Proper implementation of the mitigation measures will ensure that the residual impact from waste is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.	Slight Effect	Negligible

7.3.10 Soil Erosion

There are no activities that may affect the soil quality of the area however soil erosion is quite common in mountainous areas and through effective measures it can be reduced. The surface run-off causes damage to the structures and impairs the irrigation system. Keeping in view, that all the irrigation structure is concreted with gradual sloping. There are possibilities that these concreted channels will fill with the eroded soil in the passage of time. Besides the maintenance of irrigation channels there is also need to control of water over flow around the irrigation channels especially during the rainy season.

Impact	Severity	Duration	Likelihood	Impact Rating
Soil Erosion in channels	Major Effect	Long Term	-	High

Mitigations

The measures for erosion control in the projects are mainly related to the protection of irrigation structures or control works against the excessive surface run-off of soil and water from the eroding, sparsely vegetated, mountain slopes.

To overcome this problem there is a need to establish an effective community based maintenance system. This system will not only provide them continuous water supply but also increased the life of the water channels. Community based maintenance system will be labor efficient and bring environmental stability, it would be a good investment to protect the structures against the erosive forces. It goes without saying that erosion control also has a great intrinsic value, independent of its role in protecting structures.

The mitigations for soil erosion problem are entailed as follows:

- Communities should also encourage to plant local species along the water channels which will also stabilize the constructed channels;
- Different methods have been considered for the protection of mountain slopes. They are categorized as interception ditches, short, steep terraces and the traditional long terraces. The interception ditches can be dug along the contours to intercept the run-off, store it, and let it slowly infiltrate into the soil. The space between the ditches needs to be planted with local shrub species.

- The disadvantages of interception ditches are that they may silt up quickly and require continuous maintenance.
- Short terraces are made across erosion gullies, and have stone wall protection. Their main purpose is not to protect irrigation canals, but rather to halt further gully formation and, at the same time, to form cultivable soils.
- Long terraces are built across the more or less regular mountain slopes. They consist of two types: constructed terraces and slowly forming terraces. The constructed long terraces, like the short terraces, are usually protected by stonewalls, and are fit for cultivation or forestation. Their construction demands so much labor and heavy coast.
- At present, therefore, more attention is being given to the slowly forming terraces. In principle, the slowly forming terraces consist only of simple walls across the slopes, which will fill up to terraces by natural processes. In other words, the walls are meant to retain the eroded materials, so that in the long run a terraced landscape will develop, and the erosion will be halted. The walls can, again, consist of stones, but they can also be made of shrubs, small plants, or other local vegetative material.

Residual Impact	Severity	Impact Rating
No soil erosion along the channels will occur and sustain the life of the watercourse	Slight Effect	Low

7.3.11 Impact on Land use and Settlements

As mentioned earlier, the proposed project site will have no impact in land use as rehabilitation of existing water courses will be done rather the sole purpose of the project is to enhance the social infrastructure of the local community. From construction phase, local markets will develop. Construction activities will not affect the communities, however possibility of water contamination due to rehabilitation of water course will affect downstream water consumers but it will be a short term effect.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Land Use and settlements	Minor Effect	Medium Term	-	Low

Mitigations

- Local market infrastructure will be focused to be supported by directly involving the community in watercourse development;
- Community will be given awareness training for capacity building and being involved in development projects in the area;

- Receiving water in the proposed channel will be temporarily directed in a diverted drainage bypassing the rehabilitation works so that it may not be contaminated for downstream consumers;
- Unnecessary use, excessive storage and polluting the water channels will be strictly avoided.

Residual Impact	Severity	Impact Rating
No settlements will be affected	Slight Effect	Negligible

7.3.12 Impacts related to Temporary Labor Camps

The labor camps will be temporary in nature and outside of existing facilities. The management of labor camps will be done by the contractors. Mostly, labors will be staying near hamlets or temporarily assigned areas from the land owners, which shall use the community services for solid waste, water and sanitation. The impacts associated with temporary labor camps are as follows:

- Inadequate drinking water facilities, sanitary facilities, and drainage will cause deterioration of surface water bodies and also might contaminate the groundwater.
- Contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives and general public inhabited in the area.
- Unacceptable solid waste disposal practices such as open dumping and poor sanitation facilities will lead to pollution of surrounding environment,
- Surrounding of labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases such as mosquitoes, rats and flies.

Impact	Severity	Duration	Likelihood	Impact Rating
Impacts related to Temporary Labor Camps	Major Effect	Medium Term	-	Medium

Mitigation Measures:

Following measures are needed to protect and enhance the quality of environment during the construction stage where temporary labor camps will be developed:

- Provision of adequate washing and toilet facilities and other necessary supply in the labor camps shall be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

- Adequate supply of water shall be provided in the temporary urinals, toilets, and washrooms of the workers' accommodation.
- Temporary sewage drains shall be made either connecting to the existing drain infrastructure with prior permission or if such infrastructure is not available, the temporary drains shall connect to septic tanks or soakage pits.
- There should be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps. Thus, possibilities of infecting water borne diseases or vector borne diseases (parasitic infections) will be eliminated by adopting proper solid waste disposal procedure.
- A better way to overcome garbage disposal is by reducing or avoiding the construction of labor camps, thus the selection of majority of skilled and unskilled workers from the project influence area will be a proper measure in this regard.
- Provision of the solid waste disposal, sanitation, and sewage facilities at all sites of the construction/labor camps to avoid or minimize health hazards and environmental pollution.
- Contractor shall handle and manage waste generated from the construction/ labor camps without contamination to natural environment thus reducing risk to neighboring community. Contractor will ensure proper disposal of solid waste either through municipal services.

Residual Impact	Severity	Impact Rating
The labor camp area will be developed with an eco-sustainable approach	Slight Effect	Low

7.3.13 Impact on Local Economy

The proposed development will create employment during its construction and operational phase. The construction activities will require significant number of local skilled and unskilled workers. However, positive impact on the local livelihood during the construction phase through creating new job opportunity is envisaged.

In addition, local suppliers will also be benefited as they will be contracted for the supply of water, foodstuff etc. Considering the above, beneficial impacts are envisaged from the proposed project on the local employment and economy. Therefore, it can be concluded that the proposed project will set positive impact on local livelihood option.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Local Economy	Positive Effect	Medium Term	-	+

Mitigations

- Employment, especially for skilled labors, preference will be given to the locals;
- People from neighboring areas will be considered for unskilled employment;
- Suppliers and Vendors of neighboring areas will be given priority.

