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ACRONYMS

AOI	Area of Influence
ASME	American Society of Mechanical Engineers
BDL	Below Detectable Limits
CFCs	Chloro-Fluoro Carbons
CMH	Combined Military Hospital
CNIC	Computerized National Identity Card
dB	Decibel
DHQ	District Headquarter Hospital
EIA	Environmental Impact Assessment
EMMP	Environment Management and Monitoring Plan
EMP	Environment Management Plan
EPA	Environment Protection Agency
EPD	Environmental Protection Department
FCNA	Force Command Northern Areas
GB	Gilgit Baltistan
GDA	Gilgit Development Authority
GOP	Government of Pakistan
GRC	Grievances Redressed Committee
GWMC	Gilgit Waste Management Company
HSE	Health, Safety and Environment
IEE	Initial Environment Examination
IUCN	International Union for Conservation of Nature
KIU	Karakorum International University
LPG	Liquefied Petroleum Gas

Ltd	Limited
NDMA	National Disaster Management Authority
NEQS	National Environmental Quality Standards
NGO	Non-Government Organizations
NOC	No Objection Certificate
OGRA	Oil and Gas Regulatory Authority
PA	Protected Area
PAPs	Project Affected Persons
PEPA	Pakistan Environment Protection Act
PEPC	Pakistan Environmental Protection Council
PKR	Pakistani Rupees Equals
PMD	Pakistan Meteorological Department
PSI	Pounds per Square Inch
Pvt	Private
RO	Reverse Osmosis
SNG	Synthetic Natural Gas
TDS	Total Dissolve Solids
TMA	Town Municipal Authority
TOR	Terms of Reference
TSS	Total Suspended Solids
WACG	Weighted Average Cost of the Gas
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Agency

EXECUTIVE SUMMARY

1. Introduction

The proposed project is the provision of SNG at household level through the installation of LPG Air-Mix Plant at 40 Kanals land in Chilmish Das, Gilgit-Baltistan. SNG Plant will be installed at Khasra No. A/1249/I adjacent to Nomal Road, Chilmish Das Mouza Konodas, Gilgit, Gilgit-Baltistan. The coordinates of the site are 35°56'59.95033"N and 74°20'56.27191"E. The project is divided into several phases. In the first phase, SNG will be supplied to the Jabeer Basin, Kargha Nullah to FCNA and Jutial. Later on, it will be supplied to rest of the areas such as, Sakwar, Minawar, Mohammedabad, Danyor, Sultanabad, Konodas, Sakarkoi and KIU. The supply of SNG is directly linked with the construction of the distribution channels.

The project area proposed to be utilized for the installation of the LPG Air Mix plant is barren and it is located at a distance of 4.04 km from the nearest residential community. The topography of the area is flat and no disaster had been reported in past 5 years. Moreover, no ecologically important or sensitive ecosystem is reported in the proximity of the proposed location for installation of LPG Air Mix Plant. The components of LPG-Air Mix Plant are given below:

1. Storage Tanks
2. Air Compressor
3. Air Dyers
4. Line Filters
5. Vaporizer Chambers
6. SNG Blending System

The Proponent has engaged Ecogreen Company (Pvt.) Limited to carry out the environmental and social impact assessment for the installation of the aforementioned project in accordance with Gilgit-Baltistan EPA guidelines. The salient features of the proposed project are given below:

Salient Features of Proposed Project

Sr#	Salient Features	
1	Project Title	Provision of SNG through the Installation of LPG-Air Mix Plant
2	Project Location	Chlimash Das, Gilgit Baltistan
3	Proponent	Irfan Baig, Chief Engineer SNGPL
4	Consultant	Ecogreen Company (Pvt) Ltd.
5	Total Area	40 kanals
6	Cost of Project	PKR 460.2 Million

7	Tree Plantation	At the Designated Green Areas
8	Water Source	Underground Water
9	Status of Project	Designing Phase
10	Nature of Area	Open and Dry-Land
11	Source of Power	WAPDA (Hydroelectric Supply)
12	Wastewater Disposal	GDA Disposal System
13	Beneficiaries	45,000 households
SNG= Synthetic Natural Gas; LPG= Liquefied Petroleum Gas; SNGPL; Sui-Norther Gas Pipelines Limited; GDA=Gilgit Development Authority; WAPDA=Water and Power Development Authority		

2. Impact and Mitigation Measures

Environmental impacts have been identified and mitigation measures are recommended within the project Area of Influence (AOI). The proposed project is anticipated to have more beneficial impacts as compared to adverse impacts because the provision of SNG at household level will considerably reduce the burden on wood consumption, which in return will reduce air pollution and the rate of deforestation in the vicinity significantly. The major impacts along with the associated risk of physical, biological and social environments are described as below:

Impacts Summary

Environmental Parameters	Risk Assessment	
	Construction Phase	Operational Phase
Location	+2p	+3p
Design	+2p	+4p
A: Physical		
<i>Land Resources</i>		
Waste Management	-1t	-1p
Scrap and Debris	-1t	NA
Land Use	-1p	+2p
Storage and Spillage	NA	-2p
Deforestation	0	+3p
<i>Air Resources</i>		
Air Emission	-1t	+4p
Noise	-1t	-1t
<i>Water Resources and Wastewater Management</i>		
Water Resource	-1p	-2p
B: Ecological		
<i>Flora and Fauna</i>		
Flora and Fauna	-1p	+3p
C: Socioeconomic		
LPG Transportation	0	-2p
Gas Leakage	NA	-2p
HSE	-1t	-2p
First Aid	NA	-1p
Fire Hazards	NA	-2p
Employment	+1p	+1p
Aesthetic	-1t	+2p
Energy Consumption	NA	-1t

Security and Site Access	-1t	-1p
Socioeconomic Status	+1p	+3p
<p>✚ <i>Legends: 1= Low; 2= Medium; 3= High; 4= Extremely High; NA= Not Applicable; t= Temporary; p= Permanent; app= Applicable; 0= Negligible</i></p> <p>✚ <i>All adverse environmental impacts except natural calamities are manageable easily by implementing EMMP</i></p>		

3. Environmental Management and Monitoring Plan

A comprehensive Environmental Management and Monitoring Plan (EMMP) has been formulated to effectively manage and monitor the environmental and social impacts for the provision of SNG in Gilgit Baltistan. The salient features of EMMP are as under:

3.1 Environmental Mitigation Plan

To manage the environmental and social impacts of the project, significant negative impacts and their mitigations have been covered in this section. For the ease of understanding, identification of impacts and to implement their mitigation, an environmental management and mitigation plan has been developed as a ready reference for the Proponent and Contractor to minimize the negative impacts at source or to manage activities in such a manner that will cater any associated adverse impact.

3.2 Environmental and Social Monitoring Plan

Mitigation measures for physical, biological and socioeconomic parameters will be adopted to determine compliance with standards established in EMMP of this EIA Report. The monitoring plan will record the inputs provided by various participants in the environmental and social management process. The air quality is determined once before the commencement of the project and biannually during the operation phase. During the operational phase solid waste management practices and wastewater disposal practices will be monitored by the concerned authority on the regular basis. Moreover, fire-fighting equipment installed at the plant site will be maintained and monitored on the regular basis.

The total estimated cost for the implementation of EMMP in proposed project area is approximately **4.60 million (PKR)**.

4. Conclusions and Recommendations

In general, potential adverse environmental effects resulting from the proposed project will be temporary, short-term and of very low magnitude. Through the application of standards, recommended mitigation measures, adhering to applicable permit conditions and regulations, any adverse effects can be effectively minimized for all phases. The project is not likely to have significant adverse environmental impacts. Negligible negative impacts that likely occur

during project implementation include; solid waste management, wastewater management issue, transportation of the LPG, storage of the LPG at the site and the risk of leakage which could result in the spread of fire. The anticipated impacts can be reduced significantly by adopting management practices.

Mitigation measures will be implemented to minimize environmental impacts, though they are still negligible. Following recommendations and measures are suggested for the benefit of the project:

- The adverse environmental impacts can be reduced significantly by adopting best management and monitoring practices as well as by implementing EMMP with true spirit
- It is advised to regularly maintain the fire-fighting equipment and drills for the emergency response should be carried out properly and regularly
- Over consumption of SNG should be avoided by organizing awareness campaigns at grass root level
- For water heating, solar-energy based heating system should be installed on grass-root level
- It is recommended that the Proponent should obtain an Environmental Approval (NOC) from the GB-EPA before proceeding further into the construction activities

1. INTRODUCTION

1.1 General

The development of any project leads to positive and adverse changes in the environment and change in the social setup of the project and study area. The intensity and level of change, however, depend upon the nature of the project and the baseline environmental conditions of the area. The provision of SNG at the household level through the installation of LPG Air Mix Plant will cause minor environmental and social impacts. Most of the associated impacts are considered to be positive. An environmental and social study is mandatory to establish the baseline conditions, evaluate the possible adverse impacts, if any, and to devise the mitigation measures accordingly.

Environmental Examination and Assessment (Part VI), Section 16 of the Gilgit Baltistan Environmental Protection Act 2015 states that “No proponent of a project shall commence construction or operation unless he has filed with the Agency an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA), and has obtained approval from the concerned Agency in respect thereof.” We have filed EIA of the aforesaid project in the direction of DG-EPA Gilgit-Baltistan. So, the project falls under Category J (1) of the project mentioned in Schedule II of IEE and EIA Regulations 2000.

The proposed project is the installation of LPP Air Mix Plant in Gilgit Baltistan. The anticipated project will comply with the Regulations mentioned in Gilgit-Baltistan Environmental Protection Act, 2015. The project is proposed to be installed in Chilmish Das at an area 40 kanals which is owned by Proponent (SNGPL). The land ownership documents are attached at Annex-I followed by Term of Reference (TOR) which are attached at Annex-II of this EIA Report.

1.2 Project Background

To meet the shortage and non-availability of the domestic energy the Government of Pakistan, has geared up the project of provision of SNG at the household level through the installation of LPG Air Mix Plant in hilly areas such as; Murree, Gilgit and AJK. The cost of LPG Air Mix Plant includes; the cost of LPG storage facility, installation & commissioning, civil works and gas distribution network. The cost will be recovered from gas consumers from all over the country in the form of Weighted Average Cost of Gas (WACoG). Arshad Mirza, the secretary of the Ministry of Petroleum and Natural Resources in 2014 states, “Commencement of LPG Air Mix Plant will cater the gas requirement of local population”. He said, “In hilly areas, massive deforestation is taking place because of which land sliding and flood hitting on the

hilly areas has started occurring more frequently endangering the existence in both the wild and human lives. The consumption of gas through LPG Air Mix Plants will help save the environment and the beauty of the area as well.”

The commencement of the proposed project is the need of the hour as natural gas via pipeline is not available in the Gilgit Baltistan for heating, cooking and other domestic purposes. The fuels consumed for the production of the domestic energy are wood and LPG cylinders. Due to the high consumption of the wood during the extreme winter season, the rate of deforestation is quite high in the nearby areas of the Gilgit City as the wood is being produced from Hunza, Chillas and Danyor. With the provision of the alternative fuel and sustainable energy source such as SNG through a proper distribution channel at the subsidized rates, the rate of the deforestation and air pollution will be decreased significantly.

1.3 Nature and Location of Project

The proposed project is the provision of the SNG through the installation of the LPG-Air Mix Plant of 5.33mmCFD capacity at 40 Kanals. SNG will be supplied to 45,000 households of Gilgit Baltistan. SNG Plant will be installed at Khasra No. A/1249/I adjacent to Nomal Road, Chilmish Das Mouza Konodas, Gilgit, Gilgit-Baltistan. The coordinates of the site are 35°56'59.95033"N and 74°20'56.27191"E. The project is divided into several phases. In the first phase, SNG will be supplied to the Jabeer Basin, Kargha Nullah to FCNA and Jutial. Later on, it will be supplied to rest of the areas such as, Sakwar, Minawar, Mohammedabad, Danyor, Sultanabad, Konodas, Sakarkoi and KIU. The supply of a SNG is directly linked with the construction of the distribution channels.

The site selected for the installation of the plant is open, dry and barren land. Moreover, it is located besides the TMA solid waste disposal site and opposite to the crusher plant. The site is well connected to the other parts of the city through a metalled road network known as Nomal-Gilgit Road. The aerial distance of the of the proposed project area from various sensitive receptors is given in Table 1 below:

Table 1: Distance from various Sensitive Receptors

Sr.#	Description	Distance (km)	Coordinates
1	Nomal-Gilgit Road	Adjacent	35.949795 N, 74.348747 E
2	Hunza River	1.17	35.954277 N, 74.362609 E
3	Chilmish Das	4.04	35.977965 N, 74.324843 E
4	Karakorum International University	3.6	35.923925 N, 74.365522 E
5	Razia Enterprises	2.1	35.934879 N, 74.368328 E
6	Gilgit Airport	3.7	35.918778 N, 74.333070 E

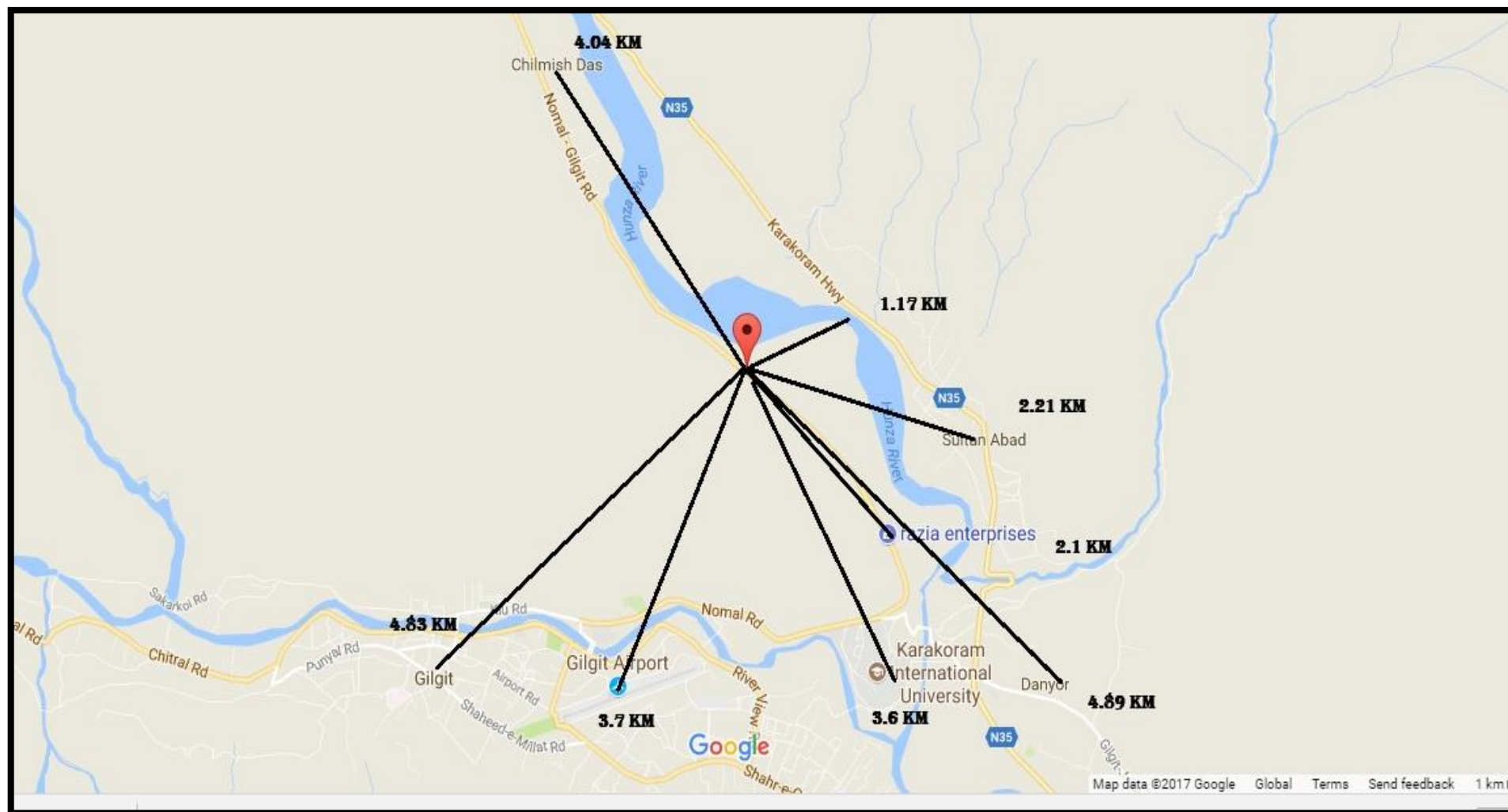


Figure 1: Project Location Map¹

¹ Source= Google Maps

Currently, the project is under-designing/proposed phase. The project will involve the provision of SNG at the household level by the installation of LPG-Air Mix Plant, which is considered as a sustainable fuel as compared to the wood and LPG cylinders. The location of the proposed project is shown on the Google maps which are given in Figure 1. The site layout of the proposed project is under the designing phase.

1.4 Project Proponent

Sui-Northern Gas Pipelines Limited (SNGPL) is the proponent of the proposed project. The details of the focal person of SNGPL are given in Table 2 below:

Table 2: Proponent Details

SNGPL Proponent	
Name	Irfan Baig
Designation	Chief Engineer (LPG/LNG)
Company Name	Sui-Northern Gas Pipeline Limited (SNGPL)
Address	Hall 1, Ground Floor, Shaheen Complex-Edgerton Road, Lahore.
Focal Person	
Name	Leenah Maqbool
Contact No.	+92-320-0800112

1.5 Project Consultant

SNGPL engaged Ecogreen Company (Pvt) Limited to carry out the Environmental Impact Assessment (EIA) Study for the installation and operation, LPG Air Mix Plant in accordance with GB-EPA guidelines. For this purpose, the company engaged the group of professional which comprised of environmental specialist, environmental engineers and chemical engineers. Below is the list of the experts along with their qualifications:

Table 3: List of Experts

Sr#	Name of Resource Person	Educational Background/Expertise
1	Akhtar H. Awan	Environmental Legislation Expert/Mechanical Engineering
2	Farhan Akhtar Awan	Project Management/Environmental Economics
3	Houda Javed	PhD. Env. Sc./MS Environmental Sciences
4	Leenah Maqbool	M.Phil. Environmental Sciences
5	Waseem Shahid	M.Phil. Environmental Management
6	Anas Butt	B. Sc. Engg. (Environment)/M.Phil. Env. Sc.
7	M. Adnan Naeem	B.Sc. Chemistry/M.Sc. Analytical Chemistry/M.Sc. Env. Sc.
8	Nukshab Zeeshan	M.Phil. Environmental Sciences
9	Zeeshan Ismail	M.Phil. Environmental Sciences
10	Maryam Ijaz	M.S. Environmental Sciences
11	Iftikhar Ali	M.Sc. Engg. (Environment)
12	Zahid Jamshed	M.Sc. Engg. (Environment)

13	Ahsan Javed	B. Sc. Engg. (Environment)
14	Muzna Manzoor	M. Sc. Engg. (Environment)
15	Hira Iqbal	M. Sc. Engg. (Environment)
16	Bilal Khan	B. Sc. Engg. (Environment)
17	Abdullah Chisty	M. Sc. Engg. (Environment)
18	Makhdum Ali Sheikh	M.Sc. Forestry
19	Niaz Ahmed Minhas	M.Sc. Hydrology
20	Muhammad Azeem	M.Sc. Chemistry
21	Muhammad Waqas	B.S. Environmental Sciences
22	Sheraz Hussain	M.Sc. Sociology

1.6 Structure of Report

This EIA Report review, information on existing environmental attributes of the project area and study area (which is considered 5.0 km road distance in radius around the project area). Geological, hydrological and ecological features include; air quality, ambient noise level, water quality (surface/ground), soils, social and economic aspects as well as the cultural resources are included and discussed in details in respective sections of this EIA Report. The EIA Report, predicts the probable impacts on the environment due to the proposed sub-project installation and commencement. It also proposes various environmental management measures that need to be adopted to control or mitigate the adverse impact. Details of all background environmental quality, environmental impact/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided. The structure of the EIA Report is as follows;

- Description of the Project
- Description of Environmental and Social Baseline Conditions
- Social Survey of the Study Area
- Assessment of the Anticipated Impacts (Adverse and Beneficial)
- Mitigation Measures for Identified Adverse Impacts
- Environmental Management and Monitoring Plan (EMMP)
- Recommendations and Conclusions

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The Chapter enlists all the relevant and applicable policies, legal and administrative framework instituted by the Government of Gilgit-Baltistan for the sustainable development and the protection of the environment from the commencement and operation of the proposed project.