Residual Impact	Severity	Impact Rating
Economic development of locals	Positive Effect	+++

7.3.14 Archaeology and Heritage

There are no protected or otherwise cultural or archaeological sites within the premises of the proposed project site and hence no impact of the proposed project will occur on cultural or archaeological resources.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Archaeology and Heritage	Slight Effect	-	Likely	Low

Mitigations

- As per the Antiquities Act, if any finding occurs of archeological significance it will be reported to Department of Archeology and Heritage.

Residual Impact	Severity	Impact Rating
Protection of archeology and heritage	Slight Effect	Negligible

7.3.15 Impact Summary

A summary of the impact rating for the construction phase is presented in **Exhibit 7.5.**

Exhibit 7.5: Summary of the Construction Phase Environmental Impact and Mitigations

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
Natural Resources	Adverse	Minor Effect	Low	Ensure that only authorized contractors will be hired for supplying the construction materials; Unauthorized third party contractors will be discouraged to participate.	Limited natural resource use will be managed	Slight Effect	Low
Existing Water Resources	Adverse	Minor Effect	Low	Diversions will be established prior to construction activities; Site supervisors will ensure the diversions are made properly so no contamination will occur in the water bodies and people will get the water as normal.	Existing water resources will be safe	Slight Effect	Low
Topography, Landscape and Landslides	Adverse	Major Effect	Medium	Acquisition of rocks and aggregates from nearby mountains must be taken in a limited to small quantities on when and where basis. Selected sites will be considered to acquire material for civil works to ensure topography is undisturbed and landslides are avoided. The project would build a weir to direct water in to the channels. This weir would reduce risk of landslides	Topography will not be disturbed to a larger extent, the same area will be utilized for the constructions; landslide prevention is ensured	Slight Effect	Low

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
				Existing quarry will be used to buy material. Low intensity dynamites must be used to avoid unnecessary damage to the area.			
Ambient Air Quality	Adverse	Major Effect	Medium	If standby generators are used, ensure maintenance and tuning is done regularly; Efficient concrete batching systems (if any) shall be utilities'; Levelling must be done carefully to avoid dispersal of dust particles; Use low intensity dynamite for localized quarrying activity, develop a complete quarry management plan with quarrying experts; Sprinkle water throughout the area of work prior to beginning the activities	Dust emissions will occur but will remain within the working zone.	Slight Effect	Low
Ambient Noise	Adverse	Moderate Effect	Medium	Noise levels as per NEQS will be maintained at the construction site; Vehicles must be tuned and maintained to reduce their noise levels; Also, the construction activities will be scheduled / planned in such a way as to prevent high noise activities during night times and simultaneous operation of multiple high noise equipment will be avoided to the extent feasible.	Construction activities will continue with recommended measure to reduce noise	Slight Effect	Low
Terrestrial Ecology	Adverse	Slight Effect	Low	There will be no unnecessary clearing of trees apart from the specific canal route; Where clearing of trees will be required	The area will sustain ecology	Positive Effect	+++

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
				along the route of the water course, the land owners will be given a monetary compensation to remove the trees and replant at an appropriate location; Those trees that are indigenous will be planted and will mature in short time and support local avifauna			
Wastewater Generation	Adverse	Medium Effect	Medium	Wastewater generated will be collected in a temporary sedimentation pond; The collected water will allowed to settle for a day and will be reused for sprinkling in the construction site to avoid dust emissions as recommended in section 7.3.4.	Implementation of the proposed mitigation measures is not likely to leave any significant residual impacts.	Slight Effect	Negligible
Solid Waste Generation	Adverse	Moderate Effect	Medium	Separate bins will be placed for different type of wastes - plastic, paper, metal, glass, wood, and cotton; Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling; No waste will be dumped at any location outside the proposed site boundary; All hazardous waste will be separated from other wastes. Hazardous wastes will be stored in designated areas with restricted access and proper marking. Hazardous wastes will be disposed of through approved waste contractors; Surplus construction materials including partially filled chemical and paint containers	Proper implementation of the mitigation measures will ensure that the residual impact from waste is minimal. Monitoring and inspection will be undertaken to ensure compliance and minimize any residual impact.	Slight Effect	Negligible

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
				will be returned to suppliers. Inert construction wastes will be sold as scrap to contractors; Record all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register; Training will be provided to personnel for identification, segregation, and management of waste.			
Soil Erosion	Adverse	Major Effect	High	All recommendations mentioned in the Mitigations of Section 7.3.9 shall be adopted where technically feasible.	No soil erosion along the channels will occur and sustain the life of the watercourse	Slight Effect	Low
Land use and Settlements	Adverse	Minor Effect	Low	Local market infrastructure will be focused to be supported by directly involving the community in watercourse development; Community will be given awareness training for capacity building and being involved in development projects in the area; Receiving water in the proposed channel will be temporarily directed in a diverted drainage bypassing the rehabilitation works so that it may not be contaminated for downstream consumers; Unnecessary use, excessive storage and polluting the water channels will be strictly avoided	No settlements will be negatively affected	Slight Effect	Negligible

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
Temporary Labor Camps	Adverse	Medium Effect	Medium	A complete Labor Camp Management plan will be developed according to the recommendations given in Section 7.3.11	The labor camp area will be developed with an eco-sustainable approach	Slight Effect	Low
Local Economy	Beneficial	Positive Effect	+	Employment preference will be given to the locals; People from neighbouring areas will be considered for unskilled employment Suppliers and Vendors of neighbouring areas will be given priority	Economic development of locals	Positive Effect	+++
Archeology and Heritage	Adverse	Slight Effect	Low	As per the Antiquities Act, if any finding occurs of archeological significance it will be reported to Department of Archeology and Heritage	Protection of archeology and heritage	Slight Effect	Negligible

7.4 ASSESSMENT OF IMPACTS DURING OPERATION PHASE

7.4.1 General

The operation phase is not deemed to be an air, water and environmental degrading aspect. However, similar to the construction phase, the net impact on each environmental element due to various sources / aspects is discussed.

7.4.2 Soil, Topography and Landscape

There will be no impacts to the soil, topography or landscape rather it will be a positive change in the aesthetics of the area. Soil erosion might develop in later years that might alter the quality of the water course:

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Topography and Landscape	Slight Effect	Long Term	Unlikely	Low

Mitigations

- All recommendations provided in Section 7.3.10 shall be followed;
- Vegetation of lower grasses and shrubs along the water course will enhance the aesthetics of the area;
- Locals must be trained to avoid damaging the water courses and highlight maintenance issues that can be overcome by the community itself.

Residual Impact	Severity	Impact Rating
A sustainable ecological approach will be developed	Positive Effect	+++

7.4.3 Infrastructure

Slight changes in infrastructure due to constant movement of labor and vehicles might be caused. However, in this project, it is proposed to develop new road infrastructure for the community to have better accessibility to the water channels which will be a positive impact. This will result in livelihood enhancement of the community.

Impact	Severity	Duration	Likelihood	Impact Rating
Infrastructure	Slight Effect	Long Term	Unlikely	Low

Residual Impact	Severity	Impact Rating
New roads for community will enhance their livelihood	Positive Effect	+++

7.4.4 Terrestrial and Aquatic Ecology

The proposed project will not only enhance the local economic infrastructure but improving water drainage in the area will eventually support the native ecology and serve as a niche for the flora and fauna of the area. Terrestrial fauna will flourish and a balanced ecosystem is anticipated from this project. The water courses are not large water bodies that may sustain aquatic life, there is no direct or indirect impact on aquatic life

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Terrestrial and aquatic Ecology	Positive Effect	Long Term	-	+++

Mitigations

- Ensure no anthropogenic activities affect the original habitat.

Residual Impact	Severity	Impact Rating
Proposed project will sustain ecology and improve aesthetic environment	Positive Effect	+++

7.4.5 Impact on Local Economy

As thoroughly described in Chapters 01 and 02, the proponent and the proposed project aims to enhance the local economy by improving the supply of a basic amenity. Training and capacity building of the local community will be done through the proponent's platform and this project will be a good opportunity for the locals to develop their area. The main aspect that is highlighted throughout the project cycle is that agriculture activities will be enhanced and more cultivable areas will be developed which in turn will give a boost to the local economy. Similarly as cultivable are will increase the plantation activity and number of trees will also increase because normally local community plant trees in the surroundings of the cultivated areas.

Impact	Severity	Duration	Likelihood	Impact Rating
Local Economy	Positive Effect	Long Term	Likely	+++

Recommendations

- The proposed project shall explore the feasibility for the remaining water sources identified during the pre-assessment of channels and develop the courses similarly.

Residual Impact	Severity	Impact Rating
Indigenous people will benefit in form of employment, business activities and agriculture	Positive Effect	+++

7.4.6 Impact on Climate of the area

Climate will not be influenced by any aspect of the project. There are no project affiliated activities that may alter the climate of the area

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Climate of the area	-	-	-	Negligible

Residual Impact	Severity	Impact Rating
Climate not influenced by the project	-	-

7.4.7 Impact on Hydrology

Since existing water courses are used, no change will occur on the hydrology of the area. However, improved water courses are expected to increase the water flow in the area. This will lead to improved water availability in the command areas.

Impact	Severity	Duration	Likelihood	Impact Rating
Impact on Hydrology	-	-	-	Negligible

Residual Impact	Severity	Impact Rating
Hydrology will be improved	-	+++

7.4.8 Surface and Ground Water

Initially, slight changes in surface water quality is expected due to disturbance during construction phase. The surface water quality is to be in natural form as lined channels will be developed. This will substantially reduce the chance of channel erosion induced turbidity. There is no impact on ground water resources as neither of them are exploited or contaminated by any of the project activities.

Impact	Severity	Duration	Likelihood	Impact Rating
Surface and Ground Water Resources	Slight Effect	Long Term	Unlikely	Low

Residual Impact	Severity	Impact Rating
Surface and ground water resources are conserved	-	-

7.4.9 Sedimentation

Sedimentation might occur by natural water flow from origin. The lined water channels will reduce the risk of sedimentation due to better water flow which does not sediments to settle in the channels.

Impact	Slight Effect	Long Term	Unlikely	Low
Sedimentation in water channels	Slight Effect	Long Term	Unlikely	Low

Residual Impact	Severity	Impact Rating
No sedimentation in water channels	-	-

7.4.10 Flooding

During increased rainfall and natural increase in water flow might result in flooding. The water channels will include wiers which will reduce the risk of incremental water flow and regularize the water flow downstream.

Impact	Slight Effect	Long Term	Unlikely	Low
Flooding	Slight Effect	Long Term	Unlikely	Low

Residual Impact	Severity	Impact Rating
Flooding risk reduced	-	-

7.4.11 Traffic

Road access and frequent vehicular movement might be mismanaged as people of the area will require better accessibility to the water resources. Although no major influx is envisaged but it will be taken in to consideration.

Impact	Severity	Duration	Likelihood	Impact Rating
Roads and Traffic	Slight Effect	Long Term	Unlikely	Low

Mitigations

- A Traffic Management Plan is developed; attached as Annexure-II.
- Traffic Management Plan to be implemented locally.

Residual Impact	Severity	Impact Rating
Traffic Management Plan will ensure better vehicular movement	Positive Effect	+++

7.4.12 Tourism

As the area has relatively nice aesthetic environment. With enhanced vegetation and greenery due to increased water availability in the area will attract more visitors. This may increase tourism and contribute to the economy of the area.

Impact	Severity	Duration	Likelihood	Impact Rating
Tourism	Slight Effect	Long Term	Unlikely	Low

Recommendations

- Locally promote tourism by local capacity building in developing the area for attracting more visitors.

Residual Impact	Severity	Impact Rating
Tourism will increase in the area	Positive Effect	+++

7.4.13 Local Women and Indigenous People

As covered in Section 7.4.5, local economy will improve. The project emphasizes on local development. Since women and indigenous people are directly involved in agriculture practices of the area thereby the project is substantially going to increase their livelihood and prosperity.

Impact	Severity	Duration	Likelihood	Impact Rating
Local women and indigenous people	Slight Effect	Long Term	Unlikely	+

Recommendations

- Locally promote capacity building in community participation of women and local people.