2.1 Policy Framework

Gilgit Baltistan assembly under *Schedule 4* of “Gilgit-Baltistan (Empowerment and Self-Governance) Order 2009” can make laws under 18th amendment in the constitution of Islamic Republic of Pakistan. Gilgit Baltistan has its own Environmental Protection Agency (GB-EPA), who is the responsible authority for policy making on environmental protection according to the Environmental Protection Act, 2015. The provision of SNG at the household levels will be subsidized by Government of Pakistan (GOP) which require compliance to the Environmental Policy and Guidelines, so it is obligatory on the part of the Proponent (SNGPL) to follow these for environmental assessment.

2.2 National Environment Policy, 2005

The National Environmental Policy (2005) provides an overarching framework for addressing the environmental issues (particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of biodiversity, desertification, etc.) confronting Pakistan. It recognizes the goals and objectives of the Pakistan National Conservation Strategy (PNCS, 1992), National Environmental Action Plans, and other existing environment related national policies, strategies, and action plans. It also provides broad guidelines to the federal government, provincial governments, federally administered territories and local governments to address their environmental concerns and to ensure effective management of their environmental resources.

2.3 Legal Framework

The Government of Gilgit Baltistan has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. In addition to this, they have also developed environmental assessment procedures governing developmental projects. Following are the excerpts of these laws and procedures somehow applicable for the installation and operation of the proposed project.

2.3.1 Gilgit Baltistan Environmental Protection Act, 2015

The Act was enacted in 2015, by repealing the Pakistan Environmental Protection Act (1997). It provides the framework for establishment of the Gilgit Baltistan Environmental Protection Council, establishment of Gilgit-Baltistan Environmental Protection Agency, Establishment of the

Gilgit-Baltistan Sustainable Development Fund, Protection and Conservation of Species, Conservation of Renewable Resources, Establishment of Environmental Courts and Green Courts, Initial Environmental Examination (IEE), and Environmental Impact Assessment (EIA) studies.

Section 16 of the Act stresses the need to carry out environmental impact assessment study prior to construction or operation of any project enlist under Schedule I and II of GB-Environmental Protection Act, 2015.

2.3.2 EPA Regulations, 2000

These regulations provide lists of the projects requiring IEE and EIA study. They also briefly describe the preparation and review of environmental reports.

2.3.3 Pakistan Environmental Assessment Procedures, 1997

Pakistan Environmental Assessment Procedures (1997) is, in fact, a package which contains the following sets of information relevant to the proposed project for filing, review and issuance of the environmental approval:

a) Policy and Procedures

It describes environmental policy and administrative procedures to be followed for filing of environmental impact assessment reports by the proponents, its review and approval by the concerned environmental protection agency/department.

b) Guidelines for the Preparation and Review of Environmental Reports

These guidelines are developed to facilitate both the proponents and decision makers to prepare impact assessment reports (inclusive of all the information contained therein) and carry out their review so as to take informed decisions.

c) National Environmental Quality Standards, 2000

The Pakistan Environmental Protection Council first approved these standards in 1993 and revised in 1995 and 2000. They furnish information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to control environmental pollution.

2.4 Other Relevant Policies and Laws

Following are the relevant and applicable laws for the development of the proposed project:

2.4.1 LPG (Production & Distribution) Policy Guidelines, 2013

The main objectives of LPG Policy Guidelines are to address the lacking of the previous LPG policies, to encourage growth of LPG industry for its sustainable and enhanced availability of

LPG products. To achieve these objective, issues regarding LPG production, LPG licensing, safety standards, pricing, use of LPG in Automotive sector, provision of LPG Air Mix to reduce pressure on existing gas system, import and export have been addressed in these policy guidelines.

2.4.2 Project Implementation and Resettlement of Affected Persons Ordinance, 2000

This ordinance will be used to safeguard the interests of persons and groups involuntarily displaced from the existing places to new resettlement areas.

2.4.3 Land Acquisition Act, 1894

The Land Acquisition Act (1894) deals with the government acquisition of private properties for public purposes including large development projects. There are 55 sections in this Act mainly dealing with area notifications, surveys, acquisition, compensation, apportionment awards, disputes resolution, penalties and exemptions. Any projects that may requires the procurement of privately owned land, government owned land and the displacement of land users. The required land may be acquired through:

- i. Expropriation (Compulsory Acquisition)
- ii. Voluntary negotiation with the owners to purchase required land
- iii. Donation from the land owners

2.4.4 Cutting of Trees (Prohibition) Act, 1975

This Act prohibits cutting or chopping of trees without a prior permission from the Forest Department.

2.4.5 The North-West Frontier Province Wild-Life Act, 1975

This Act defines rules and regulations for the protection, preservation, conservation and management of wildlife.

2.4.6 The Antiquities Act, 1975

Archaeological sites and monuments are specifically protected under The Antiquities Act of, 1975.

2.4.7 Canal and Drainage Act, 1873

This Act entails provisions for the prevention of pollution of natural or man-made water bodies.

2.4.8 Motor Vehicle Rules, 1969

Motor Vehicle Rules 1969 (MVR 1969) define powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory

measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions.

2.4.9 Pakistan Penal Code, 1860

This Act defines the penalties for violations concerning pollution of air, water bodies and land.

2.5 Institutional and Administrative Framework

The only institution and administrative body involved for the review of the assessment study, enforcement of the environmental laws, issuance of the environmental approval and monitoring of the project is the Gilgit Baltistan Environmental Protection Agency.

2.5.1 Environmental Protection Agency, Gilgit Baltistan (GB-EPA)

The Pakistan Environmental Protection Agency (Pak-EPA) is meant for the enforcement of environmental laws in Pakistan. They have delegated powers to provincial environmental protection departments/agencies for review, approval and monitoring of environmental assessment projects. The proposed project is in Gilgit-Baltistan therefore the GB-EPA will be responsible for reviewing the report, issuing Environmental Approval and overall/broad based monitoring of the proposed project activities to ensure compliance with the Environmental Management and Monitoring Plan.

3. PROJECT DESCRIPTION

The proposed project is the provision of SNG at the household level through the installation of LPG Air Mix Plant of 5.33 mm CFD capacity, which will supply SNG to 45,000 households in Gilgit Baltistan. This Chapter gives the detail description of the proposed project, its basic components, design and magnitude which is explained in the sub-sections below.

3.1 Screening/Type and Nature of the Project

Environmental Examination and Assessment (Part VI), Section 16 of the Gilgit Baltistan Environmental Protection Act 2015 states that *“No proponent of a project shall commence construction or operation unless he has filed with the Agency an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA), and has obtained approval from the concerned Agency in respect thereof.”* We have filed EIA of the aforesaid project in the direction of Director EPA Gilgit-Baltistan. So, the project falls under **Category J (1)** of the project mentioned in Schedule II of IEE and EIA Regulations 2000.

3.2 Project Objectives

Following are the main objectives of the proposed project of provision of SNG at household level in Gilgit Baltistan:

1. To provide sustainable living standards and to reduce the ever-increasing demand of fuel wood for burning
2. To provide alternative fuel at economical rates to sustain population
3. To reduce the rate of deforestation significantly as the wood is the main fuel being consumed in the burning
4. To provide the basic amenity to facilitate the residents of GB
5. To reduce the air pollution and to provide a healthier living environment for the citizens
6. To minimize environmental impacts of the wood consumption as the fuel wood
7. To support the local economy by the provision of the cheaper burning fuel as compared to the other available options such as; Wood and LPG cylinders

3.3 Project Alternatives

Following alternatives were considered for the aforesaid project installation and operation:

3.3.1 Site Alternatives

Three sites were considered for the installation of LPG Air Mix Plant located in Jutial, Barmas and Chilmish Das. Chilmish Das was selected as the final site for the installation of the plant. The

reasons for the rejection of the alternative sites and the selection of the Chilmish Das are given below:

a. Jutial Site

Characteristics of the Jutial site are as follows:

- The site was located within the proximity of the main city and residential area was quite close
- The topography of the site was flat
- The land is owned by the Government of Gilgit Baltistan and it is readily available for the lease/sale without any dispute
- The access road was not available for the free movement of the Bowser carrying LPG
- The elevation difference between the site and the river was 450ft and the chances of the flooding were quite high
- The proposed site was in the close proximity of the river bank
- Electricity is available in the area

The proposed site was not suitable for the installation of the LPG-Air Mix Plants because of the less elevation difference between the river and the site which makes the site highly vulnerable to the flooding during the rainy season.

b. Barmas

Following are the characteristics of the Barmas site;

- The site is located in the Suburbs of Gilgit City
- The topography of the site is not flat
- The land is owned by the local government and it is available for the lease/sale without any dispute
- The access road was not available
- No natural disaster is reported in the area in past 5 years
- The site was at the appropriate distance from the surface water body

The proposed site was rejected because the topography of the site was not flat and it does not have the metaled road access.

c. Chilmish Das

The Chilmish Das site was selected for the installation of the plan because of the following reasons:

- The topography of the site was flat
- It was at the distance of 4km from the residential area and at the distance of 14km from the city center
- Accessible through Nomal-Gilgit Road
- The 22-wheeler vehicle the LPG Browser can easily move through the available road network
- No protected site/reserved area is located within the 10km radius of the project area
- The site is at 100ft elevation from the Gilgit City
- The land is owned by the Government of Gilgit Baltistan and it is available for the lease/sale without any dispute
- The proposed land is barren and by the installation of the plant no disturbance to the ecology and the geology of the area is being envisaged
- The site is across the Hunza River and the distribution pipelines will be laid by using the permanent bridge structures
- Electricity is available at the site

Keeping in view the availability the land, its topography and the various features mentioned above the Chilmish Das site is best suited for the installation of the LPG-Air Mix Plant. There is no protected or environmentally sensitive area present in the vicinity of the proposed project area. The public and the social amenities will be extended to the workers easily. So, the site is considered suitable for the installation of the LPG-Air Mix Plant.

The ranking of all the sites is given below:

Table 4: Ranking of the Alternative Sites

Sr#	Parameters	Jutial	Barmas	Chilmish Das
1	Distance from Residential Area	0*	10	10**
2	Distance from the Water Body	0	10	10
3	Road Accessibility	10	0	10
4	Provision of Electricity	10	10	10
5	Land Use at Site	10	10	10
6	Land Ownership	10	10	10
7	Flooding	0	10	10
8	Protected and Reserved Area	10	10	10
9	Topography	10	0	10
10	Distribution Lines	0	0	10
Total		60	70	100
0= Rejection Reasons, 10**=Acceptances/Positive				

3.3.2 Alternative Technologies

LNG and biogas production are the alternative technologies that can be used as the alternative technology for the provision of the domestic energy. Following are the reasons for the rejection of other technologies and adoption of the LPG-Air Plant:

a. Natural Gas

Natural gas is used as basic fuel in central, southern and some northern parts of the country. The transportation of natural gas is done via high pressure transmission lines. The cost of laying a pipeline in the mountainous terrain of Gilgit Baltistan area for the provision of natural gas is very high as opposed to supplying LPG as is the current project. Also, if natural gas were to liquefy in the same manner, 5 times more energy is required to do so compare to LPG. So, it was rejected due to the high operational cost.

b. Biogas

Biogas is mainly produced from the manure, agricultural waste, green waste and food waste. It is one of the cleanest fuel for the burning. The production of the biogas in Gilgit Baltistan is not the feasible option as it faces extreme climatic conditions during summer and winter. To get the desired production the temperature should be maintained between 32°C to 35°C as the bacteria works at these optimum conditions. During winter, the temperature in Gilgit reaches -10°C at which the production of the biogas is not an economically feasible option. So, this option was rejected.

c. LPG Cylinders

LPG cylinders were currently being used as the source of the domestic energy. The issue with the usage of the LPG cylinders is that, high risk is involved as no regulatory body exist to regulate the transportation and usage of the LPG cylinders. During the winter season, the shortage of the LPG cylinders disturbs the routine life of the people. Moreover, the cost of the LPG cylinder is quite high as compared to the cost of the SNG being proposed. So, an LPG cylinder is not a viable option as the source of domestic energy.

d. LPG Air Mix Plant

The boiling point of the LPG is -42°C. LPG is composed mainly of propane and butane, while natural gas is composed of the lighter methane and ethane. LPG, vaporized and at atmospheric pressure, has a higher calorific value (94 MJ/m³ equivalent to 26.1kWh/m³) than natural gas (38 MJ/m³ equivalent to 10.6 kWh/m³). LPG can be mixed with air to produce a synthetic natural gas (SNG) that can be an easy substitute of the natural gas. The LPG can be vaporized at room

temperature by applying pressure. Thus, its less energy intensive as compared to the LNG processing and transmission. The supply of the LPG will be continued around the year. Hence, LPG is more reliable and economical option as compared to LNG and biogas.

3.4 Project Location and Site Layout

The proposed project is the installation of the LPG-Air Mix Plant at 40 Kanals having 5.33mm CFD capacity. It is located at Khasra No. A/1249/I adjacent to Nomal Road, Chilmish Das Mouza Konodas Gilgit, Gilgit-Baltistan, and the coordinates of the site are 35°56'59.95033" North and 74°20'56.27191" East by the installation of the LPG-Air Mix Plant around 45,000 houses will be benefited. SNG will be supplied to the eleven (11) zones/areas such as, Jabeer Basin, Kargha Nullah to FCNA, Jutial, Sakwar, Minawar, Mohammedabad, Danyor, Sultanabad, Konodas, Sakarkoi and Karakorum International University depending upon the construction of the distribution lines.

The proposed location for the installation of the LPG Air Mix Plant is dry, open and barren land. The site is located besides the TMA solid waste disposal site, on the western side a crusher plant is present and at the eastern side River Hunza flows. The distance between the River Hunza and project area is 1.17 km. The site is well connected to the other parts of the city through a metalled road network known as Nomal-Gilgit Road. The aerial distance of the of the proposed project area from various sensitive receptors is given in Table 5 below:

Table 5: Distance from various Sensitive Receptors

Sr.#	Description	Distance (km)	Coordinates
1	Nomal-Gilgit Road	Adjacent	35.949795 N, 74.348747 E
2	Hunza River	1.17	35.954277 N, 74.362609 E
3	Chilmish Das	4.04	35.977965 N, 74.324843 E
4	Sultan Abad	2.21	35.943183 N, 74.378266 E
5	Karakorum International University (KIU)	3.6	35.923925 N, 74.365522 E
6	Razia Enterprises	2.1	35.934879 N, 74.368328 E
7	Gilgit Airport	3.7	35.918778 N, 74.333070 E
8	Sky Light Academy Gilgit	4.23	35.977942 N, 74.324838 E
9	Government Girls Primary School Faizabad Nomal, Gilgit	4.13	35.977956 N, 74.324840 E

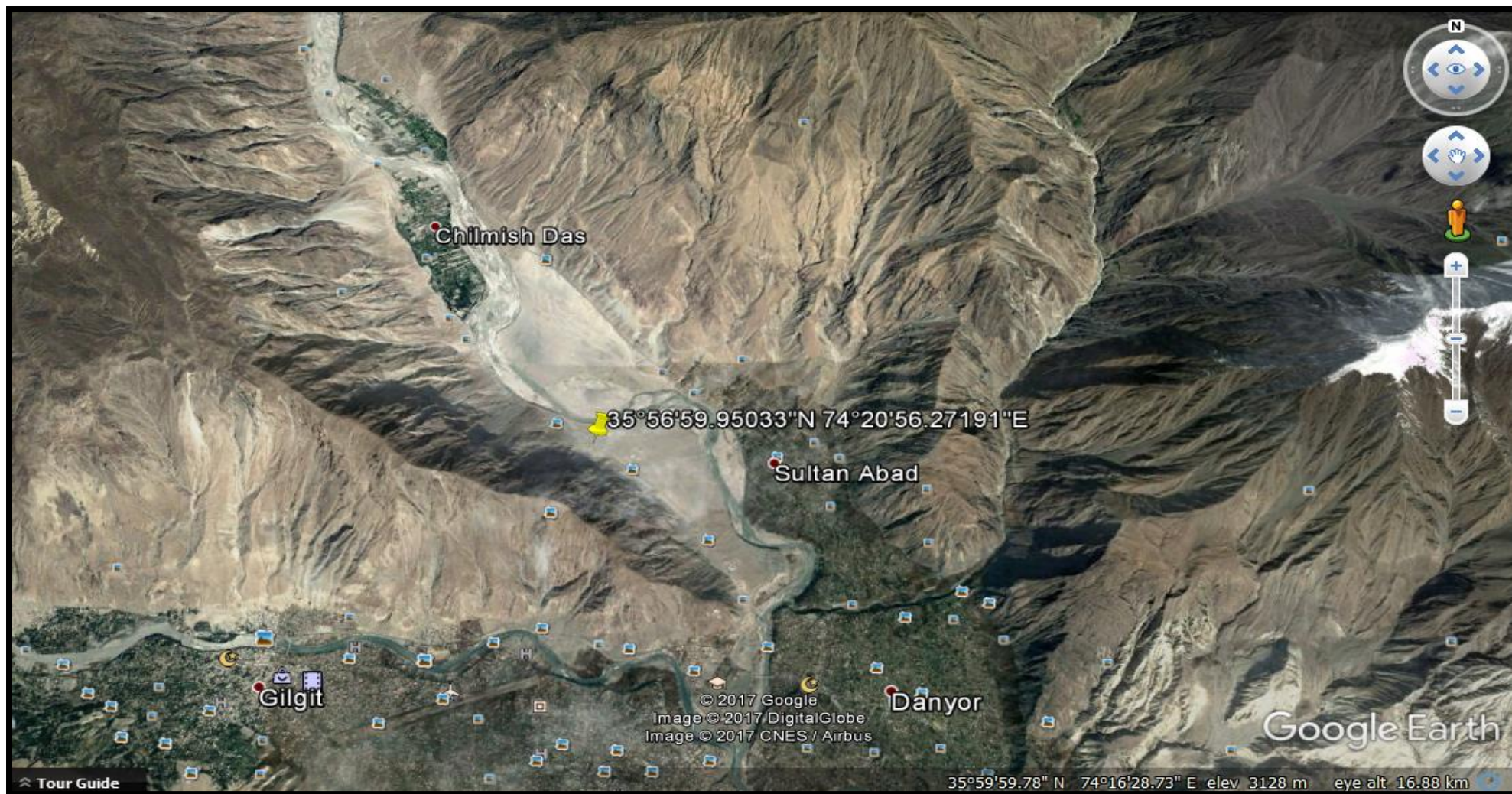


Figure 2: Project Location²

² Source=Google Earth

Currently, the design of LPG Air Mix Plant is in designing/proposed phase. The project will involve the provision of alternative fuel of sui-northern gas known as SNG at the household level through proper distribution network. The location of the project is shown on the Google Earth map which is given in Figure 2. The plant layout plan is attached at Annex-IV of this EIA Report

3.5 Land Use

The proposed project site is a barren, open and dry land located adjacent to the River Hunza at 1.17 km distance. The site is accessible through the metalled road named Nomal-Gilgit Road. The area besides the project area is being used by the TMA for the disposal of the solid waste and a crusher is present adjacent to the site.

3.6 Road Access

The proposed project area has road accessibility as it is accessible and connected to the other parts of the city through metaled road known as Nomal-Gilgit Road. The road access to the project area is given in the Figure 3 below.

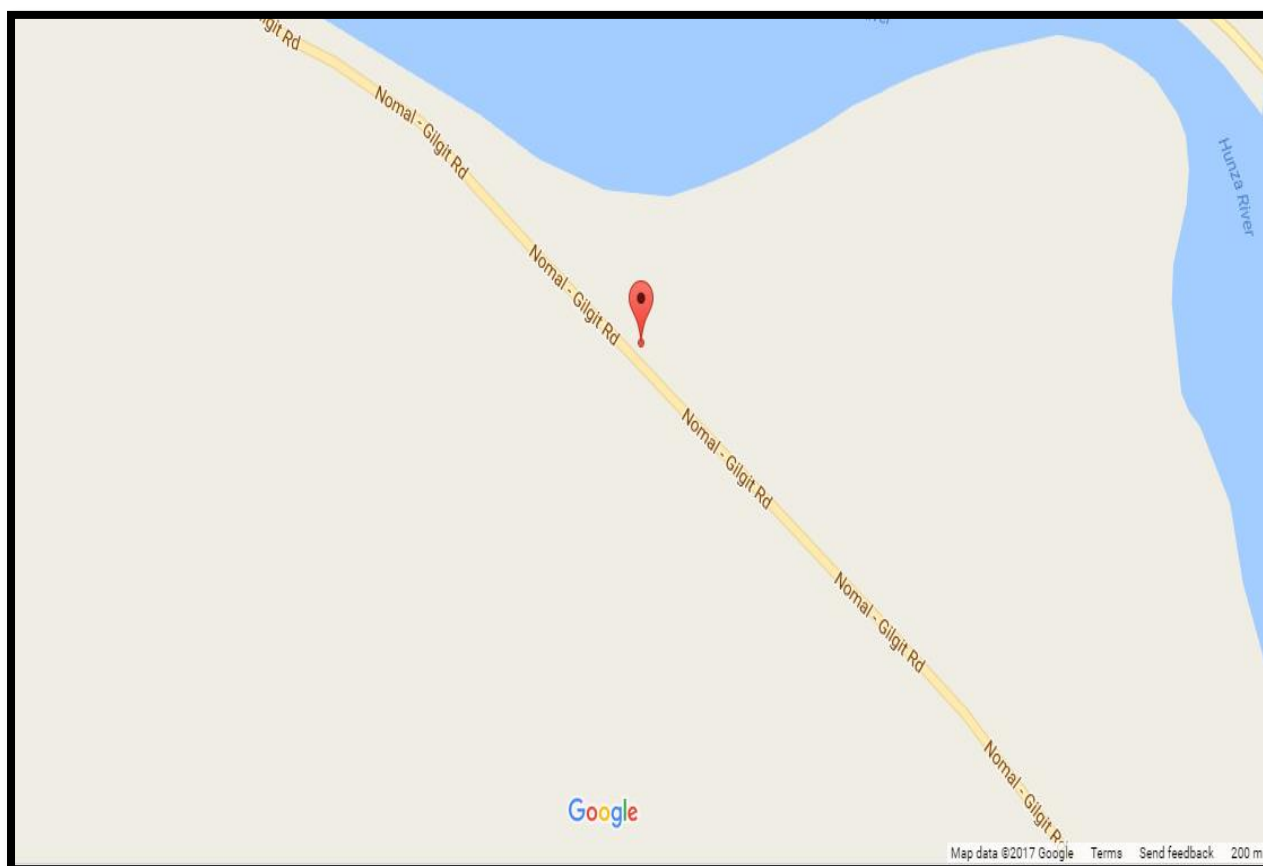


Figure 3: Road Access of Project Area³

³ Source= Google Maps

3.7 Vegetation Features

The project area is surrounded by the barren mountains and project site is inhabited by two herb species which is used as the medicinal plants. The list of the vegetative features present on-site is given in Table 6.

Table 6: Vegetative Features of Project Area

Sr.#	Local Name	Biological Name	Uses
1	Red Cedar	<i>Cedrella toona</i>	<i>Medicinal Herb</i>
2	Seeta	<i>Artemisia scoparia</i>	<i>Medicinal Herb</i>

3.8 Basic Components of the Plant

The proposed project is the provision of the SNG at the household level through the installation and operation of the LPG-Air Mix Plant in Chilmish Das, Gilgit-Baltistan. The distribution network, to supply SNG is not the part of this project. A mass energy balance of the proposed project is attached at Annex-XI of this EIA Report. Following are the basic component of the LPG-Air Mix Plant:

3.8.1 Storage Tanks

The LPG will be stored in the airtight storage tanks made up of stainless steel having one coat of red oxide primer and two coats of white enamel paint. There will be 15 storage tanks of 50-ton capacity and 6 storage tanks of 12-ton capacity. The total capacity of the storage will be 50 m-tons at 85% capacity. The LPG will be stored 65.5°C temperature and 250 PSI pressure. The height of the storage tanks will be between 50-40 ft. A retaining wall of 3-4ft will be constructed adjacent to the storage tanks. The storage tanks will be constructed according to the standards prescribed for the issuance of the OGRA License and ASME standard. The tank will be filled up to 85-90% capacity. The layout plan along with the specifications is attached at Annex IV and V of this EIA Report.

3.8.2 Air Compressor

Complete industrial air cooled, oil injected rotatory screw air compressor with all standard accessories will be installed. The pressure will be maintained at 8.5 bar and the rate of the free air delivery rate will be 955 l/sec (57.2 m³/min). Two (02) air compressors manufactured by Atlas Copco and the model of the air compressors will be GA315-8.5 bar. The detail specification of the air compressor is attached at Annex-V of this EIA Report.

3.8.3 Air Dryer

Air dryer manufactured by Atlas Copco will be installed after air compressors. The model of the air compressors will be FD-1500+. The capacity of the air dryer at the optimum conditions will be

1250 l/sec and the frequency of the air dryer will be 50Hz. The detail specification of the air compressor is attached at Annex-V of this EIA Report.

3.8.4 Line Filters

Two line filters manufactured by Atlas Copco will be installed. The model of the line filters will be DD-1100+F and PD-1100+F. The first line filter is known as a coalescent air filter, it will be used for the removal of the particles less than 1 micron in size, removal of the humidity and oil aerosols up to 0.1 ppm (0.1 mg/m³). Whereas, the other one is known as high efficiency coalescent air filter and used for the removal of the particles less than 1 micron in size, removal of the humidity and oil aerosols up to 0.1 ppm (0.1 mg/m³) but the efficiency is quite high. The detail specifications of the air compressor are attached at Annex-V of this EIA Report.

3.8.5 Vaporization Chamber

LPG will be vaporized in the vaporization chamber. The total fluid capacity of the vaporizer will be 199 SCFH and 7.515 lb will be vaporized per hour. The temperature at the inlet will be -10°C (14°F) and at the outlet will be 66°C (152°F). The operating pressure will be maintained from 93-95 PSIG. The diameter of the chamber will be 48 inches, length will be 24ft and the thickness will be 3/8 inches.

3.8.6 SNG Blending System

Synthetic Natural Gas (SNG) Blending System will consist of the following components:

a. Duplex Pump Set

The flow rate will be 300 MMBTU at 50 PSIG. The capacity of the duplex pump set is 90 GPM/396 liters. The dimensions of the duplex pump set are 79 inches in width, 100 inches in length and 117 inches in height. The power of the duplex pump set will be 50 hz. All wiring, controls, electrical components and their installation comply with recognized code standards defined in NFPA. Following are the components:

- i. Steel ase
- ii. Coupling Guard
- iii. Inlet Y-Strainer
- iv. Hydrostatic Relief Valve
- v. Pilot Operated Back Pressure Control Regulator
- vi. Pressure Gauge

vii. Magnetic Starters and Disconnect

b. Active Flow Control

The flow rate will be 300 MMBTU at 50 PSIG of the active flow control system. The capacity of the active flow control will be maintained 531 MMBTU/hr for HD 5-Propone and 567 MMBTU/hr for LPG 60% P 40% B. The skid dimensions are 25 inches in width, 90 inches in length and 39 inches in height. The humidity will be maintained at 85%. The maximum temperature will be 32°C and the minimum temperature will be -10°C. The elevation will be 1500 meters. Following are the components of the active flow control:

- i. Teleservice Communication Module for Remote Diagnostics on AFC
- ii. Automatic Safety Shutoff Valve
- iii. Manual Shutoff Valve
- iv. Solenoid Valve for Instrument Air
- v. Needle Valves on all the Gauges
- vi. Air Flow Control Valve
- vii. Air Intel Check Valve
- viii. LPG Vapour Inlet Check Valve
- ix. Safety Valves
- x. Structural Steel Base
- xi. Junction Box
- xii. Line-Pak
- xiii. Mixing Header
- xiv. LPG Vortex Flow Meter
- xv. Air Vortex Flow Meter
- xvi. Control Panel with HMI/PLC
- xvii. Touch Screen Control
- xviii. Pro-fibus Cable interconnect from AFC to Remote Panel
- xix. Air Pressure Transmission w/local indicator
- xx. LPG Pressure Transmission w/local indicator

- xxi. SNG Pressure Transmission w/local indicator
- xxii. Auto Ratio Control, Connected to Wobbe Meter w/ 4-20mA Input
- xxiii. Feed Forward Control
- xxiv. Auto Feed Back Control

3.8.7 Wobbe Meter

Wobbe meter will be installed at the end of the SNG blender. Wobbe meter will check the ratio of the propane and butane as well as the requirement of the air mix before final distribution. The Wobbe Number will be maintained at 1170. The ratio of the LPG and air will vary on the basis of the LPG composition. It would vary from 60:40-50:50. According to the ratio, the SNG will be sent back through the loop backward controlling system. Wobbe indicator and controller will maintain the required composition of SNG.

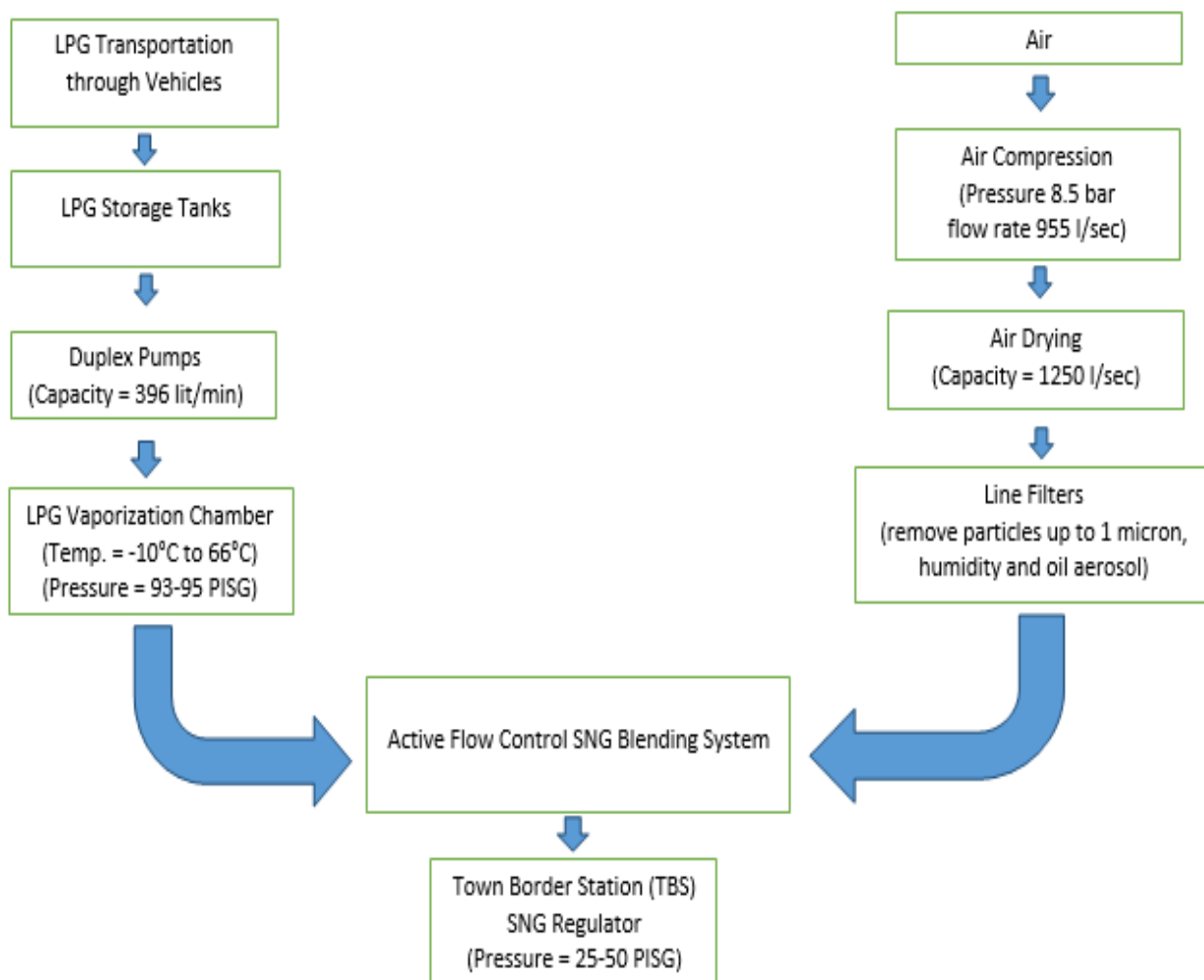


Figure 4: Block Diagram for the Process Flow for LPG-Air Mix Plant

3.9 Distribution Lines

Distribution lines will be laid down for the distribution of SNG in eleven zones such as; Jabeer Basin, Kargha Nullah to FCNA, Jutial, Sakwar, Minawar, Mohammedabad, Danyor, Sultanabad, Konodas, Sakarkoi and Karakorum International University. The distribution lines will be laid down in close liaison with the GDA. The material of the pipelines will be mild steel having 8-inches and 12-inches diameter. The length of the 8-inches dia will be 40-km long and 12-inches diameter pipelines will be 19-km long approximately. The layout plan for the distribution network is given below;



Figure 5: Distribution Network of LPG-Air Mix Plant

3.10 Public Amenities

Following are the main amenities that will be available to the residents living at the plant site

3.10.1 Synthetic Natural Gas

The SNG will be supplied to the workers for heating and cooking.

3.10.2 Electricity Supply

Water and Power Development Authority (WAPDA) will provide electricity to the plant to keep the continuous supply of SNG at the household level. In Gilgit, the source of electricity production is through the hydroelectricity being produced from the Satpara Dam. In the case of the power shortage, electricity will be generated by using the generator facility. The efficient utilization of the electricity will be assured by the workers while working in the plant. In order, to conserve the electricity during operational phase energy efficient electric lights and appliances may be used in allied buildings.

3.10.3 Fresh Water Supply and Wastewater Disposal

During the constructional and operational phases, water being pumped from the well after filtration will be used for the drinking purposes. Hunza River is at the distance of 1.17 km from the project area. For domestic purposes and in fire-fighting system surface water will be consumed.

The wastewater is mainly sewerage that will be generated by the workers living on site. The amount of the wastewater can be estimated as; the per capita consumption of water is 150 liters/day and it is assumed that the average no. of the workers living at the site will be 35-40 during the construction phase. So, the amount of the waste water generated will be 5,250-6000 liters/day. During the operation phase, around 15 workers will be living at the plant site and the amount of the wastewater generated will be 2,250 liters/day. The wastewater will be disposed off in the sewerage lines laid down by GDA, it will be treated in the wastewater treatment plant (treatment plant is under designing phase) and it will be disposed of by using standard practices.

3.10.4 Solid Waste Collection and Management

During the construction phase, the solid waste will mainly consist of the construction material such as; steel, wood, sand, debris and packaging material. They are re-usable and the will be sold by the proponent. During the operational phase, the solid waste will be mainly generated by the workers, mainly consisting of the municipal solid waste such as; kitchen waste, plastic, paper, tin, etc. The solid waste generation rate by each person is approximately 0.65kg/day. The number of the workers living at the site during the construction phase will be 35-40 and the amount of the

SW generated will be 22.7-26 kg/day. During the operational phase, 15 workers will be residing at the plant site. So, the estimated amount of the solid waste generated will be 9.75 kg/day. The generated solid waste will be collected by the Gilgit Waste Management Company (GWMC). After collection the solid waste will be disposed of at the TMA waste disposal site by using standard practices.

3.10.5 Storm Water Collection System

During the rainy season, the storm water will be collected in the wastewater collection lines laid down by GDA and will be disposed of after treatment.

3.10.6 Residential Complex

To accommodate the workers working at the plant site, residential complex having 4-5 buildings have sufficient capacity to accommodate the workers will be constructed at the plant site.

3.10 Raw-Material

The raw material will mainly consist of the construction material such as; sand, mud, cement, bricks, steel, etc. During the construction phase public amenities such as main office building, residential complex (4-5 Buildings) and control rooms will be constructed. Moreover, during the construction phase the installation of the SNG supply system will be done according to the LPG Rules, 2001.

3.11 Manpower

Employees from the main office of SNGPL will be transferred to the plant site on the temporary basis during the construction phase to monitor construction and the working of the plant. During constructional phase, 35- 40 workers will be hired for the timely completion of the proposed project. Almost 10-15 workers, will stay at the plant site during the operational phase. They will include; Engineer, Sub-Engineers and the lower staff. Local will be preferred over others for hiring.