Residual Impact	Severity	Impact Rating
Project will help the area grow as a community	Positive Effect	+++

7.4.14 Impact Summary

A summary of the impacts for the operation phase is presented in **Exhibit 7.6.**

Exhibit 7.6: Summary of the Operation Phase Environmental Impact and Mitigations

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
Soil, Topography and Landscape	Minimum	Slight Effect	Low	All recommendations provided in Section 7.3.9 shall be followed; Vegetation of lower grasses and shrubs along the water course will enhance the aesthetics of the area; Locals must be trained to avoid damaging the water courses and highlight maintenance issues that can be overcome by the community itself.	A sustainable ecological approach will be developed	Positive Effect	+++
Infrastructure	Minimum	Positive Effect	Low	None Required	New roads for community will enhance their livelihood	Positive Effect	+++
Terrestrial and aquatic Ecology	Minimum	Positive Effect	+++	Ensure no anthropogenic activities affect the original habitat.	Proposed project will enhance ecology and improve aesthetic environment	Positive Effect	+++

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
Local Economy	Minimum	Positive Effect	+++	The proposed project shall explore the feasibility for the remaining water sources identified during the pre-assessment of channels and develop the courses similarly	Indigenous people will benefit in form of employment, business activities and agriculture	Positive Effect	+++
Climate of the area	None	No Effect	Negligible	None Required	No Impact	No Effect	Negligible
Hydrology	None	No Effect	Negligible	None Required	Hydrology of the area will be improved	Positive Effect	+++
Surface and Ground Water Resources	Minimum	Slight Effect	Low	None Required	Surface and ground water resources are conserved	No Effect	Negligible
Sedimentation	Minimum	Slight Effect	Low	Supervision of channels for sedimentation must be done	No Sedimentation in water channels	No Effect	Negligible
Flooding	Minimum	Slight Effect	Low	None Required	Flooding risk is reduced	No Effect	Negligible
Roads and Traffic	Minimum	Slight Effect	Low	Traffic Management Plan to be followed	Traffic Management Plan will ensure better vehicular movement	Positive Effect	+++

Environmental Aspect	Nature	Severity	Impact Rating	Mitigation Measures	Residual Impact	Severity	Residual Impact Rating
Tourism	Minimum	Slight Effect	Low	Locally promote tourism by local capacity building in developing the area for attracting more visitors	Tourism will increase in the area	Positive Effect	+++
Local Women and Indigenous People	Minimum	Slight Effect	+	Locally promote capacity building in community participation of women and local people	Project will help the area grow as a community	Positive Effect	+++

Chapter 5

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

5.1 OVERVIEW

This chapter describes the specific mitigation actions for the possible environmental impacts that are identified, the monitoring program, and the resource allocation during the construction and operation of the proposed project. Efforts have been made to provide mitigation measures commensurate with assessed level of risk, e.g., 'low', 'medium' and 'high'.

The references made to potential mitigation measures in the preceding chapters of this report have also been summarized in the following sections along with the monitoring plans and the management systems proposed for implementing such mitigation measures.

The ultimate responsibility for environmental management during all phases of the project rests with AKRSP. However, the contractor for the project will also bear the responsibility for developing and implementing the EMP during the construction phase of the proposed project. The responsibility for implementing the EMP during the operation phase will be entirely with AKRSP. Periodic environmental monitoring and audits will be conducted by AKRSP and the contractors during the construction phase to ensure effective implementation of the management plan. Appropriate corrective actions will be implemented with due correspondence and consensus with GB-EPA over any deviations.

5.2 CONSTRUCTION PHASE ENVIRONMENTAL MANAGEMENT

.2.1 Organization and responsibilities

The Engineering and Commissioning Contractor will be required to establish an organizational structure for environmental management, including health and safety issues, to ensure effective implementation of mitigation measures, and to review the environmental management process.

As project developer AKRSP will ensure, through its onsite project manager that the construction contractor develops and implements EMS for the project construction phase. EMS will comply with the control measures and environmental management

requirements outlined in this EMP and any additional requirements specified by GB-EPA, construction permits, etc.

The Health, Safety and Environment (HSE) manager of the contractor reporting to the project manager will be responsible for day-to-day HSE management on site. The HSE Manager will maintain constant interactions with construction managers and other staff throughout the construction period. The contractor will assist in periodic audits of the EMS including monitoring programs to ensure effective implementation of the control and mitigation measures and implementation of corrective actions for any deviations.

.2.2 Site Preparation

As discussed in the previous chapters, the project sites and laydown areas contain small trees and shrubs within and around the area. Leveling and grading of the site prior to the civil construction will involve small scale removal of such vegetation. Care will be taken not to disturb any vegetation existing outside the proposed project sites during the mobilization and demobilization of construction equipment.

Surface contaminated soil, if found, should be removed and stored as a hazardous waste with proper protocols. Any subsurface contamination that is suspected or discovered during the construction activities is to be further assessed and remediated if required.

Grading and soil compaction will be involved as a part of site preparation. If any dust emissions are expected particularly during the dry weather conditions, water spraying is to be carried out for dust suppression. During the construction, the dislocated soil will be stored at appropriate locations within the project site. The soil will be used for backfilling, wherever possible. The excess soil will be relocated to adjacent lands.

.2.3 Air Quality

<u>Planning</u>

Plan activities such that dust may not disperse in the area;

Allocate appropriate location for stockpiling of aggregates, sand and gravel;

Blasting activity will be done with the permission of relevant authority consent and the local communities will be informed.

<u>Controls at proposed Project site</u>

Water to be sprayed on dust prone graded roads and vacant sites;

Stockpiles must be covered with impermeable layers;

Grey water that may generate during concrete batching activities may be reutilized for sprinkling on land to suppress dust emissions;

Low intensity dynamites should be used and be set up in such way that the effect remains localized; and their storage should be done accordingly;

Construction workers to be properly trained to follow control measures.

Monitoring

Periodic audits to be conducted to assess implementation of the control measures and results of audits to be reviewed and corrective actions to be taken;

Particulate Matter must be monitored at regular intervals or as prescribed by the GB EPA.

.2.4 Noise

Planning

Major construction activities at site to be planned in such a way as to maintain source noise levels as per GB EQS;

Activities to be simultaneously synchronized to avoid noise intensification in the area.

Controls at Project Site

Use noise abatement canopies or layers on any such devices that may cause noise;

Train the workers to work in a systematic manner to avoid disturbance in nearby communities.

Monitoring

Periodic audits to be conducted to assess implementation of the control measures and results of audits to be reviewed and corrective actions to be taken.

.2.5 Land Use and Soil

Planning

Efficient design shall be applied to avoid soil erosion along the canal route.

Controls at Project Site

Vegetation, erosion protection and stone pitching whenever required are few controls that shall be adopted;

Discussion of soil erosion in 7.3.9 must be taken into consideration.

Monitoring

Periodic audits to be conducted to assess implementation of the control measures and results of audits to be reviewed and corrective actions to be taken.

.2.6 Geology

Planning

No direct or indirect impact is associated in the project design as existing water channels are being used, however, it will be ensured that no transgression in area's geology is done.

Controls at Project Site

Supervise and ensure no vehicular movement or land material acquisition is done on any area other than the project borrow areas.

Monitoring

Project related activities do not occur than the project area.

.2.7 Landslides

Planning

No direct or indirect impact is associated in the project design as existing water channels are being used, however, weirs will be built along the water channels.

Controls at Project Site

Weirs are properly built along the water channels. Turfing methods on slopes will be done where feasible.

Monitoring

Land stability is checked on random timeframes during the project cycle.

.2.8 Agriculture and Vegetation

Planning

Interruption/reduction in downstream flow will be prevented by providing diversion channels on temporary basis.

O & M Control

Water must be fit for human consumption. It is therefore recommended that drinking water quality test will be done after the selection of any option

mutually agreed between contractor and AKRSP environmental staff.

Drivers will be not allowed to wash the vehicles or do any maintenance work near the channels to avoid contamination.

Monitoring

Equal distribution of water is ensured by monitoring extraction and distribution systems. Community engagement throughout the process will be made effective.

Agriculture activities are uninterrupted by any project activity. Community takes active participation in planting more trees during the process.

.2.9 Wastewater

Planning

Collection of grey water if generated from concrete batching (if used) need to be collected in a sedimentation pond.

Controls at Project Site

Any waste water generated shall be retained to be reused for sprinkling in the area.

Monitoring

No monitoring is required in this case as no polluted water is generated.

.2.10 Solid Wastes

Planning

Suitable storage area (adequately designed to protect from rains and to prevent any run offs) and collection skips to be provided for solid wastes for segregated collection of wastes. The sizing of such areas and skips to be in accordance with the expected waste quantities and the frequency of disposal. The waste containers holding the waste material to be suitably labeled for easy identification of material;

Controls at Project site

Excavated soil if not utilize in the construction need to be stockpiled at an appropriate location near site. Adequate enclosures and curbs to be provided to avoid blowing away by wind and run off with storm water. The soil to be reused for backfilling and grading as feasible. Any excess soil to be disposed of in approved dumpsites;

Wastes from construction activities such as concrete waste, metal scraps, domestic refuse, etc., to be collected, segregated and disposed through approved landfill sites;

Metal scrap, wood scrap, empty containers of non-hazardous materials, packing materials, etc., to be collected, segregated and recycled to scrap dealers as feasible and the non- recyclable waste to be disposed through approved dumpsites;

Non-hazardous wastes should not be mixed with hazardous wastes at any time. Non- hazardous wastes suspected to be contaminated with hazardous wastes are to be treated as hazardous wastes;

Waste consignment notes to be prepared and documented for transporting wastes from the site identifying the type of waste, quantity, disposal site, etc. The delivery receipts obtained from municipal dumpsites are to be documented.

Training will be provided to personnel for identification, segregation, and management of waste.

Monitoring

The quantities of various categories of wastes generated, stored and transported for offsite disposal to be recorded and monitored; and

Periodic audits to be conducted to assess implementation of the control measures and results of audits to be reviewed and corrective actions to be taken for deviations.

.2.11 Temporary Labor Camps

Planning

Develop the labor camps by keeping the maximum possible number of labors that will be recruited during the construction activities.

Calculate and ensure the quantity of water that will be required for washing and toilet facilities as well as potable water for drinking purposes.

Sewage drains will be made either connecting to the existing drain infrastructure with their prior permission or if such infrastructure is not available, the temporary drains shall connect to septic tanks or soakage pits.

Solid waste storage sites will be developed on a safe location away from residential area and on impermeable flooring.

Controls at Project Site

Trainings will be provided to the labors for resource conservation such as sustainable use of water and solid waste reduction techniques;

Sewage drains will be maintained to avoid stagnant spoiled water in the area;

Segregation of solid waste will be practiced in the camp for better solid waste management and to maintain the aesthetics of the area;

Storage of solid waste will not be allowed more than a week.

Contractor will ensure proper disposal of solid waste either through municipal services or approved contractors and keep records of the waste disposed.

Monitoring

Resource supply and consumption records will be maintained.

Quantities of waste generated, stored and disposed from the camp sites will be monitored and recorded.

Periodic audits to be conducted to ensure the implementation of control measures.

.2.12 Health and Safety

Planning

Prior to any site works, the proponent and contractor will develop a construction management plan. It should be ensured that activities at the site will not cause damage to lives and properties by implementing measures to ensure the health and safety of workers and the public.

Controls at Project Site

During construction all necessary PPEs should be provided to workers and employees i.e. masks, gloves, safety shoes, safety goggles and helmet etc.

MSDS and safety precautions should be communicated to all workers and employees.

Emergency evacuation and assembly areas must be allocated and communicated to all people involved with the project directly or indirectly such as workers, contractors as well as community members.

Activity areas will be marked to avoid accidents and will be properly drained to avoid ponding of water that could harbor mosquitoes and other disease vectors,

Solid waste will be segregated and labeled in separate bins or bags and dispose of appropriately.

Basic medical facilities and appropriate safety gear will be provided to workers.

Monitoring

Emergency response training should be given to employees and evacuation drills should be scheduled and conducted. Regular monitoring to be conducted to ensure the health and safety compliance of workers at the work place.

Periodic audits to be conducted to assess implementation of the control measures and results of audits to be reviewed and corrective actions to be taken for deviations.

5.3 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAMME – CONSTRUCTION PHASE

The Environmental Management System (EMS) of EPC contractors and the sub-contractors are to include systems for scheduling, organizing and conducting periodic audits of the EMS implementation during the construction phase. The audits are to be scheduled in such a way as to cover all significant activities of the construction in order to assess the implementation of control measures proposed in this EMP, including environmental monitoring programs and in turn to assess compliance with applicable environmental regulations. Various environmental monitoring proposed during the construction phase are presented in **Exhibit 8.2**. The monitoring data are to be compiled and documented. The reports of such audits/monitoring will be prepared. Corrective actions are to be implemented for any deviations from compliance requirements.