3.12 Cost and Magnitude of Operation

The cost of the SNG supply system (including the distribution network) is PRK 5 billion as mentioned by Hafeez-ur-Rehman The Chief Minister Gilgit-Baltistan on 02 November, 2016 mentioned in The News.

The cost of the LPG-Air Mix Plant is **PKR 460.2 Million** and the break-down of the cost is given Table 7 below:

Table 7: Total Cost of the LPG-Air Mix Plant

Sr#	Machinery	Price (PKR) Million
1	LPG Vaporizer, SNG blender modules, duplex pump and compressor	225.0
2	Design, supply, installation and commissioning, fire-fighting equipment, civil work and over-heads	175.0
3	Land Cost	4.0
4	Appointment of the consultant, EIA Study, application of licenses, approval from relevant authorities including GB-EPA	3.0
5	4×4 double chain cabin vehicle	13.0
6	Contingency (10%)	40.2
Total		460.2
<i>In words: Four hundred and Sixty Point Two Only</i>		

The magnitude of operation of LPG Plant includes:

- Detailed site survey, planning and demarcation of the site
- Purchase and installation of LPG Air Mix Plant according to the LPG Rules, 2001
- LPG will be purchased on the contractual basis; it can be purchased locally or it can be imported based on the price varies
- Operation and regular maintenance of the SNG Plant
- Plantation of various ecologically important grasses, herbs, shrubs and trees on the designated green spaces

3.13 Restoration and Rehabilitation Plans

The land is owned by Proponent (SNGPL) and its ownership documents are attached at Annex-I of this EIA Report. There is no dispute and rehabilitation associated with the construction and operation of the proposed project as the project area is the barren land. No dislocation of the community and physical infra-structure is involved. After the installation of the SNG Supply System, native trees will be planted at the designated green areas.

3.14 Schedule of Implementation

The schedule of implementation for the commencement of the civil work involved for the installation of LPG Air Mix Plant is approximately 10 months and the detail timeline of the construction period is given in Table 8:

Table 8: Timeline for Project Development

Sr. #	Activities	2.5 Months			2.5 Months			2.5 Months			2.5 Months		
		4W	4W	2W	4W	4W	2W	4W	4W	2W	4W	4W	2W
1	Detailed Designing												
2	Mobilization of Contractors												
3	Lean development Period												
4	Peak installation Period												
5	Plantation at Site												
6	Commissioning												*
W=Weeks													

Gilgit City has been divided into eleven zones. The proposed project is the installation of the LPG-Air Mix Plant. The distribution of the supply lines is an aligned project. Firstly, the lines will be laid down in; Jabeer Basin, Kargha Nullah to FCNA and Jutial. Later on, the supply lines will be laid down in Sakwar, Minawar, Mohammedabad, Danyor, Sultanabad, Konodas, Sakarkoi and KIU accordingly. It will take around 5 years to supply SNG to the whole Gilgit City.

3.15 Government Approvals

The Client had applied to acquire the approval from Oil and Gas Regulatory Authority. No ligation certificate/NOC has been obtained from Assistant Commissioner Gilgit Baltistan for the installation LPG Air Mix Plant at kharsa No. A/1249/I situated at Chilmish Das Mouza Konodass Tehsil Gilgit. The application and NOC are attached at Annex-VI of this EIA Report. Now, the Proponent had applied for the environmental approval from GB-EPA.

4. ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

This chapter provides environmental and social baseline conditions (physical, biological and socioeconomic parameters) prevailed in the project and study area. The information has been compiled up by using primary and secondary data resources. This chapter also refers to the theoretical analysis of the methodology adopted for the collection of the environmental and social baseline data. The underlying principles and practices adopted in this regard are also discussed in detail.

4.1 Methodology

The methodology employed to collect the baseline data and information regarding the social structure and parameters is discussed in sub-sections below:

4.1.1 Data Collection

The primary data was collected by surveying the project area and the nearby residential community. The secondary data regarding physical parameters (topography, geology, seismology, hydrology and climatology) was obtained by visiting relevant departments and their official websites. The biological parameters (flora and fauna) were also studied in the project area. The vegetation of the project area was studied by preparing a floristic list based on visual observation. The species were recorded with reference to their historical existence in the project area.

Information on wildlife, fauna species (mammals, amphibians, reptiles, birds, etc.) in the assessment area was compiled based on opportunistic observation, gathering the existing information and consultation with local experts, community members, government and Non-Government Organizations (NGOs). The socioeconomic aspects were studied and analysed by conducting detailed village profile and household surveys.

4.1.2 Social Survey

The purpose of social survey was to record the socioeconomic conditions of the people living in the study area and to assess the expected impacts on the community due to the installation of the SNG Supply System on their life, subsistence systems and socio-cultural conditions. The social survey was conducted specifically in the following communities; Chilmish Das, Faizabad and Nomal whereas, the social survey was also conducted in the Gilgit City. Prior to conducting the field surveys, the following steps were taken:

- The boundaries of the project area were identified and demarcated clearly
- The sampling procedure was selected for the social survey in order to draw a representative sample size of the target population and households

- Developed the tools for data collection, i.e. questionnaires for Village Profile, Socioeconomic Questionnaire and Environmental Checklist

4.1.3 Sampling Design

Social baseline data of the persons residing in the study area have been estimated and collected through random sampling by using pre-developed questionnaires.

4.1.4 Questionnaires

In order to test the validity and reliability of the proposed questionnaires, they were reviewed to assess whether questions needed to be clarified, changed or re-sequenced and then a final editing of questionnaires was conducted prior to their application in the study area. The sample of socioeconomic questionnaires used are attached as Annex-VII and the environmental checklist is attached at Annex-VIII of this EIA Report.

4.1.5 Data Editing and Analysis

The filled questionnaires and recorded information were concise by the same field investigators who were involved in the data collection. This was done immediately after completing the socioeconomic survey of the nearby communities. Data sets were processed after the compilation of socioeconomic data. Analysis of the data and preparation of conclusions in the minimum possible time was done using statistical techniques of data analysis.

4.2 Baseline Conditions

The information provided is based on primary and secondary data collected from site visits, desk studies, consultation with locals respectively and by studying the related projects. Baseline conditions refer to the existing physical, environmental and socioeconomic status of the study and project area was collected and analysed. On the basis of baseline information, the project interventions are assessed and mitigation measures were proposed. The baseline information also helps to indicate the site specific issues to be monitored during the installation and operational phases.

4.3 Physical Environment

This section gives the overview of the physiology, topology, geology, seismology and meteorological conditions of the Gilgit City whereas, it gives specific information about the surface water, ground water and air quality of the project area. The detail of each parameter is discussed in sub-sections below:

4.3.1 Physiography

The area generally consists of rugged and precipitous terrain classified as alpine scrub zone and is characterized by heavy snowfall at higher altitudes in winter. Land sliding is very common feature of the study area because of the high, steep terrain and barren mountains. GB covers an area of 72,971 km² (28,174 miles). It has an estimated population of 1.249 Million. Silk Route is the major and the only road link between this area and other parts of the country, utilized mainly for economic activities. Gilgit has recently been named as Gilgit Baltistan (GB), it was given full autonomy on 29 August 2009 rendering its constitutional status of an integrated part of Pakistan. GB comprises of two (02) divisions, seven (07) districts and twenty two (22) tehsils⁴.

4.3.2 Topography and Geology

A land of immense geographic and strategic significance, GB is gifted with Geo-corridors ever exploited by empires/powers of all times. GB occupies an extraordinarily varied and attractive landscape and it had become a meeting point of world's three famous high altitude mountain ranges namely Himalayas, Karakoram and Hindu Kush. It borders Pakistan's KPK province of the West, Afghanistan's Wakhan Corridor to the North, China to the Northeast, Azad Kashmir to the Southwest, and Indian occupied Jammu & Kashmir to the East and Southeast. GB covers an area of 72,971 km² (28,174 miles).

The topography of the project area is flat. The nature of the project area is an open and dry land located besides Nomal-Gilgit Road and River Hunza is at 1.17 km distance from the project area. A pictorial representation of the project area is shown below:



⁴ <http://www.gilgitbaltistanscouts.gov.pk/geodemo.htm>

Figure 6: Topography of the Project Area

The Himalaya Range is a series of several parallel or converging ranges, intersected by large valleys and extensive plateaux, rather than a single continuous chain of mountains. Along the Indus and some tributaries of the river, gravel and sand can be seen high up on the canyon walls. These landslides contribute heavy sediment load to the river.

4.3.3 Seismicity

According to Seismic Zoning of Pakistan, the project area lies near the edges of the Indian and Eurasian tectonic plates. The plate boundary is considered as part of a seismically active zone. In the past, the epicenters of a large number of earthquakes have been located in this region. In October 2005, an earthquake of very high intensity (7.8) hit the area near Muzaffarabad and disturbed the ground to a significant extent in that area” (National Disaster Management Authority). The seismic zoning of Pakistan is given below in Figure 6 shows that Gilgit Baltistan lies in the region of moderate to severe damage prone area, i.e., Zone 3 of Modified Mercalli (M.M.) intensity scale.

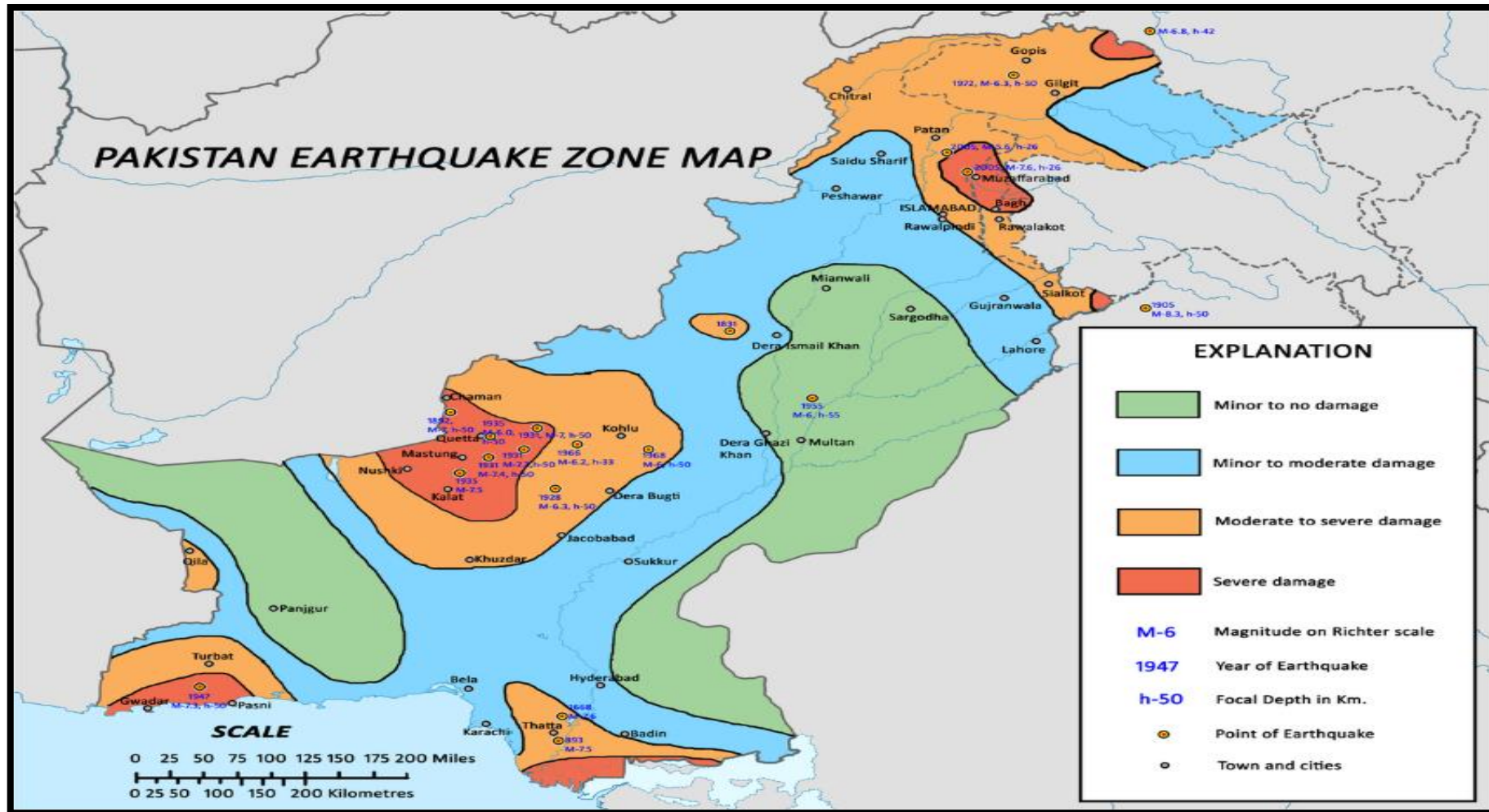


Figure 7: Seismic Zoning of Pakistan⁵

⁵ Source= National Disaster Management Authority

4.3.4 Cropping Patterns and Orchids

In Gilgit Baltistan, crops that are cropped during various seasons includes; wheat, maize and potatoes. In Gilgit, wheat crop is being sold subsidized rates and the availability of the water for growing wheat is not sufficient. So, there is a shift towards the cropping of the potatoes as it is considered cash crop. Irrigation and agricultural are practiced on a limited scale and 75% of the farmers obtain only a single crop per year. The holdings are very small (average 3 acres or 12,000 m²) used for cultivation through traditional techniques with plough pulled by bullocks. Maize is the second major crop and other crops include tomatoes, peas, beans, cabbage and capsicum. Suitable land is also used for raising fruit trees. A large number of the orchids are present in Gilgit, it includes, Apricot, Apples, Cherries, Grapes, Blackberries, Plum, etc. are present. Most of the villages in this region are self-sustained.

4.3.5 Climatology

In general, two seasons prevail in the project area: winter (October to March) and summer (April to September). The hottest month is July with an average maximum and minimum temperature of 36.2°C and 23.4°C respectively, whereas, January is the coldest month with an average maximum and minimum temperature of 7.8°C and -0.2 °C respectively. The dominant weather of the city is winter, which lasts eight to nine months a year. Gilgit District is bordered by glaciers that are receding due to the rising temperatures, consistent with global warming. A detailed annual mean temperature of the project area is given below:

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	3.8	6.7	11.8	16.7	21.2	25.8	28.3	27.8	23	16.9	10.7	5.6
Min. Temperature (°C)	-0.2	2.3	6.8	11.1	14.9	18.9	21.8	21.6	16.8	10.7	4.9	1.4
Max. Temperature (°C)	7.8	11.2	16.8	22.3	27.6	32.8	34.9	34	29.3	23.1	16.6	9.8
Avg. Temperature (°F)	38.8	44.1	53.2	62.1	70.2	78.4	82.9	82.0	73.4	62.4	51.3	42.1
Min. Temperature (°F)	31.6	36.1	44.2	52.0	58.8	66.0	71.2	70.9	62.2	51.3	40.8	34.5
Max. Temperature (°F)	46.0	52.2	62.2	72.1	81.7	91.0	94.8	93.2	84.7	73.6	61.9	49.6
Precipitation / Rainfall (mm)	7	11	21	27	32	7	11	13	8	10	2	5

Figure 8: Annual Mean Temperature

Gilgit, Skardu and Chillas adjacent to project area receive annual average rainfall of 130 mm, 225 mm and 173 mm respectively. In the river Indus, flows are mostly due to snow and glacier, melt which entirely depend on air temperature. Wind speeds tend to be higher between April and September and lowest from November to January with short bursts of gusty convectional wind especially during the late spring and summer when heating effects cause strong but short lived convectional winds⁶.

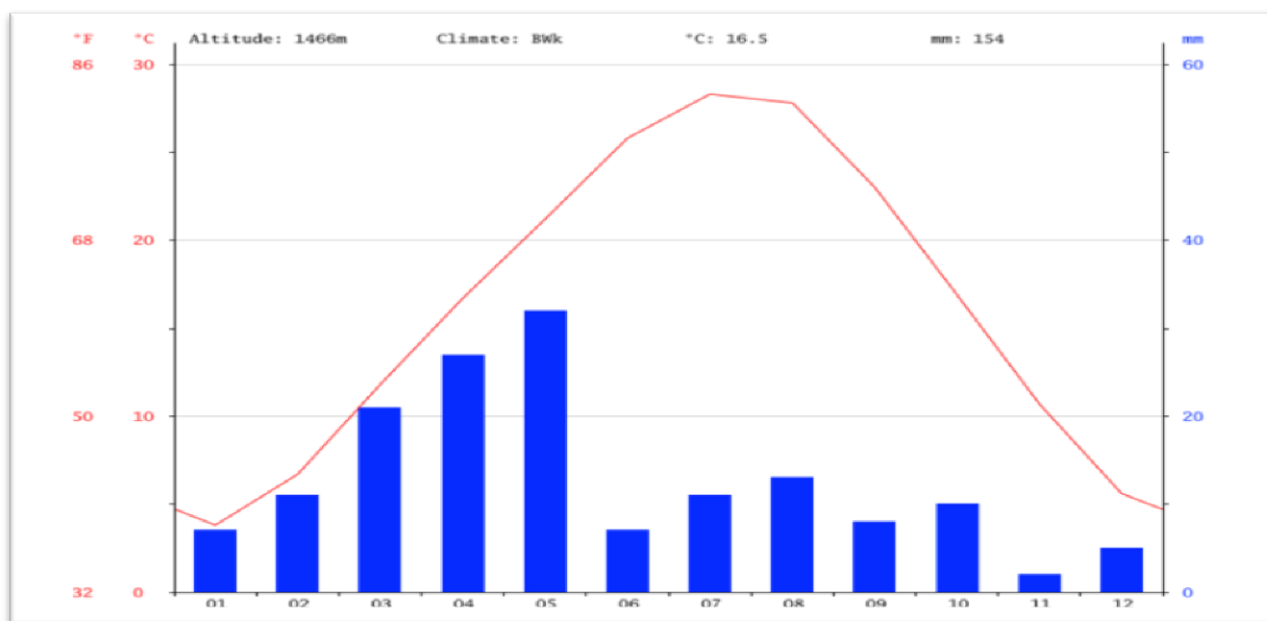


Figure 9: Average Annual Precipitation

4.4 Biological Environment

The biodiversity of the Gilgit City and its surroundings is adapted to the extreme variations in climate (-2°C to 35°C) and geographical conditions. Gilgit River, Hunza Rivers and minor Nullahs contain both endemic and exotic fish species which is reported to decline due to high sedimentation rate. In the sub-sections below, the detailed description of the flora and fauna present in the study and the project area is discussed.