The findings and recommendations of periodic audits and related monitoring along with recommendations for corrective actions and improvements are to be periodically reviewed by AKRSP and the Contractors. Adequate resources are to be provided by AKRSP and the Contractors or sub-contractors for implementation of such recommendations and corrective actions for improving the effectiveness of the EMS.

The proposed monitoring and auditing plan for construction phase is presented in **Exhibit 8.1.**

Exhibit 8.1: Environmental Monitoring during Construction Phase

S. N	Environmental Aspect	Scope of Monitoring	Method	Frequency of Monitoring / Auditing	Responsibility	Budget
1	**Air Quality**	Parameters as per GB EQS	Ambient Air Analyzer	Monthly	Project Manager/ Contractor	100,000/-
2	**Noise Levels**	Noise levels at various locations in and around the project site	Using sound pressure level meter	Monthly	Project Manager/ Contractor	80,000/-
3	**Land Use and Soil**	Soil erosion/ degradation	Visual assessment Photographic evidences	From beginning till completion of project	Project Manager/ Contractor	-
4	**Geology**	No egress of land due to project activities	Project area being demarcated	From beginning till completion of project	Project Manager/ Contractor	-
5	**Landslides**	Slopes and Land stability	Protective measures are in place	From beginning till completion of project	Project Manager/ Contractor	-
6	**Agriculture and Vegetation**	Equal water distribution Agriculture activities are uninterrupted	Local water governing bodies maintain log for distribution Community feedback log is maintained	From beginning till completion of project	Project Manager/ Contractor	-

S. N	Environmental Aspect	Scope of Monitoring	Method	Frequency of Monitoring / Auditing	Responsibility	Budget
7	**Water**	Water borne diseases Water scarcity Ensure Spills prevention plan is available	Check water drainage system Ensure the plan is being implemented	Monthly	Project Manager	-
8	**Solid Waste**	Health hazards Property loss Unaesthetic conditions Hazardous waste will not be mixed with non-hazardous Transfer of hazardous solid waste will be done by GB-EPA approved contractors	Solid waste management Designated areas for solid waste storage Safe disposal and segregation Waste disposal through contractors to be kept in record. Record of solid waste generated	Monthly	Project Manager/ Contractor	120,000/-
9	**Terrestrial Ecology**	Replantation program to be implemented by local communities	On-site inspection	Quarterly	Project Manager	-
10	**Temporary labor camps**	Resource Conservation practices (water & electricity consumption) Solid waste segregation and storage Adequate water supply and drainage system	Records of resource consumption Visual assessments Waste Management	weekly	Project Manager/ Contractor	100,000/-

S. N	Environmental Aspect	Scope of Monitoring	Method	Frequency of Monitoring / Auditing	Responsibility	Budget
		Housekeeping				

5.4 OPERATION PHASE ENVIRONMENTAL MANAGEMENT

.4.1 Organization and Responsibility

At a later stage of project development, AKRSP will develop an appropriate organizational structure for project management integrating the existing environmental and social safeguard procedures. The project manager will be responsible for the implementation and effective management of the EMS. The Environmental compliance manager will be responsible for the project cycle and for coordination of Environmental and Social benefits for the area and community development as per the objectives of the SDP.

.4.2 Soil and Land Use

Design

Regular maintenance checkup along the canals will be planned on regular intervals.

Community will be trained to look after the water courses as it is should be an integral management system with AKRSP and community members.

O & M Control

Durability and infrastructure of canals must be up to mark and flow of water is maintained;

Cracks and fissures where deterioration of canal is expected must be repaired immediately; and

Soil erosion control measures shall be taken as recommendations given in Section 7.3.9.

Monitoring

Periodic monitoring of the water courses will be done by physical inspection. Community awareness will be assessed by periodic visits in the area.

.4.3 Water Resources

Design

Community will be trained to look after the water courses as it is should be an integral management system with AKRSP and

community members.

Sustainable and ethical use of water resources will be promoted by AKRSP and community members.

O & M Control

Water distribution must be equal to all areas as planned in the engineering design.

Water must be utilized in proportionate quantities according to the flow available in the region with varying seasons.

Monitoring

Periodic monitoring of the water courses will be done by physical inspection. Community awareness will be assessed by periodic visits in the area.

.4.4 Climate

Planning

No direct or indirect impact is associated in the project design as no climate influencing anthropogenic activities are involved.

O & M Control

None required.

Monitoring

None required.

.4.5 Agriculture and Vegetation

Planning

Channels will be developed with respect to natural drainage of water ensuring regularized flow for downstream consumers.

O & M Control

None required.

Monitoring

Water from public sources will only be abstracted after getting formal permission from the concerned department.

Community engagement and participation will be made effective.

5.5 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM – OPERATION PHASE

Based on the discussions above, an environmental monitoring program summarized in **Exhibit 8.2** below is proposed for the operational phase.

hibit 8.2: Environmental Monitoring during Operation Phase

S.N	Environmental Aspects	Scope of Monitoring / Auditing	Method	Frequency of Monitoring	Responsibility	Budget
1	Soil and Land-use	Channels will be inspected for durability	On-site inspection, community awareness questionnaires	Monthly	AKRSP	
2	Water Resources	Equal distribution of water resources	Complaint Register; Community Awareness questionnaires	Monthly	AKRSP	
3	Climate	None Required	Nil	N/A	None	

S.N	Environmental Aspects	Scope of Monitoring / Auditing	Method	Frequency of Monitoring	Responsibility	Budget
4	Agriculture and Vegetation	Good Water governance by equal and legal distribution to agriculture lands	Water distribution log by local water departments	Monthly	AKRSP	

Chapter 9

CONCLUSION

The IEE of the proposed project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;
- Identification of the environmental features of the project area including the physical ,biological and social disturbance and likely impact of the project on the environment;
- Recommendation of appropriate mitigation measures that AKRSP will incorporate and ensure as per this IEE into the project to minimize the adverse environmental impacts;
- The study was intended to generate factual information on irrigation projects and their potential applications.

Baseline physical, biological, socio-economic and cultural data and information was collected from a variety of primary and secondary sources, including field surveys, review of relevant literature and online publications. The collected data was used to organize profiles of the physical, biological and socio-economic environments, likely to be affected by the proposed project.

Further this IEE Report has been made to highlight the potential impacts of the described project on the area's physical, biological, socio-economic and cultural environments.

It is concluded that the potential impacts of the proposed water sources project will be insignificant on most of the environmental receptors, provided that the EMP and the mitigation measures proposed in this report are implemented in true spirit. AKRSP must be constituted to ensure minimum impacts.

After assessing the proposed project activities and investigating the project area, the environmental consultants have concluded that:

"If the activities are undertaken as proposed and described in this report and the recommended mitigation measures and environmental management plan is adopted, it is concluded that the proposed project will increase the existing water sources capacity to supply more water for more agricultural lands without causing any negative impact. The proposed project is favorable in all respects which include irrigation capacity, economics and environmental impacts."

ANNEXURE-I

Water Quality Results

Central Analytical Facility Division
ISO 9001:2008 certified
Directorate of Systems & Services
Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan
Tel.: (051)9248772, Fax: (51)9248808, Email: waqarfarhat@yahoo.com, cafdoffice@yahoo.com

Aug 1st, 2016

ANALYSIS REPORT

Customer Contact: Agha Khan Rural Support Program
Regional Office Satpara Road
Skardu
Customer Reference: Nil
Sample ID: Water
Submitted By: Ilyas Hussain

CAFD No: 4323
Date Registered: 26-07-2016
Report No: CAFD-4323-2016/
No. of Samples: 09
Technique used: Titration

Parameters		Hussainabad	Thayoure	Burgaiy Nallah
Bicarbonate	1	67.122mg/l	ND	73.224mg/l
-	2	67.122mg/l	ND	67.122mg/l
-	3	61.02mg/l	ND	73.224mg/l

ND = Not Detected

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within one months of the issuance of this report, if required.

Analyst

Group Head 1.8.16

Head, CAFD 1.8.16

Central Analytical Facility Division

ISO 9001:2008 certified

Directorate of Systems & Services

Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan

Tel.: (051)9248772, Fax: (51)9248808, Email: waqarfarhat@yahoo.com, cafdoffice@yahoo.com

August 1, 2016

ANALYSIS REPORT

Customer Contact: Agha Khan Rural Support Program Regional Office Satpara Road Sakardu

CAFD No: 4323

Date Registered: 26-07-2016

Customer Reference: Nil

Report No: CAFD-4323-2016/

Sample ID: Water

No. of Samples: 09

Submitted By: Mr. Ilyas Hussain

Technique used: HPLC/Instrumental method

S.#	Sample ID	TDS	Flouride	Chloride	Nitrate
1.	Burgaiy Nallah-1	96mg/L	ND	ND	ND
2.	Burgaiy Nallah-2	97mg/L	ND	ND	ND
3.	Burgaiy Nallah-3	106mg/L	ND	ND	ND
4.	Thayoure-1	57mg/L	ND	ND	ND
5.	Thayoure-2	56mg/L	ND	ND	ND
6.	Thayoure-3	57mg/L	ND	ND	ND
7.	Hussainabad-1	70mg/L	ND	ND	ND
8.	Hussainabad-2	71mg/L	ND	ND	ND
9.	Hussainabad-3	71mg/L	ND	ND	ND
LOD		-	**1ppm**	**2ppm**	**3ppm**

ND = Not Detected LOD = Limit of Detection

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within ONE month of the issuance of this report, if required.

Analyst

Lab Incharge

Group Head 2.8.16.

Head, CAFD

Central Analytical Facility Division
ISO 9001:2008 CERTIFIED
Directorate of Systems & Services
Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan
Tel.: (051)9248772, Fax: (51)9248808, Email: waqarfarhat@yahoo.com, cafdoffice@yahoo.com

August 4, 2016

ANALYSIS REPORT

Customer Contact: Agha Khan Rural Support Programme, Skardu
Customer Reference: Nil
Sample ID: Water
Submitted By: Mr. Ilyas Hussain

CAFD No: 4323
Date Registered: 26-07-2016
Report No: CAFD-4323-2016
No. of Samples: 9
Technique: GFAAS, HGAAS

Concentration (ng/mL or ppb)

Sample	Element			
	As	Cu	Mn	Pb
Burgaiy Nallah-1	3.36	ND	ND	ND
Burgaiy Nallah-2	3.45	ND	ND	ND
Burgaiy Nallah-3	3.32	ND	ND	ND
HussainAbad-1	ND	ND	ND	ND
HussainAbad-2	ND	ND	ND	ND
HussainAbad-3	ND	ND	ND	ND
Thayoure-1	3.35	ND	ND	ND
Thayoure-2	3.65	ND	ND	ND
Thayoure-3	3.66	ND	ND	ND
LOD	0.89	15.81	1.27	3.87

RSD ≤ 5.0% ND = Not detected LOD = Limit of determination

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within one month of the issuance of this report, if required.

4/08/2016
(Analyst)
Tanveer Ahmad

Lab Incharge 2016 08 04

Group Head

Head CAFD 4.8.16

Central Analytical Facility Division
ISO 9001:2008 CERTIFIED
Directorate of Systems & Services
Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan
Tel, (051)9248772, Fax: (051)9248808, E-mail: waqarfarhat@yahoo.com, cafdoffice@yahoo.com

July 27, 2016

ANALYSIS REPORT

Customer Contact: Agha Khan Rural Support Prog. Skardu
Customer Reference: Nil
Sample Type: Water samples
Submitted By: Ilyas Hussain

CAFD No: 4323
Date Registered: 26-07-2016
Report No: CAFD-4323-2016/
No. of Samples: 09
Technique: ICP-OES

Concentration (µg/ml)