4.4.1 Flora

The Gilgit City is categorized as urban area and it had largely degraded habitats. However, the hills in the vicinity of the Gilgit City and the adjacent valleys, particularly the forests in the Kargah and Jutial Valleys, provide habitat for faunal species, including mammals, birds and herpeto-fauna. The vegetation in the city falls in the Dry Subtropical Shrub Zone and Dry Temperate Coniferous Forest Zone. The former is located at lower elevations and southern slopes

⁶ <https://en.climate-data.org/location/1007/>

of the mountains, especially along the Gilgit and Hunza Rivers. The latter consists of forests found in the inner or northern slopes of the Himalayas and are less susceptible to monsoons. The dry, temperate coniferous forests occur between elevations of 1,500 to 3,400 meters. These forests are characterized by fewer deciduous tree species, although coniferous species predominate.

Forests occur in the valleys, including the Naltar and Bagrot Valleys and also present in the vicinity of the Jutial Nullah. Typical tree species in these forests include *Picea smithiana*, *Cedrus deodara* and *Pinus willichiana*. Smaller shrubs include *Quercus ilex*, *Junglus regia* and scattered shrubs of *Artimesia maritima*, *Indigofera gerardiana*, *Sambucus ebulus*, *Sorbaria tomentosa*, and *Plectranthus rugosus*. These forests not only provide habitat for native fauna, but also provide timber for the locals use as well as for domestic and commercial purposes. A large number of the orchids are present in Gilgit, it includes; Apricot, Apples, Cherries, Grapes, Blackberries, Plum, etc. Most of villages present in the proximity of the Gilgit City are self-sustained⁷.

The project area is an open and dry land, having sparse vegetation of two medicinal herbs. It includes;

Table 9: Vegetative Features of Project Area

Sr.#	Local Name	Biological Name	Uses
1	Red Cedar	<i>Cedrella toona</i>	<i>Medicinal Herb</i>
2	Seeta	<i>Artemisia scoparia</i>	<i>Medicinal Herb</i>



⁷ Sheikh, M. I. & M. Hafeez. 1977. *Forests and Forestry in Pakistan*. Pakistan Forest Institute, Peshawar.



Figure 10: Vegetation Features of Project Area

4.4.2 Fauna

Mammals reported in and around the city outskirts include members of the family of *Vespertilionidae*, *Canidae*, *Felidae*, *Sciuridae*, *Muridae* and *Mustelidae*. Large mammals, like the Snow Leopard (*Panthera uncia*), Common Leopard (*Panthera pardus*), Wolf (*Canis lupus*), Markhor (*Capra falconeri*) and Red Fox (*Vulpes*), have been reported in the city hills. In addition, small mammals, such as bats and rodents, have been reported from inside the city limits.

More than a hundred bird species have been reported around the city. These include passage migrants, vagrant, resident, breeding and irregular visitors. The altitudinal migratory birds descend from higher altitudes during the winter months. Typical bird species found here include Snow Partridge (*Lerwa*), Chukar (*Alectoris chukar*), Common Quail (*Coturnix*), Common Hoopoe (*Upupa epops*), Common Swift (*Apus*), RockPigeon (*Columba livia*) and Common Kestrel (*Falco tinnunculus*)⁸.

No above mentioned fauna is seen and reported in the project area that could be harmed or damaged due to the installation of LPG-Air Mix Plant.

4.4.3 Endangered Species

Mammals reported in and around the city outskirts include members of the family of *Vespertilionidae*, *Canidae*, *Felidae*, *Sciuridae*, *Muridae* and *Mustelidae*. Large mammals, like the Snow Leopard (*Panthera uncia*), Common Leopard (*Panthera pardus*), Wolf (*Canis lupus*) and

⁸ Jackson, R., Mallon, D., McCarthy, T., Chundaway, R.A. & Habib, B. 2008. *Panthera uncia*. IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 09 June 2017.

Red Fox (*Vulpes*), have been reported in the city hills. In addition, small mammals, such as bats and rodents, have been reported from inside the city limits.

No Endangered or Critically Endangered bird has been reported in the Gilgit City. The only bird included in the IUCN Red List is the European Roller (*Coracias garrulous*), which is listed as Near Threatened⁹.

4.4.4 Archaeological Sites or Wetlands

Twin bridge is located at the distance of 7.8 km from the project area and Buddhist Scripts are located at a distance of 3.14 km from the project area. No impact is being envisaged on the archaeological sites due to installation and operation of SNG Plant at the proposed location. No wetland is reported within the 5 km radius of the project area.

4.5 Environmental Monitoring Through Laboratory

Laboratory analysis for the monitoring of the environmental parameters such as surface water, ground water, air and noise was done in order to check the baseline condition and pollution load. In this connection M/S Global Environmental Laboratory (GEL) which is Punjab-EPA certified laboratory was engaged.

Ecogreen Company (Pvt) Limited has facilitated the laboratory (GEL) to collect the ambient air samples from project site located at Chilmish Das Mouza Konodas, Gilgit. No industry or any other significant pollution source in the project vicinity except crusher. As a result, the ambient air quality of these sites is expected to be well within the acceptable limits, and no major criteria pollutants are likely to be found in excess of the limits prescribed by national and international standards. Detail ambient air quality report is annexed at Annex-IX of this IEE Report and the detail information related to the testing is given below:

4.5.1 Sampling Sites

Following localities were identified to collect samples of water, noise and air for testing according to the testing guidelines of Pak-EPA. It also defines number of samples as well as the number of sites from where samples were collected.

Table 10: Sampling Sites Details

Sr#	Particulars	Details
1	Number of Samples	Eight (08)
2	Kind of Monitoring	Noise, Ambient Air, Ground Water and Surface Water

⁹ IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 06th July, 2017.

3	Sampling Sites	Four (04)
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4.5.2 Ambient Air Quality

The primary source of air pollution at the project sites is the vehicular emissions and the key pollutants likely to be found at project proposed locations are Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Sulphur Dioxide (SO_x), and Particulate Matter (PM). In order to determine the air quality of the area, GEL has been engaged, the laboratory had the requisite air sampling device and expertise for the analysis of the air quality. To determine the ambient air quality, a sampling sites inside the project area were selected. The monitoring results of ambient air quality of the project area is given below:

Table 11: Ambient Air Quality

Source	CO	SO ₂	NO ₂	PM ₁₀	SPM	CO ₂	O ₂
Units	ppm	Ug/m ³	Ug/m ³	Ug/m ³	Ug/m ³	Ug/m ³	ppm
NEQS	9	120	80	150	350	500	130
1 At Plant-Site	0.1	2.6	64.0	18	5	32	6

4.5.5 Surface Water Resource

The annual water flows in the river at the dam site from 1970 to 2005 ranges from 210 m³/sec (February, 2017) to 3,454 m³/sec (July, 2017). In the project area the Hunza River flows, the water of the river is being used for drinking, agricultural and other purposes. The people used water of perennial streams (nallahs) for drinking, household and agriculture purposes. Generally, there is a shortage of potable water in the project area, but waterborne diseases such as; Diarrhoea, Typhoid Fever and Cholera are reported due to the presence of the faecal microbes in the surface water. The laboratory results of water samples show that chemical quality of the Hunza River is within the NEQS limits whereas, the biological analysis showed that the concentration of the Total Coliform, E. Coli, Enterococci and Total Colony Count is much higher than the NEQS.

Table 12: River Hunza Water Quality Results

Sr#	Parameters	Units	Concentrations
Physio-Chemical Analysis			
1	pH value	----	7.66
2	Colour	Cu	151.0
3	Taste	-----	Normal
4	Odour	TON	0.0
5	TDS	mg/l	206.0
6	Chloride	mg/l	4.0
7	Chromium	mg/l	BDL
8	Iron	mg/l	BDL
9	Nitrate	mg/l	3.0
10	Nitrite	mg/l	0.008
Microbial Analysis			

1	Total Coliforms	cfu/100ml	Too numerous to count
2	E. Coli	cfu/100ml	Isolated
3	Enterococci	cfu/100ml	0
4	Total Colony Count	cfu/ml	>5700

The quality of the Gilgit River is much better than the quality of water of River Hunza. The microbial concentration is quite lower as compared to its concentration in the Hunza River water. The laboratory reports are attached at Annex-IX of the EIA Report.

Table 13: River Gilgit Water Quality Results

Sr#	Parameters	Units	Concentrations
Physio-Chemical Analysis			
1	pH value	----	7.91
2	Colour	Cu	48.0
3	Taste	-----	Normal
4	Odour	TON	0.0
5	TDS	mg/l	200.0
6	Chloride	mg/l	4.0
7	Chromium	mg/l	BDL
8	Iron	mg/l	BDL
9	Nitrate	mg/l	1.6
10	Nitrite	mg/l	0.002
Microbial Analysis			
1	Total Coliforms	cfu/100ml	1500
2	E. Coli	cfu/100ml	70
3	Enterococci	cfu/100ml	Isolated
4	Total Colony Count	cfu/ml	0

4.5.6 Ground Water

Ground water was being use as the source of the drinking after filtration in Chilmish Das, Nomal and Faizabad. Few small wells were also present in the communities owned by the locals. The ground water sample for physio-chemical analysis (temperature, pH, TDS, EC, colour, odour, taste, etc.) and microbial analysis was collected from the Chilmish Das and analysed by the Punjab-EPA certified laboratory (GEL). The physio-chemical analysis results showed that all the parameters are within the prescribed limits mentioned in NEQS whereas, the microbial analysis results showed that the concentration of all the parameters is much higher than the limit prescribed in NEQS.

Table 14: Ground Water Quality (Chilmish Das) Results

Sr#	Parameters	Units	Concentrations
Physio-Chemical Analysis			
1	pH value	----	7.19
2	Colour	Cu	0.0
3	Taste	-----	Normal
4	Odour	TON	0.0

5	TDS	mg/l	246.0
6	Chloride	mg/l	8.0
7	Chromium	mg/l	BDL
8	Iron	mg/l	BDL
9	Nitrate	mg/l	1.6
10	Nitrite	mg/l	0.005
Microbial Analysis			
1	Total Coliforms	cfu/100ml	Too numerous to count
2	E. Coli	cfu/100ml	Isolated
3	Enterococci	cfu/100ml	Isolated
4	Total Colony Count	cfu/ml	>5700

4.5.7 Air Quality

Overall, air quality of the study area is good and smoke emissions are not high as the area is not densely populated and there is no large scale industry present in Gilgit Baltistan. According to the Air and Noise Pollution Monitoring Report in Seven Urban Centres of GB generated by GB-EPA the concentration of NO_x is found to be much higher.

The chances of increased concentrations of dust and smoke are moderate in the project area due to high speed winds. Potential issues associated with the deterioration of the air quality within the project area is the presence of natural dust as the project area is categorized as barren-dry land. There is a crusher plant opposite to the project area that could be the source of dust and noise pollution in the project area. At present, there is no large scale industry in GB or any other source that emits greenhouse gases. Moreover, the vehicle intensity is also very low in project area. As per air quality survey conducted in the project area the concentration of all ambient air quality parameters (CO, NO₂, SO₂, PM₁₀) are within the limit of NEQS whereas, the concentration of the NO₂ is high due to movement of the vehicles. The laboratory analysis report for the ambient air quality report is attached at Annex-IX of this EIA Report.

4.5.4 Noise

The ambient noise level of the project area was monitored by using digital sound meters and results of the ambient noise level monitoring are given below:

Table 15: Noise Level Monitoring

Sr#	Location	Units	Conc.
1.	32°30'10.14"N, 71°49'19.33"E	Db(A)	46.8

4.6 Socioeconomic Profile

The socioeconomic profile of the study area is given below:

4.6.1 Demography

According to the 1998 census, the Gilgit population at the time was 0.88 million,¹⁰ projected rate of population growth in year 2013 is 1.301 million. The annual growth rate is 2.56%. The average household size is 8. According to the Planning and Development Department, Government of Gilgit-Baltistan, “Gilgit-Baltistan at a Glance, 2013” the literacy rate is 60% in 2013¹¹.

4.6.2 Employment Status

The respondents were asked about their employment status. In Chilmish Das (Faizabad) 92% of respondents were found employed, whereas remaining 08% respondents were unemployed. In Nomal, the employed and unemployed were found as 86% respondents were employed and remaining 14% respondents was unemployed. This reflects that overall maximum ratio of the respondents were employed.

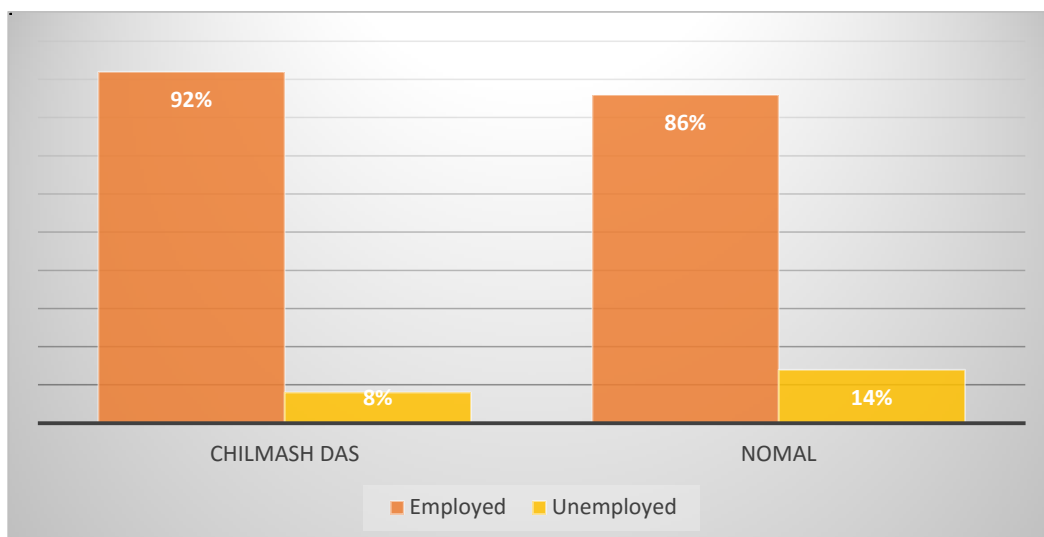


Figure 11: Employment Status of the Community

4.6.3 Type of Employment

The respondents of the Chilmish Das/Faizabad and Nomal were inquired about the nature of the employment. The majority of the respondents were involved in the agricultural related activities, self-employed (have orchids) shopkeepers and drivers. A lesser number of the respondents were linked with the private and government jobs.

4.6.4 Civic Amenities

Respondents were inquired about the civic amenities within their area. In Chilmish Das/Faizabad and Nomal 100% respondents had electricity, water supply services through pipelines, wells,

¹⁰ 1998 Census/Statistical Cell P&DD GB

¹¹ *Gilgit-Baltistan at a Glance. (2013). Planning and Development Department Government of Gilgit-Baltistan*

private and local transport facilities. Sewerage system and sui-northern gas is not available in the study area. The Karakorum International University is located at the distance of 3.50 km away from the proposed project area. Sky Light Academy and Govt. Girls Primary School Faizabad is located in Chilmish Das. Police Public School (35°56'32" N and 74°22'7" E) is located at the distance of 1.9 km (aerial distance) from the project area.

The average annual income of the people of Gilgit is around Rs. 30,000/month. The economy is largely driven by NGO donations and GOP funding¹². The solid waste is collected by GWMC and it is responsible for the effective disposal. There is one District Headquarter Hospital (DHQ), hospitals, dispensaries and Civil Military Hospital (CMH) in Gilgit.

4.6.5 Religious Structure

No religious structure will be damaged or dismantle due to the installation and operation of the proposed project.

4.6.6 Protected Areas

No protected area is present within 10 km vicinity of the project area that could be impacted due to the implementation of the proposed project.

4.6.7 Source of Domestic Energy

In Gilgit Baltistan around 44% of the respondents use fuel wood as the source of domestic energy the 22% of the respondents consumes LPG whereas, 34% of the respondents consumes LPG and wood on an alternative basis. The wood and LPG are being supplied from Hunza, Chillas and Astore.

¹² The World Bank, Asian Development Bank, Government of Pakistan. (2010). *Gilgit Baltistan Economic Report- Broadening the Transformation*. WB, ADB, GoP.

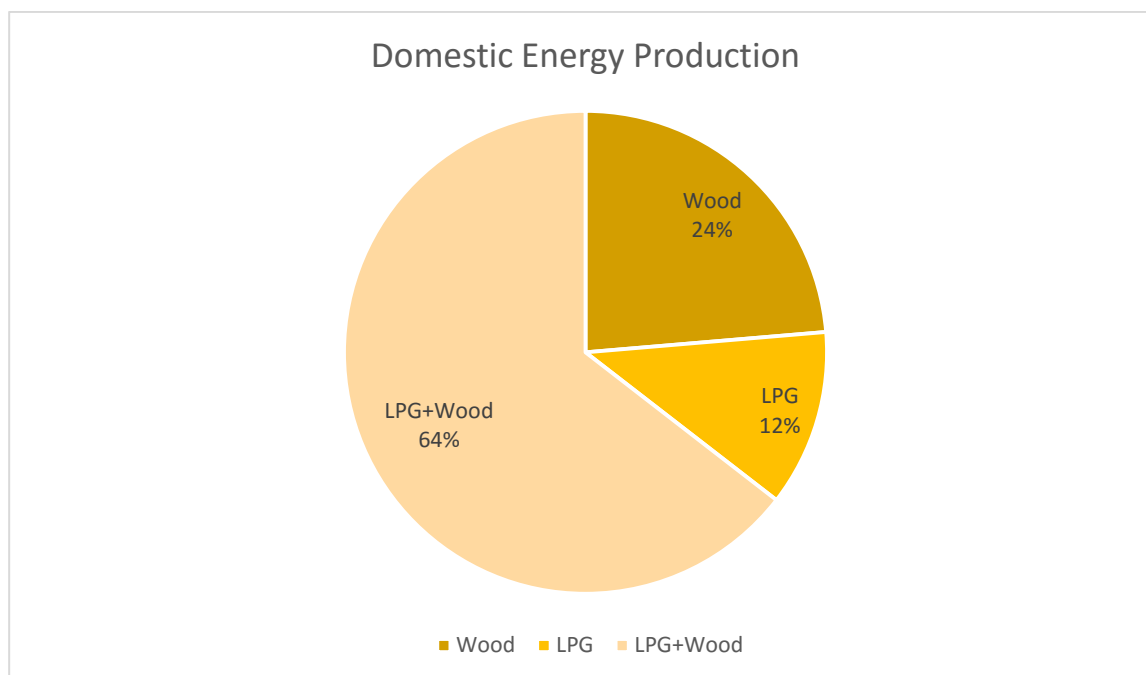


Figure 12: Domestic Energy Production Ratio

The wood is available at the rate of Rs. 25/kg, whereas, LPG is sold at the rate of Rs. 125/kg. the majority of the respondents consumes wood as the source of domestic energy production. According to the survey, maximum 8 ton of the wood is consumed during winter for heating and cooking. This consumes a large portion of their income. Around 5-6 LPG cylinders consume on an average during the winter season. In summer season, the consumption of wood and LPG reduces significantly. So, does the air pollution and deforestation rate.

4.6.8 Favour for the Project

Respondents were inquired about their views regarding the commencement and operation of the proposed project. Almost 100% respondents of being in favour of the project. The majority of the respondents consumes wood as the fuel wood while the consumption of the LPG filled in the cylinders was less as compared to wood. A large portion of their income was consuming to purchase wood or LPG cylinders. With the provision of the SNG on the subsidized rate will reduce the burden on the income of the locals.

4.6.9 Common Diseases

The respondents were asked about the common diseases prevailing within the area. In Chilmish Das, Nomal and Jutial respondents suffered from diarrhoea, cholera, cough and diabetes.

4.6.10 Community Issues

The community was asked about the burning issues they are facing. In Chilmish Das and Nomal about 78% of the responses complained about the lack of safe drinking water, 100% of the

respondents complained about the lack of burning fuel and 82% of respondents were interested about the provision of the sewerage system in Gilgit City.

4.7 Quality of Life Values

Most of the respondents had the basic facilities of life such as; health and education facilities as well as basic amenities such as electricity, water supply and transportation to sustain life. Most of the respondents have an access to the recreational places such as Chinar Bagh and City Park. The Shandur Polo Festival in Gilgit attracts ordinary tourists and dignitaries from the world over. Major tourist attractions around Gilgit include; Naltar Peak, Hunza Valley, Fairy Meadows in Raikot, Shigar Town, Skardu City, Haramosh Peak in the Karakoram Range, Bagrot-Haramosh Valley, Deosai National Park, Astore Valley, Rama Lake, Juglot Town, Phunder Village, Yasin Valley and Kargah Valley. Karakorum International University is present at 3.5 km distance from the project area.

4.8 Environmental Analysis

Environmental parameters such as; air quality, surface water quality and ground water quality are discussed in the Sections above. The environmental analysis reports issued by the GEL are attached at Annex-IX of this EIA Report.

5. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public consultation refers to the process by which the concerns of local affected persons and others who have a plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. According to the IEE and EIA Review Regulations, public consultation is mandatory for any socio-environmental study.

5.1 General

Impact assessment survey and public consultation sessions held with different stakeholder groups that may be impacted by the proposed project commencement. The consultation process was carried out in accordance with the guidelines laid by GB-EPA. The objectives of this process were to:

- Share information with stakeholders on proposed project installation and operation
- Assess the impacts on the physical, biological, and socioeconomic environment
- Understand stakeholder concerns regarding various aspects of the project commencement as well as regarding the current consumption of wood and LPG cylinders
- Identify the weaknesses and issues associated with the non-availability of the domestic energy such as sui-northern gas
- Find out valuable suggestions by the stakeholders to improve the proposed project design
- Understand the perceptions, assessment of social impacts and concerns of the affected people/communities of the project area
- Find out the awareness level and situation of acceptability to identify any issues for the implementation of the proposed project
- Invite people to express their views about the positive/negative impacts on their lifestyles and environment
- Disclose information about contact offices/officers for any complaints/queries

It is envisaged, there will be no social impact being foreseen due to the provision of SNG through the installation and operation LPG-Air Mix Plant. Chilmish Das is the nearest community located at 4.04 km distance from the project area. No negative impact is being foreseen, the community will be benefited rather due to the provision of SNG at household level. This EIA Report includes all the comments, which were taken into account during the social survey and preparing the

definitive development concept for the installation and operation of LPG-Air Mix Plant in the Gilgit City. Public consultation performas is attached as Annex-VII of this EIA Report.

5.2 Objectives of Consultation

Public consultation plays a vital role in studying the impacts of the proposed project on stakeholders in successful implementation and execution of the project. It provides an opportunity to exchange knowledge with the beneficiaries and affected parties. Referring particularly to a project related to environmental assessment, involvement of the public is all the more essential, as it leads to better and more acceptable decision-making. The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, that have been presumed to arise and to identify those which are not known or are specific to the project. In fact, discourse with many who have thoroughly observed the site conditions in the pre-development phase, goes a long way in updating the knowledge and understanding.

5.3 Identification of Stakeholders

All the people who are directly or indirectly affected or concerned with the project are the stakeholder. Besides the living population of the surrounding areas, some other stakeholders were identified and contacted which enlisted below. They are the key players including; shops in the main Gilgit market, public and government offices, schools, university, hospitals, hotels, international agencies and the NGOs. Not only published material, brief or other literature were obtained on request, but also noted their views and the concerns, in an official capacity as well as on the personal basis. Following stakeholders are identified for this project:

Project Affected Persons (PAPs) include the settled families, either property owners or the tenants, businessmen (big, shopkeepers, vendors, etc.), employees of the commercial entities. PAPs are of two types, for instance:

5.3.1 Direct Stakeholders

In this case, the PAPs are those who will be benefited due to the provision of the gas. As, no disturbance in the local community is being foreseen due to the installation of the SNG Plant as the minimum distance between the community and the project area is 4.04km (Chilmish Das). No property loss is being envisaged due to the installation of the LPG-Air Mix Plant. NOC issued from the Deputy Commissioner for the suitability of the area for the installation of the LPG Air Mix Plant is attached at Annex-VI of this EIA Report.

5.3.2 Indirect Stakeholders

Indirect impact will occur on those who are living or doing business within a project Area of Influence (AOI). In the case of the proposed project, the citizens of Gilgit City will be provided

with the continuous supply of SNG as the source of the domestic energy at the household level. So, in the early development stages and during the operational phase the people will be benefited due to the installation of the SNG Plant. Indirect respondents include;

- ✓ Government agencies responsible to deal with the project related activities
- ✓ Government Agencies directly, indirectly or widely involved in the execution and monitoring of the proposed project
- ✓ Government departments such as GDA and Planning & Development Department, working on the other development activities are considered as indirect stakeholders
- ✓ Workers of political, cultural, religious or social scientific bodies, directly or indirectly related to the project installation

5.4 Public Disclosure

Public disclosure is the outcome of all such activities where the public is involved at least in the information sharing process. This is an integral part of the process. So, before the proponent applies for NOC to the GB-EPA, this disclosure will be distributed properly among all stakeholders. It is the responsibility of the proponent and the consultants to display a public disclosure document in prominent places where community has easy access.

5.5 Consultation Process

Information disclosure, public consultation and discussion regarding the various aspects of the project with the people of the area are necessary. This process is intensified during the EIA Studies, and separate rounds of public consultations were held. Surveys were carried out in order to investigate physical, biological and socioeconomic resources falling within the immediate area of influence of the project. Primary data collection included:

- Data collection regarding the socioeconomic condition of the study area
- Pretesting of socioeconomic survey tools in the field
- To consult the locals for collection of information on biological environment

Various meetings with the stakeholders were held the following objectives:

- Share information with stakeholders on the proposed project and expected impacts on community in the vicinity of the project
- Understand stakeholders' concerns regarding various aspects of the project, including the existing condition of the upgrading requirements, and the likely impact of construction and operation activities
- Provide an opportunity to the public to influence the project design in a positive manner

- Obtain local and traditional knowledge, before decision making
- Increase public confidence about the proponent, reviewers and decision makers
- Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions
- Dissemination of information through discussions, education and liaison
- Documentation of information narrated by the stakeholders and mitigation measures proposed by the stakeholders
- Incorporation of public concerns and their address in the EIA; and eliciting their comments and feedback
- Create a sense of ownership of the proposal in the mind of the stakeholders

5.6 Participants of Public Offices Contacted

Following officers of government departments were consulted by the socio-environmental team of the consultants and concerned details about the project were noted down through personal interviews, group meetings, etc., in their offices, for instance, see Table 16.

Table 16: Views of Participants of Public Sector Stakeholders

S#	Participant	CNIC/Designation	Concerns/Remarks
Gilgit Development Authority			
1	Engr. Arif Hussain	71501-1695174-1	<ul style="list-style-type: none">• Timely Implementation of the Project• Proper distribution network• Distribution lines should be laid down in liaison with the GDA• No interruption in the SNG supply after implementation of the project• HSE plan should be enforced strictly• The plant should be leakage proof• Regular inspection of the plant should be carried out to eliminate the associated risk
Environmental Protection Agency			
1	Mr. Munawar Hussain	Asst. Director EIA/Mont./L&E	<ul style="list-style-type: none">• HSE measure should be adopted to protect the workers from the risk and hazards• Preventive measures should be adopted to avoid any unfortunate incident• Environmental enhancement measures such as; Tree plantation, monitoring and safety should be ensured• For public consultation guidelines given by GB-EPA should be followed
2.	Mr. Waqar Kazmi	Scientific Officer	
3.	Mr. Usama Rehmat	Scientific Officer	
Livestock and Fisheries			
1	M. Hussain	71503-5491846-3	<ul style="list-style-type: none">• Provision of SNG should be ensured• Project should be implemented as soon as possible• For the installation and operation,

			<p>international standards of HSE should be followed</p> <ul style="list-style-type: none">• The rate of the sedimentation in River Gilgit and Hunza will decrease significantly as the rate of the deforestation will decrease• Efficient utilization of the SNG should be promoted in the region• Regular maintenance should be carried out
Forest and Environment Department			
1	Sajjad Hussain	Secretary	<ul style="list-style-type: none">• An effective EMMP should be designed and enforced with true spirit• Rate of the deforestation will decrease significantly, as the most of the population of GB resides in the Main Gilgit City depends on the wood for the production of the domestic energy• Project should be implemented, within the proposed time frame• SNG shouldn't be consumed for the heating of the water. The solar based heating system should be subsidized• Deforested area will be revegetated after the implementation of the proposed project
2	Rahimullah	Asst. Secretary	
KIU			
1	Farida	71501-5458666-2	<ul style="list-style-type: none">• Air pollution will be reduced significantly• Rate of the deforestation will be reduced significantly in GB• The project should be subsidized by GoP• The social concern should be addressed accordingly, if any
2	Iqlider Husain	71501-0670970-9	
3	Muh. Zafar Khan	71501-6085589-7	
Planning and Development Department			
1	Muh. Alam	71503-4592853-5	<ul style="list-style-type: none">• Latest technology/machinery should be purchased and adopted for the SNG provision• The pollution during the winter season increase significantly, due to the provision of the sustainable energy source the pollution will reduce significantly• The project should be planned in accordance the GB development plan• The rate of sedimentation will decrease significantly
2	Muh. Nazir Khan	71103-6604334-3 Deputy Chief	
WAPDA			
1	Irfan Hussain	Asst. Engr.	<ul style="list-style-type: none">• The dependency on the electricity during the winter season will reduce as the water level in the dam decreases significantly• The project should be implemented in consultation with the relevant departments• The HSE plan should be disclosed prior to the implementation of the project• The engineers have the prior experience of LPG air mix plant should be consulted in the

			design phase
Sky Light Academy			
1	Noor Neasa	71104-1419183-8	<ul style="list-style-type: none">• The SNG should be provided at the subsidized rates• SNG should be supply in the remote areas too• The provision of the SNG should be continuous
Army Public School			
1	Shah Kamar	71402-9432115-9	<ul style="list-style-type: none">• The continuity of the SNG should be ensured• Development process should be completed as soon as possible• SNG supply should be extended to the other remote areas• HSE plan should be design effectively
2	Qamar Zaman	7140237164407 Section Officer	
Hospital			
1	Dr. Naheed	Medical Officer	<ul style="list-style-type: none">• Supply of SNG should be ensured around the year• Efficient utilization of SNG should be ensured• Project should be commenced as soon as possible• The project should be replicated in other remote areas too
2	Hassan Ali	Nursing Head	
3	Dr. Hina	Medical Officer	
4	Dr. Samar Ahmed	Medical Officer	
Agha Khan Cultural and Dept. Pakistan			
1	Sher Ghazi	71504-0387497-7	<ul style="list-style-type: none">• Supply of SNG will have a positive impact on the health of the citizens• This project should be implemented as soon as possible
GDA= Gilgit Development Authority, KIU= Karakorum International University, WAPDA= Water and Power Development Authority			

Pictorial view of the consultation with the government departments is given below:





Figure 13: Consultation With KIU, Sky-Light Academy and APS-Staff



Figure 14: Consultation with Gilgit Development Authority (GDA)



Figure 15: Consultation with Planning and Development Department



Figure 16: Consultation with GB-EPA

5.7 Consultation with Beneficiaries

In addition, to the use of direct methods to evince the response of the various stakeholders in the population of the study area was ascertained by conducting a sample survey, through specially formatted questionnaires (attached in the Annex-VII of this EIA Report). Questions posed to the public were related to creation of possible impacts, adverse impacts and beneficial impacts, including; employment opportunities, income generation activities, change in living standards and provision of the amenity.

Personal views of the respondents on the installation of the proposed LPG Air Mix Plant, possible disturbance to the residents near the area of influence and infringement of their privacy were also recorded from 16th June, 2017 to 23rd June, 2017. The various grounds of public meetings and consultations were arranged in project and study area. The objectives of consultation with the affected persons are given in the table below:

- Disclose the government plan of domestic energy provision facilities at household level
- To share information on the design and specifications of proposed project works
- To analyse the expected impact on the socioeconomic environment
- To understand their concerns regarding various aspects of installation and operation

5.7.1 Views, Concerns and Suggestions of Various Stakeholders

The major socioeconomic concerns and problems of the affected persons of various communities have been given in tabulated form below (Table 17 to 19) along with their main concerns and remarks. Community showed a lot of concerns; a few are being mentioned here:

- SNG should be provided at the household level as it is a cleaner fuel as compared to wood and coal
- The project should be implemented as soon as practically possible
- A large portion of the income is being used on buying the burning fuel, so the SNG should be subsidized by GoP, to increase the acceptability of the project
- With the provision of SNG, the dependency on the wood and LPG cylinders will reduce significantly
- Deforestation rate will be decrease significantly
- The air pollution is one of the major impact of the wood consumption during the winter season, will decrease significantly
- The health of the people will be improve significantly

The hustle to buy the fuel wood will be reduce to zero almost with the provision of SNG in the GB. The major socioeconomic concerns and problems of the affected persons of various communities have been given in tabulated form below (Table 17 to 19) along with their main concerns and remarks. The community showed a lot of concerns; a few are being mentioned here:

- SNG should be provided at the household level as it is a cleaner fuel as compared to wood and coal
- The project should be implemented as soon as practically possible
- A large portion of the income is being used for buying the burning fuel, so the SNG should be subsidized by the GOP, to increase the acceptability of the project
- With the provision of SNG, the dependency on the wood and LPG cylinders will reduce significantly
- Deforestation rate will be decreased significantly
- The air pollution is one of the major impact of the wood consumption during the winter season, will decrease significantly
- The health of the people will be improved significantly
- The hustle to buy the fuel wood will be reduced to zero almost with the provision of SNG in the GB
- During the rainy season, the fuel wood and LPG cylinders shortages occur due to the landsliding because of the provision of the SNG as the alternative fuel it wouldn't impact the locals significantly





Figure 17: Consultation with the Affected Community

The views and the concerns of the local communities of Chilmish Das, Faizabad, Nomal, Jutial and Gilgit Main City is presented in the tabular form below:

Table 17: Views and Concerns of Persons Residing in Chilmish Das/Faizabad

S#	Participants	CNIC/Mobile No.	Concerns
1	Rizwan Ali	0315-5908350	<ul style="list-style-type: none"> • SNG supply should be continuous • SNG should be supply throughout the year • This project should be implemented as soon as possible • The provision of SNG should be economical • The health of the citizens will be improved due to
2	M. Shafa	0312-6956014	
3	Ghulam Murtafa	Less than 18 years	
4	Hussain Ali	7170403392199	
5	Imarn Hussain	-----	
6	Danish Ali	-----	
7	Haider Abbas	7170403457417	
8	Zuhaib Ali	7150119858081	
9	Abdul Hameed	7110427790233	
10	Ahmed Hussain	7150152966723	
11	Shahid Hussain	7150313127461	

12	Noor Neasa	7110414191838	<p>significant reduction in the air pollution</p> <ul style="list-style-type: none"> • The rate of the deforestation will be reduced • Due to the provision of SNG, the impact on the livelihood will be reduced • Transportation relation operations should be handled wisely • Proper trainings should be given to the workers
13	Abdul Majeed	7130303421701	
14	Nazia	0312-9235537	
15	Shahmari	7150154027120	
16	Imlak Hussain	7150159850873	
17	Shah Raees Khan	7150174021653	
18	Irfan Hussain	7150159755873	
19	Zaman Asghar	7140293266605	
20	Muh. Shah	7150102166865	

Table 18: Views and Concerns of Persons Residing in Jutal

S#	Participants	CNIC/Mobile No.	Concerns
1	Saba Gohar	7140290449612	<ul style="list-style-type: none"> • Due to the provision of SNG at household level the stress level will reduce significantly • The pressure on the natural resources will be reduce significantly • The air pollution will be reduced significantly • The price of the SNG should be economical • The project should be implemented as soon as possible • This kind of the projects should be replicate in other cities too • The impacts related to the installation of the project should be mitigated effectively
2	Muneer Alam	7150184446103	
3	Zahida Ali	7170405574670	
4	Aisha Wahab	7140272107142	
5	Nahda Mirza	71505040484293	
6	Shakir Hussain	----	
7	Khurram Shahzad	7150137082441	
8	Syed Kashif Hussain	7150140073543	
9	Israr Hussain	0312-9712558	
10	Zarmait Khan	7110495894985	
11	Tariq Ahmed	4210124280883	

Table 19: Views and Concerns of Persons Residing in Nomal

S#	Participants	CNIC/Mobile No.	Concerns
1	Israr Hussain	7170103431443	<ul style="list-style-type: none"> • Locals should be preferred while hiring people • SNG supply should be un-interpreted around the year • Effective EMMP should be design and implemented • Efficient utilization
2	Farhan Naseem	7150157761359	
3	Engr. Arif Hussain	7150116951741	
4	Ajaz Ali	7120760023843	
5	Raja Meer Naizm Khan	1310107848681	

6	Ameer Hamza	7150147606559	strategies should be design • The health of the citizens will be improved due to significant reduction in the air pollution • The rate of the deforestation will be reduced
7	Ameer Alam	7150119489923	
8	Nijat Walli	4210151292170	
9	Ali Shah	4220139634399	
10	Muzafar Karim	4220188124737	

Table 20: Views and Concerns of Gilgit Main City

S#	Participants	CNIC/Phone No.	Concerns
1	Shah Umer	7140294321159	• SNG should be supply to the Gilgit main city first • The provision of SNG will raise the socioeconomic status of the locals • People should make aware of efficient consumption of the SNG • The project should be implemented as soon as possible • The provision of the SNG in the remote areas should be ensured • The supply of SNG should be continuous • Locals should be given job opportunity
2	Ghulam Muslafa	7150102066311	
3	Azeem Ullah	7150198620431	
4	Nayyab Ali Shah	7150363722495	
5	Shahid Ali	7150193775325	
6	Zakir Hussain	7150159918963	
7	M. Khan	7150138216089	
8	Yousaf Ali	----	
9	Jaffar Hussain	----	
10	Akthar Hussain	7150195643605	
11	Iqudar Hussain	7150106790709	
12	Majid Khan	-----	
13	Ashiq Hussain	7150128576639	
14	M. Zafar Khan	7140160855897	
15	Hussama Rehmat	7150121504677	
16	Syed Jarrar Hussain	7150130723475	
17	M. Hussain	7150354918463	

5.7.2 Addressing Public Concerns

Responding to the concerns of the locals will be addressed by the proponent before the provision of SNG at household level. The best mechanism of effective communication between the community and the proponent is the by the nomination of the representative of the community and all the issues/concerns must be recorded for future reference. This representative may be the member of the Grievances Redressed Committee (GRC).