No. of Elements	Elements	Burgaiy Nallah-1	Burgaiy Nallah-2	Burgaiy Nallah-3	Thayoure-1	Thayoure-2
1	Ca	23.89	24.81	26.20	16.94	16.15
2	Cu	ND	ND	ND	ND	ND
3	Fe	ND	ND	ND	0.05	0.06
4	K	1.02	0.99	1.24	0.62	0.59
5	Mn	ND	ND	ND	ND	ND
6	Na	1.25	1.31	1.74	0.51	0.49
7	Pb	ND	ND	ND	ND	ND
8	SO_4	20.37	22.15	24.04	7.77	8.15
9	Zn	ND	ND	ND	ND	ND
No. of Elements	**Elements**	**Thayoure-3**	**Hussainabad-1**	**Hussainabad-2**	**Hussainabad-3**	**LODs (µg/ml)**
1	Ca	16.11	18.26	19.49	18.71	-
2	Cu	ND	ND	ND	ND	0.03
3	Fe	0.05	ND	ND	ND	0.03
4	K	0.56	1.75	1.79	1.76	-
5	Mn	ND	ND	ND	ND	0.01
6	Na	0.50	1.49	1.58	1.56	-
7	Pb	ND	ND	ND	ND	0.03
8	SO_4	7.56	6.23	6.74	6.57	-
9	Zn	ND	ND	ND	0.14	0.01

RSD ≤ 2.0 ND = Not detected LOD = Limit of determination

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use
3. The analyzed samples may be collected back within one month of the issuance of this report, if required.

Analyst
(Ahmed Naveed Sajid)

Lab Incharge

Group Head 27/07/2016

Head CAFD 28.7.16

ANNEXURE-II

Traffic Management Plan

Traffic Management Plan

1. Objectives

A traffic management plan (TMP) is one of minimising the interface wherever possible between public and site traffic, developed in order to cope with traffic disruption and avoid peaks and controlling vehicular movement on the project. The main objectives of this plan are to:

- Facilitate road traffic
- Facilitate construction activities

2. Construction Period

The SDP will take approximately 1.5 years to complete and the activities period includes vehicular movement carrying material. Although the construction activity is not large enough but it is important to manage traffic and vehicles as their mismanagement can cause a nuisance to locals in terms of noise, dust, congestion and delay.

3. Construction Traffic

Construction traffic will be generated by the following:

- The supply and movement of construction personnel, materials, equipment.

4. Traffic Management Issues

The key issues addressed by the TMP in terms of mitigation measures include:

- Easy access to the areas of construction for construction goods and personnel.
- Routing of construction traffic
- Temporary traffic control and management
- Road crossing
- Parking facilities
- Keeping road clean of mud and dust
- Reducing the probability of traffic accidents

5. Plan

Traffic management and road safety considerations are of utmost importance to ensure successful execution of the project. The anticipated impacted area due to project construction activities would consist the following: A suitable detailed traffic management plan will have to be prepared by the contractors and vetted by supervision consultants and should be implemented accordingly:

- The factors requiring special attention are:
- Type of traffic (Heavy , Light)
- Size of vehicles
- Historic traffic flow
- Estimated project site specific traffic
- Road conditions
- Rainfall and flood pattern and probability

- As an alternate option for traffic flow the erection of steel structure on the bridge during replacement of gates job
- Cost of alternate options

6. Traffic and Access Routes

It is important to manage public access routes and site traffic during construction because it can cause delay to local traffic and create a safety hazard both on and off site. People working and living near the site are also often annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access and site traffic are detailed below:

7. Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size and width and type of load
- Time
- Parking

8. Site Workers Traffic

Site personnel should not be permitted to park vehicles around the site boundary; this will lead to disruption in deliverables, so for this purpose designated parking areas with appropriate space should be arranged. Any plain area can be used near the construction site. Contractors should indicate in their plan that where vehicles will pick up, drop off and park.

9. Site Rules

- As far as practicable access to and from the site must be only via the main entrance;
- On leaving the site, vehicles must be directed to follow the directions;
- Drivers must adhere to the site speed limits;
- All deliveries to site must keep to their allocated time limits;
- No material or rubbish should be left in the unloading area;
- Develop map for alternate routes; and
- Project vehicles must be badged or logo displaying that they belong to Satpara Development Project.

The contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan, which produces minimum nuisance to the local people and to the environment. It comes under Contractor's obligation to notify the Traffic Management Plan to AKRSP and traffic police.

ANNEXURE-III

Grievance Redress Mechanism

Frame work of a Grievance Mechanism

Grievance mechanism should offer a variety of approaches, not just a single grievance procedure. The complainant should have influence over which approach to select.

Identify a central point for coordination. A staff member or an individual or team, should be maintained. This central coordinator facilitates the development and implementation of the grievance mechanism, administers some of its resources, monitors internal and external good practice, ensures coordination among access points, and makes certain that the system is responsive to the information it manages.

Maintain and publicize multiple access points. Expanding access beyond those individuals who have the primary responsibility to receive grievances can significantly reduce barriers to entering the system and encourage community members to address problems early and constructively. Individuals serving as access points are most effective if they are trustworthy, trained, knowledgeable, and approachable regardless of the ethnicity, gender, or religion of the complainant.

Report back to the community. The proponent should provide regular feedback to relevant stakeholders to clarify expectations about what the mechanism does and does not do; to encourage people to use the mechanism; to present results; and to gather feedback to improve the grievance system. Information reported back might include types of cases and how they were resolved, and the way the grievance has influenced organizational policies, procedures, operations, and the grievance mechanism itself.

Use a grievance log to monitor cases and improve the organization. In addition to resolving individual or community disputes, the grievance mechanism is an opportunity to promote improvements in the organization. A grievance log (or register) can be used to analyze information about grievance and conflict trends, community issues, and project operations to anticipate the kinds of conflicts they might expect in the future, both to ensure that the grievance mechanism is set up to handle such issues and to propose organizational or operational changes. Sometimes, enacting policies or other types of structural change can resolve grievances around a common issue, rather than continuing to settle individual complaints on a case-by-case basis.

Evaluate and improve the system. The organization should periodically conduct an internal assessment of the grievance mechanism to evaluate and improve its effectiveness. Important elements of evaluation include: general awareness of the mechanism; whether it is used and by whom; the types of issues addressed; the ability of the mechanism to resolve conflicts early and constructively; the actual outcomes (impacts on project operations, management systems, and benefits for communities); its efficiency; and, most fundamentally, the ability to accomplish its stated purpose and goals. At certain times, the company should also solicit and include the views of stakeholder representatives to see how the mechanism is proving effective in practice.

A good grievance mechanism should be simple to understand, but not simplistic in its dealings with people and issues. Clarity and a user-friendly approach are certain to yield positive results.

Figure : .**The Typical Steps of a Grievance Mechanism**