5.7.3 Grievances Redressed Committee

Grievances Redressed Committee (GRC) will be formulated by the proponent to address the concerns of the locals during the construction phase. The main role of the GRC will be to resolve the issues of the community associated with the proposed project, if any.

5.8 Acceptance Level of the Project

The opinions of the respondents were noted during the public consultation. The majority of respondents (100%) of Chilmish Das, Faizabad, Nomal and Jutail were in favor of the proposed project. They expect that installation of the LPG Air Mix Plant will help in the provision of the SNG to the locals. This will reduce the environmental and health issues prevalent in the area. On the other hand, installation of the LPG Air Mix Plant will also increase the economic value of local assets. According to them the proposed project will boost the employment opportunities, mobility access to resources, living standards, social amenities, agricultural production, housing and biological environment.

6. IMPACT ASSESSMENT METHODOLOGY

In the sections below the impact assessment methodology for the installation of the LPG Air Mix Plant has been defined in detail. It includes the magnitude, the extent of the impact and the nature of the anticipated impact being foreseen due the installation and operation of the proposed project

6.1 Methodology

This Section discusses the project's potential environmental impact on the area's geomorphology, soil, water resources, air, biological resources and socioeconomic condition and, where applicable, identifies mitigation measures that will reduce its impact up to the acceptable limits, if it's not possible to eliminate. The assessment carried out in the subsections below is based on potential impacts on overall environmental receptors within the project area of influence. Impacts are evaluated on the basis of their magnitude, immediacy and sustainability. Evaluation criteria is as follows:

6.1.1 Magnitude

The magnitude of the impact includes the type of impact project will cause such as; direct, indirect and cumulative. Direct impact means the impact being caused in the immediate environment within the same time frame. Indirect impact is the impact being caused as a result of the other impact or may result as the reaction of the other parameters. Cumulative includes both.

6.1.2 Immediacy

Immediacy focus on the following parameters:

- Temporal Extent (during construction and after construction)
- Spatial Extent (local or may be widespread)

6.1.3 Sustainability and Reversibility

It focused on the following parameters:

- Mitigability (Fully/Partially)
- Monitoring (Fully/Partially)

6.2 Objectives

Following are the objectives of screening out all significant environmental and social impacts as well as mitigation measures need to reduce the severity of the impact up to the extent possible:

- To find different alternatives and ways of carrying out the project activities causing adverse impacts

- To enhance the Environmental and Social benefits of proposed project
- To avoid, minimize and remediate adverse impacts
- To ensure that residual adverse impacts are kept in acceptable limits

6.3 Purpose of Mitigation Measure

The basic purpose of mitigation measures is to reduce the impacts of the proposed project development on the socio-environment up to the maximum possible extent. The mitigation measures are suggested based on the following parameters:

6.3.1 What is the problem?

The proposed project is the provision of SNG through the installation of the LPG Air Mix Plant in the Gilgit Baltistan. The proposed location for the installation of LPG-Air Mix Plant is an open, barren and dry land located in Chilmish Das. So, the major impacts associated with the proposed project during the construction phase will include; raw material storage and transportation, consumption of water in the civil work and noise generation from various constructional activities. During the operational phase, HSE of the workers, the risk of the fire out-burst, gas leakage, transportation and storage of LPG, solid waste management and sewerage disposal issues may cause minor to moderate impacts on the nearby community and on the various environmental parameters.

6.3.2 When problem will occur and when it should be addressed?

The impacts from the provision of SNG will occur during the installation and operation of LPG Air Mix Plant it includes civil work, operation, inspection and maintenance of the plant. These impacts associated; noise generation, solid waste management, wastewater disposal, etc. These all problems should be addressed on-site where they are being generated, to avoid the residual or adverse impacts.

6.3.3 Where problem should be addressed?

The problem will be generated during the installation and operational phase. The adverse impacts will be of minor magnitude. So, it should be addressed on source, i.e. at site within the same time frame.

6.3.4 How the problem should be addressed?

Proper mitigation measures will be provided according to the nature of the impact/problems. Like for dust emissions sprinkling of water will be done as and when required, for solid waste proper solid waste management and disposal practices will be adopted, to manage liquid waste proper treatment will be done before discharging the waste water into the receiving body. To manage

health and safety at site, HSE Plan will be adopted and practiced with the true spirit. To prevent the out-burst of the fire preventive measures will be adopted to eliminate the involved risks. One of the issues related to the operation is the storage of the LPG at the site. The storage tanks will be kept full at 85% capacity, 3-4ft retaining wall will be constructed.

6.4 Ways of Achieving Mitigation Measures?

Following ways will be adopted to reduce the impacts of the installation of the LPG Air Mix Plant in Gilgit Baltistan:

6.4.1 Changing in Planning Design

For the provision of SNG, LPG Air Mix Plant is being installed on the open, barren and dry land. The LPG Air Mix technology is considered to be safer as compared to the LPG cylinders and more reliable open as compared to the biogas. In the hilly areas, wood is being used for the production of the domestic energy. The design of the LPG Air Mix Plant will not cause any impact as the project is closed having zero emissions. So, no adverse impact is being envisaged. Hence, there is no need to change the design of the project as LPG Air Mix Plant is considered a sustainable option as compared to the wood, cylinders and coal.

6.4.2 Improved Management and Monitoring Practices

The anticipated impacts had been reduced significantly by adopting better management activities, as it will be carried out for the betterment of the environment. While monitoring will be conducted to keep the sources of the pollution and nuisances in-check, if any. Following practices that need to be adopted to reduce the impact significantly:

a. Compensation in Money Terms

There is no damage envisaged to fauna, flora or any other biological source due to the installation of the LPG Air Mix Plant. However, barren, open and dry land is being used for a beneficial purpose. So, no compensation in monetary terms will be needed as the land is owned by the Client and the land ownership documents are attached at Annex-I of this EIA Report.

b. Replacement/Relocation/Rehabilitation

The proposed project is located in open, barren and dry land, where there is no sensitive area, population or natural resource is present, which could be impacted due to the installation and operation of the LPG Air Mix Plant. No replacement, relocation and rehabilitation is required.

6.5 Impacts Associated with Project Location

The proponent has selected the site owing to the following reasons:

- The site is undisputed and under the ownership of the GB Government
- There is no community or human settlement present on-site, i.e., Chilmish Das is the nearest community located at 4.04 km distance from the project area
- There is no fauna or flora (particularly belonging to an endangered species) present on-site
- The site has access through Normal Gilgit Road, which connects site to the other road network (N35)
- There is no ecologically sensitive or declared protected area (PA) like; Reserved Forest, Fish Hatcheries, Territorial Waters, Wildlife or Game Reserves. Moreover, there is no socio-cultural significant structure (historical or archaeological site or religious structures; Masjid, temples, etc.) located within 5 km of the selected site that could be impacted

It can be concluded in view of these reasons that the selected site is best suited for the project and the technology adopted for the provision of domestic energy in the form of SNG at the household level is most suitable and sustainable option. The proposed project will not pose any adverse impact or threat on any component of the environment.

7. SCREENING OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

In this Chapter anticipated impacts and their mitigation measures due to the installation and operation of the LPG Air Mix Plant in Gilgit Baltistan have been discussed in detail. The purpose of conducting an EIA Study is to provide information about the general environmental setting of the project area, various impacts have been identified based on project activities on the bio-physical, socioeconomic and cultural environment, if any, recommendation measures are suggested accordingly. As well as site specific environmental mitigation measures and an Environmental Management Plan (EMP) is developed to ensure that assessment addresses the requirements of GB-EPA. It is expected that the project activities will not have any significant adverse impact on the environment.

7.1 Impact Evaluation

Impact Screening Checklist and Project Impact Evaluation Matrix have been developed (Given in Table 20 and Table 21) to evaluate the potential impacts of installation and operation of the proposed project on the basis of set procedures as mentioned in the environmental guidelines of GB-EPA.

7.1.1 Methodology for Impact Evaluation

These tools have been used to identify the significance and magnitude of the impact as well as the nature, reversibility and extent:

1. An Impact Screening Checklist
2. Project Impact Evaluation Matrix

Following is given a brief description of assessment tools:

a) Impact Screening Checklist

The Impact Screening Checklist is developed to screen out the potentially insignificant environmental and social impacts from the potentially significant adverse environmental and social impacts during planning & designing, construction and operational phases of the proposed project. The objective of the impact screening process is to assess the significance of the issues related to the air, water, noise, soil, transportation, infrastructure, communication, the safety and health hazards and external constraints of the proposed installation of LPG Air Mix Plant at Chilmish Das. The positive and adverse impacts of the proposed project during planning, design, development and operational phases are identified based on their duration, location, frequency, extent, significance and reversibility. Each activity impact on various environmental parameters are given below:



Table 21: Impact Screening Checklist

Sr#	Environmental Component	Impact Characteristics												
		Duration		Location		Frequency		Extent		Significance			Reversibility	
		Long	Short	Direct	Indirect	Cont.	Intermittent	Wide	Local	Large	Moderate	Minor	Rev.	Irrev.
Beneficial Impacts														
1	Local Resources Development	☑		☑		☑			☑		☑			☑
2	Employment Opportunities	☑		☑		☑			☑			☑	☑	
3	Reduced Deforestation	☑			☑	☑			☑			☑		☑
4	Provision of Public Amenity	☑			☑		☑		☑		☑		☑	
5	Enhanced Living Standard	☑		☑		☑			☑		☑		☑	
6	Increased Business Opportunity	☑		☑		☑			☑		☑		☑	
7	Infra-Structure Development	☑		☑		☑			☑		☑			☑
8	Local Economy	☑			☑	☑			☑			☑		☑
9	Air Pollution Reduction	☑		☑		☑		☑		☑				☑
10	Green Buildings	☑			☑	☑			☑			☑	☑	
11	Tree Planation	☑			☑	☑			☑		☑			☑
Adverse Impacts														
1	Noise Pollution		●	●			●		●			●	●	
2	Wastewater Generation	●		●		●			●			●	●	
3	Solid Waste Generation	●		●		●			●			●	●	
4	Transportation and Storage	●		●		●			●		●			●
5	Health and Safety	●		●			●		●			●	●	
6	Fire Risk		●	●			●		●	●				●

b) Project Impact Evaluation Matrix

The Project Impact Evaluation Matrix was developed by placing different environmental parameters that are likely to be affected by the proposed project actions, grouped into categories i.e., physical, ecological and socioeconomic environment. For the impact assessment, risk assessment methodology was used. Moreover, the risk assessment was done on the basis of project phases (design, development and operation). A Project Impact Evaluation Matrix is attached as Table 19 below:

Table 22: Impact Evaluation Matrix

Environmental Parameters	Risk Assessment	
	Construction Phase	Operational Phase
Location	+2p	+3p
Design	+2p	+4p
A: Physical		
<i>Land Resources</i>		
Waste Management	-1t	-2p
Scrap and Debris	-1t	NA
Land Use	-1p	+2p
Storage and Spillage	NA	-2p
<i>Air Resources</i>		
Air Emission	-1p	+4p
Noise	-1t	-1t
<i>Water Resources and Wastewater Management</i>		
Water Resource	-1p	-2p
B : Ecological		
<i>Flora and Fauna</i>		
Flora and Fauna	-1p	+2p
C: Socio-Economic		
LPG Transportation	0	-2p
Gas Leakage	NA	-2p
HSE	-1t	-2p
First Aid	NA	-1p
Fire Hazards	NA	-2p
Employment	+1p	+1p
Aesthetic	-1t	+2p
Energy Consumption	NA	-1t
Security and Site Access	-1t	-1p
<p>  Legends: 1= Low; 2= Medium; 3= High; 4= Extremely High; NA= Not Applicable; t= Temporary; p= Permanent; app= Applicable; 0= Negligible  All adverse environmental impacts except natural calamities are manageable easily by implementing EMMP </p>		

7.2 Impact and Mitigation Management

Purpose of mitigation is to evade, reduce or balance the expected antagonistic effects in a suitable way, to integrate these into environmental managing strategy or plan. At every stage of the project, mitigation plan for all the adverse impacts should be predictable to find out the best alternative. The objectives of mitigation are to:

- Invention of best substitution, better alternatives and ways to reduce the adverse environmental and social impacts on the surroundings
- To improve the environmental and societal payback of the project
- To prevaricate, remedying/reduce and to pro-vocative the associated impacts
- To certify that remaining negative influences are kept within permissible limits

In this part of the EIA Report, a number of complications including; cleanliness, environmental health and safety, societal and environmental managing and inspection, industrial vulnerability, tools and apparatuses and during various activities, the influx of people and procurement of land have been deeply elaborated.

7.2.1 Approaches for Mitigation Measures

The following approaches may be used to mitigate the impacts of the proposed project:

Table 23: Approaches for Mitigation Measures

Avoid: Change of route or site details, to avoid important ecological or archaeological features
Replace: Regenerate similar habitat of equivalent ecological value in different locations
Reduce: Filters, precipitators, noise barriers, dust, enclosures, visual screening, wildlife corridors, and changed time of activities
Restore: Site restoration at the end of the operational activities
Compensate: Relocation of displaced communities, facilities for the affected communities, financial compensation for the affected individuals, etc.

7.3 Impacts of Project Location

As discussed in Chapter 3 (Project Description) of this EIA Report the proposed project is located in an urban area and has been categorized as an open and dry land. There will be no long-term, high and adverse impact anticipated associated with the provision of SNG due to the installation and operation of the LPG Air Mix Plant at this proposed location. The selected site is owned by the SNGPL and there is no dispute associated with the ownership of the land (NOC/No Litigation

Certificate issued by Deputy Commissioner GB is attached at Annex VI of this EIA Report). The construction of the proposed project will not change the nature of the area as it is being constructed beside the TMA solid waste disposal site and opposite to the crushing unit. Moreover, the area is not inhabited by any ecologically important or protected flora and fauna specie as well as within 4.0 km vicinity of the project area, no community, archaeological and historical important site is located.

The topography of the area is flat. No earthquake and flooding is reported in the proposed area. Moreover, the site is selected near the center of the city. This will decrease the expense of the distribution network that is being laid for the distribution of the SNG.

7.4 Impacts of Project Design

The project design of the LPG Air Mix Plant is considered as a sustainable option for the production of the domestic energy. Currently, the source of the domestic energy is wood and LPG cylinders. With the provision of domestic energy, the dependency on the wood will be reduced significantly which will directly reduce the deforestation and air pollution. The principles of energy conservation and management rules for the LPG storage and distribution formulated by GOP, mention under the LPG (Production & Distribution) Policy Guidelines, 2013 will be followed.

The design of the LPG-Air Mix Plant is the sustainable option for the provision of domestic energy as compared to the wood, LPG cylinders and coal. The proposed project system is closed system having zero emissions. The latest technology will be adopted to supply SNG and the details of the components is given in Chapter 03.

The design of the residential complex and main office building will follow the green building designs such as; maximum utilization of the sunlight, insulation of building to avoid heat exchange, insulation of the building will reduce the electricity consumption and heating requirements, etc. Moreover, the buildings will be designed by keeping in consideration all the technical standards to avoid adverse impacts on the environment and society.

7.5 Adverse Environmental and Social Impact

Construction and everyday operations would involve the use of mechanized equipment with the potential hazard to release the hazardous materials, such as particulate matter (dust), oil and LPG in the surroundings. Most of the adverse impacts associated with proposed project installation and operation will be reduced up to significant levels by adopting best management and monitoring practices. Management and monitoring practices are given below in the details below under each specific impact.

7.5.1 Impacts During Pre-Construction Phase

Following impacts are being foreseen due to the installation and operation of the LPG Air Mix Plant:

a. Topography

The topography of the proposed location for the installation of the LPG Air Mix Plant is flat. No impact is being envisaged on the topography of the area. As the proposed project will not alter the overall topography of the area. In fact, it will help to improve the present situation and to improve aesthetic in the city.

b. Land Acquisition

No land acquisition will be required for the installation of the LPG Air Mix Plant. As the land is owned by the proponent and land ownership documents are attached at the Annex-I of this EIA Report.

c. Impact on the Economy

The proposed project will not cause the adverse impact on the economy of the area. However, the project will cause a positive impact on the overall economy of the area.

7.5.2 Construction Phase

Following impacts are being envisaged for the installation of the LPG-Air Mix Plant:

a. Raw Material Transportation

The proposed project area is open, barren and dry land. The project area is connected through the metaled road known as Nomal-Gilgit Road. During the transportation of the raw-material such as; cement, bricks, sand, gravels, etc. The dust may be generated and the air-pollutants may be released from the burning of the fossil fuels in the vehicles. It will have minor impact on the air quality of the area on the temporary basis. This impact is considered insignificant because of the availability metaled road network and very few vehicles will be deployed for this purpose.

Nature of Impact

The nature of the impact is low, short-term, temporary and insignificant.

Mitigation

Impacts of raw materials can be reduced significantly by adopting better management and monitoring practices. Following management and monitoring practices will be adopted to reduce the impacts:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution generated by the burning of the fossil fuels
- Restrict excessive transportation of the vehicles as well as the speed of the haulage trucks that shall not exceed the speed limit of 40km/hour
- Careful site planning and managing the transportation routes for the vehicles carrying raw-materials
- Cover the vehicles with tarpaulin carrying sand and loose material
- The engines of the idle vehicles should be kept off

b. Impacts on Vegetation

The proposed project site is an open, dry and barren land having very sparse herbaceous vegetation. Before, the start of the construction, vegetation on the project site will be cleared. Two herbs, species are present on the project site. After the end of the construction phase, the site will be re-vegetated and the plants will be planted in the designated green areas. The impact is considered to be insignificant and temporary in nature due to very sparse vegetation.

Nature of Impact

The nature of the impact will be low, short-term and insignificant.

Mitigation

Following mitigation measure will be adopted to reduce the impact of the vegetation removal:

- The plantation will be started as soon as the designing phase is completed and green areas are demarcated
- Trees will be planted along the boundaries and in the designated green areas
- Trees should be planted as soon as the construction on-site completed
- Proper maintenance of the planted trees will be done on the regular basis
- Dust along the un-metalled road should be controlled by regular sprinkling water on the construction material

c. Impacts on Wildlife and their Habitats

The impacts on wildlife around the project area are considered not significant as there is no protected area within 10 km vicinity of the project area. Installation of LPG Air Mix Plant will not cause any significant adverse impact on the wildlife and on their natural habitats. Moreover, due to installation the pressure on the local wood consumption will reduce significantly and the deforested area can be re-vegetated. Which will improve the condition of the wildlife habitats. So, no adverse impact is being envisaged.

d. Impacts on Water Resource

During the construction phase, water will be used for the preparation of the raw material, for watering under-construction buildings and consumption by the workers in various activities. It will cause negative impact on water resource. The consumption of the water will be low, causing minor negative impact on the surface water resources of the area. Around 150 liters, of wastewater is generated by one person in one day. Around 35-40 workers will be working on site during the construction phase. So, the amount of the wastewater generated will be 5,250-6,000 liters/day. If this wastewater is not treated properly may adversely impact the quality of the water significantly.

Nature of Impact

The nature of impact is low, short-term, temporary and insignificant.

Mitigation

Following mitigation measures will be adopted to avoid the impact on water resources

- Avoid un-necessary consumption of the water
- Close the tap when water is not in use
- Special care will be required to protect the chemicals and petroleum products from spillage
- Water efficient equipment and process will be used
- The wastewater that is being consumed from the use of the labour on-site will be disposed off in the wastewater drains being laid by GDA

e. Impacts on Air Quality

During the construction phase, the machinery working on project site may cause air pollution due to release of the pollutants such as; carbon dioxide, methane, NO_x and SO_x from the burning of the fossil fuels in the vehicles. Dust may be generated due to the excavation activity and filling of the pits. No other impact is envisaged that may pollute the air quality.

Nature of Impact

The nature of the impact will be low, short-term, temporary and insignificant.

Mitigation

Following mitigation measures will be adopted to reduce the impact on the air quality:

- Proper tuning of vehicles should be done on the regular basis in order to control the air pollution
- Avoid unnecessary movement of the trucks carrying raw-materials
- Avoid excavation and filling activity on the windy days

- The impact can be minimized through a management programs which ensure dust will be controlled by regular watering the dusty areas
- Abandoned excess laterite and stone aggregate littered around stockpile areas after construction completed changes the soil structure
- Regular water sprinkling may be done to control the dust generation

f. Impacts of Noise

During the construction phase, heavy construction machinery will be used. The machines are noisy and can cause a certain degree of nuisance to the nearby residents. The noise levels of machines and vehicles vary widely depending on the type of noise generated and level of activity. Some common impacts of noise nuisance include annoyance, sleep disturbance and interference with communication. Acceptable levels of noise are regarded to be 40 dB(A) during the night and 50 dB(A) during the day. Since construction will take place during the day only the 50 dB(A) level is of importance. As the proposed project is located at the distance of 4.04 km from the nearest residential area so this impact is considered as insignificant.

Nature of Impact

Nature of impact will be low, short-term and significant

Mitigation

Following mitigation measure will be adopted to reduce the noise level:

- The noise related activities should be done during the daytime to ensure minimum disturbance to the local community
- Proper tuning of the vehicles should be done on the regular basis, so that the noise level will be reduced up to the acceptable limits
- Noise related activities should be done speedily and completed as soon as practically possible
- Construction activity will be confined to the small reserved area

g. Impacts on Land-Use and Surrounding Environment

The land-use around the project site is characterized as barren land having very sparse herbaceous vegetation only. No impact is anticipated as the LPG Air Mix Plant is proposed to be constructed on barren land and the construction will not change the land use of the area. As the project area is levelled and due to the proposed project constructed geology of the area will not be impacted. So, no adverse impact is being envisaged on the land use of the area.

Nature of Impact

The nature of the impact will be low, short-term, temporary and hence insignificant.

Mitigation

Following mitigation measures will be adopted to reduce the impact:

- No mitigation measure is required as the project is being constructed on the barren, open and dry-land.
- Landscape management system will be devised to reduce the visual impacts
- Trees will be planted in the specified green zones
- Excavation and filling process should be done on non-windy days
- Designated green areas should be re-vegetated as soon as they are marked

h. Impacts on Socioeconomic Environment

During this phase, skilled and unskilled labour will be required. Employment opportunities for the un-skilled workers will therefore increase, which will enhance the positive benefits for the local people who are in dire need of income for sustenance. Furthermore, indirect opportunities for employment will arise from the provision of services to the construction teams, such as the sale of raw-material such as cement, bricks, sand etc., as well as food and beverages for the labour and after completion of construction phase serve as a permanent business opportunity. In this sense the construction of the Installation of the LPG Air Mix Plant will have a positive impact on the employment situation of the nearby communities. Moreover, the domestic energy will be provided at the household level at the subsidized rates. This will reduce the pressure on their income sources as on an average 30% of their livelihood is being used to purchase the wood and LPG cylinders.

Nature of Impact

This impact is considered to be positive, short-term and significant.

i. Impacts on Cultural and Historic Sites

There is no adverse impact anticipated on the cultural and historical sites as there is no cultural and historical sites located within the 3.0 km boundary that could be impacted due to the construction of the proposed project.

j. Impacts on Human Settlements

The land is owned by the proponent and there is no dispute related to the land ownership and dislocation of any human settlements. Moreover, there will be no possibilities of demolition and

relocation of any physical infrastructure. Moreover, construction work will be confined to the 40 kanals of the area. The potential adverse impact is considered insignificant in nature because the project area is located in barren zone and the development will not cause any adverse impact or may not cause of public nuisances.

k. Impacts of Work Accidents

During the construction phase, heavy machinery will be deployed on-site. Heavy machines make a lot of noise, may generate carbon dioxide emissions, generate dust and may cause accidents among operators, if not handled properly. This is likely to have a negative impact on the health of the workers. To limit the risk of accidents, safety procedures will be put in place and enforced by the foreman to ensure that vehicles and machinery only drive in the places designated by authorized personnel.

Nature of Impact

The nature of the impact will be minor, low, short-term and insignificant.

Mitigation

Following mitigation measures will be adopted:

- Make sure all the workers wear Personal Protective Equipment (PPEs) while working. The PPEs will include; Helmets, safety shoes, mask, earplugs/ear muffs, etc.
- The wearing of the PPEs should be enforced strictly by the contractor
- Regular checking and maintenance of the machines should be done in order to maintain working machinery and to avoid accidents
- Noise related activities should be done during the day hours and make sure the workers wear the earplugs/muffs
- Generated dust can be controlled effectively by water sprinkling

7.5.3 Impacts during Operational Phase

Following impacts are being envisaged during the operational phase:

a. Ecology

Currently, few herb species are present in the project area and after the completion of construction phase different ornamental plants and native tree species will be planted in designated green spaces and around the public buildings. This will improve and have a significant impact on the overall ecology, aesthetic and landscape of the area.

Nature of Impact

This impact is considered to be positive, long-term and significant. Hence, it does not require any mitigation measure.

b. Water Resource

The excessive construction material left after the completion of construction works, it may be washed into the water sources which may lead to increase the sedimentation load of water bodies which will cause adverse impact on the quality of water. During the operational phase, water will be consumed by the workers residing in the residential complex. Around, 15 workers will be deployed on-site during the operational phase and the amount of the wastewater generated will be approximately 2,250 liters/day. This generated wastewater may have an adverse impact on the local water resources if not treat and disposed off properly.

Nature of Impact

The nature of the impact will be direct, low, short-term and insignificant.

Mitigation

Following mitigation measures will be adopted to reduce the impacts on water resource

- Close the water tap when not in use to conserve the local water resource
- To provide safe drinking water to the staff and workers will be ensured
- Avoid using excessive water during various building construction activities
- The capacity of the toilet tanks installed in public and private buildings should be reduced in order to conserve water resources
- The wastewater will be treated by the proposed water treatment plant and the generated wastewater will be discharged into the sewerage system proposed by GDA after getting approval from local government authorities

c. Impacts of Road Traffic

No impact is being envisaged on the local traffic conditions as, a 22 wheeler Bowser having 30-ton capacity will carry the LPG from the field to the project area. Around 3-4 vehicles will travel on the daily basis. The total storage capacity of the storage tank is 822 metric tons. It is expected that the risk of the incidents will increase because of the sharp turns and negligence of the drivers.

Nature of Impact

The nature of impact will be direct, low, long-term and significant.

Mitigation

Following mitigations should be adopted to reduce the chances of accidents along the transportation route:

- Strict observance of the traffic rules and speed limit should be regularized on the daily basis
- Strict speed limits should be enforced
- Improved sight lines and replacement of road furniture will reduce some accidents

d. Energy Consumption

A large amount of energy will be consumed during the operational phase for lightning, heating, and to run the SNG plant. The source of the electricity production in GB is mainly hydroelectricity. The dependency on the electricity, as it is being consumed as one of the energy source for heating during the extreme winter season will be reduced significantly due to the provision of SNG at household level. Pakistan is an energy deficient country and it relive the pressure on the Energy Sector.

Nature of Impact

The nature of impact will be direct, low, long-term and significant.

Mitigation

Following mitigations should be adopted to reduce the energy consumption at the plant site:

- Energy efficient equipment and appliances will be installed in order to conserve energy
- The residential complex and main office building will be insulated, to reduce the requirement of heating and cooling
- Proper awareness and trainings regarding the saving of the energy should be given at grass-root level

e. Solid Waste Management

Solid waste generated during the operational phase mainly includes organic waste (e.g., food waste). Around 15 workers, will be living at the plant site and around 9.75 kg (considering 0.65 waste generation rate) of the solid waste will be generated per day. In the terms of weight, a large portion of the solid waste consists of organic kitchen waste and it may produce vector which could transfer diseases to humans and can be the cause of public nuisance if not disposed off properly.

Nature of Impact

The nature of impact will be direct, medium, long-term and significant.

Mitigation

Following mitigations should be adopted to reduce the issues related to the solid waste:

- Solid waste should be stored in the covered bins in order to avoid the growth of vectors and rodents as well as to control the odour and to reduce public nuisance
- Solid waste will be collected by GWMC on the regular basis and will be disposed off by using the standard practices adopted in the area
- It should be ensured that no burning of the solid waste will be carried out on site
- Higher penalties should be imposed on the burning of the solid waste
- Solid waste should be collected from the project site and it will be transported to the waste disposal site on the daily basis
- Solid waste composition is organic in nature and it can be converted to the organic fertilizer, it will reduce the pressure on the waste disposal system and will enhance the properties of the soil
- Good management practices should be adopted to avoid the spread of diseases among the locals
- Appropriate in-housekeeping, sanitary and solid waste management practices should be adopted

f. Health and Safety

After the installation of the LPG Air Mix Plant, the health and the safety of the workers will be at great risk if proper safety measures will not adopt. The SNG inhalation can cause unconsciousness and even death. The SNG plant is closed system and the risk of the leakage of the SNG is quite low. In the case of the leaking valves will be closed to prevent further leakage from the system.

Nature of Impact

The nature of impact will be direct, low, long-term and significant.

Mitigation

Following mitigations should be adopted to improve the health and safety:

- Regular inspection and maintenance of the plant will be carried out to eliminate the risk and associated hazards of any unfortunate incident

- Workers will be trained on the regular basis regarding personal safety and disaster management
- As the project is being constructed besides the TMA waste disposal site, burning of the solid waste should be banned and high penalties should be imposed
- Operators operating the plant should be fully trained and equipped
- Training regarding HSE should be given on the regular basis
- Workers will be given PPEs such as; helmets, mask, earplugs/muffs, safety boots, etc.
- It should be strictly enforced to wear PPEs while working
- Incidents should be reported directly to the concerned authority

g. Fire Hazards

Hazards include gas leakage due to the damage of storage tanks and machinery. This could result in the episode of the fire at the massive scale.

Nature of Impact

The nature of impact will be direct, low, long-term and significant.

Mitigation

Following mitigations should be adopted to reduce the risk of the hazards involved:

- Retaining walls of 4-5 feet will be constructed around the storage tanks
- In the case of LPG spillage, the LPG will be converted to the vapours and mix with the air. The walls around the storage tanks will be high to prevent the spreading. Moreover, pressure control valves will be installed which will prevent the leakage further.
- The fire-fighting system will consist of; fire-extinguishers, smoke detection system, fire pumps, fire-fighting hoses, fire fighting nozzles, fire and water monitors, fire trolleys, hooters, hydrants and sand buckets will be installed inside the facility
- The NSFP-15 and 20 standards will be followed for the fire-fighting at plant site
- All the equipment will be placed at strategic locations where the risk of an out-burst of the fire is high
- Smoking will not be permitted in the vicinity of the plant and the burning of the solid waste should be banned
- A proper fire fighting plan will be implemented during the constructional and operational phases
- Emergency preparedness and fire fighting training and drills will be given to the employees on the regular basis

- The regular site inspection will be done to eliminate all the chances of the hazards
- Checking and maintenance of the fire-fighting equipment will be carried out on the regular basis
- Workers will be given training of fire-fighting on the regular basis
- Emergency evacuation routes and the fire extinguishers strategic placement is shown on the layout plan is shown below and A3-copy is attached at Annex-X of this EIA Report.

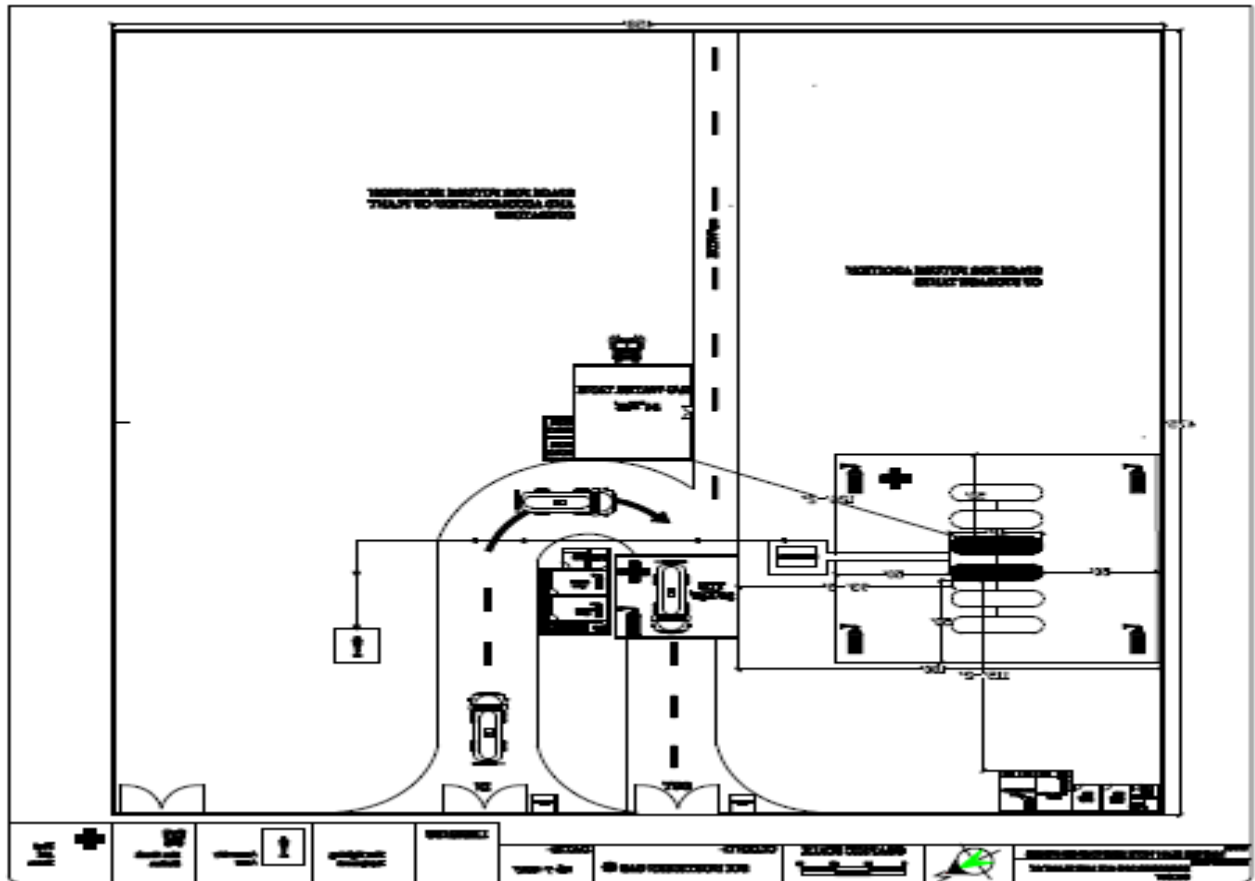


Figure 18: Emergency Response Plan

h. Storage and Spillage

The LPG will be stored in the airtight storage tanks made up of stainless steel having one coat of red oxide primer and two coats of white enamel paint. There will be 15 storage tanks of 50-ton capacity and 6 storage tanks of 12-ton capacity. The total capacity of the storage will be 50 m-tons at 85% capacity. The LPG will be stored 65.5°C temperature and 250 PSI pressure. The height of the storage tanks will be between 50-40 ft. A retaining wall of 3-4ft will be constructed adjacent to the storage tanks. The risk associated with the spillage of the LPG is quite low as the SNG plant is closed system. In the case of the leaking valves will be closed to prevent further leakage from the system.

Nature of Impact

The nature of impact will be direct, low, long-term and significant.

Mitigation

Following mitigations should be adopted to improve the health and safety:

- The storage tanks will be constructed according to the standards prescribed for the issuance of the OGRA License and ASME standard.
- The tank will be filled up to 85-90% capacity. The layout plan along with the specifications is attached at Annex IV and V of this EIA Report.
- Retaining walls of 4-5 feet will be constructed around the storage tanks
- In the case of LPG spillage, the LPG will be converted to the vapours and mix with the air. The walls around the storage tanks will be high to prevent the spreading. Moreover, pressure control valves will be installed which will prevent the leakage further.
- The fire-fighting system will consist of; fire-extinguishers, smoke detection system, fire pumps, fire-fighting hoses, fire fighting nozzles, fire and water monitors, fire trolleys, hooters, hydrants and sand buckets will be installed inside the facility
- The NSFP-15 and 20 standards will be followed for the fire-fighting at plant site
- A proper fire fighting plan will be implemented during the constructional and operational phases
- Emergency preparedness and fire fighting training and drills will be given to the employees on the regular basis
- The regular site inspection will be done to eliminate all the chances of the hazards
- Checking and maintenance of the fire-fighting equipment will be carried out on the regular basis
- Workers will be given training of fire-fighting on the regular basis
- Emergency evacuation routes and the fire extinguishers strategic placement is shown on the layout plan attached at Annex-X of this EIA Report.

7.6 Positive Impacts

Following are the positive impacts of the Proposed Project, that will enhance the overall socioeconomic and ecological condition of the project area.

7.6.1 Positive Environmental Impacts

Following are the positive benefits of the proposed project:

a. Tree Plantation

The tree plantation will be carried out along the boundary of the project site, parks, greenbelts and open green spaces as the part of the proposed plantation plan on site. This will include plantation of ornamental as well as indigenous species of the plants. The plantation will be carried out designated green area which will improve the overall ecological conditions.

b. Green Building

The design of the residential complex and a main office building will be energy efficient, i.e., sunlight will be used during the daylight hours and during the dark-hours energy savers will be used. The building will have an adequate access to the proper ventilation and sunlight. The building will be insulated and design in such a way that the requirement of the heating and cooling will be decreased significantly during the extreme climatic conditions.

c. Reduced Deforestation Rate

Currently, wood is being consumed as the source of domestic energy. On an average 300 kg of wood is being consumed per month during winter season. The rate of deforestation is quite high in the nearby zones of the Gilgit Baltistan. The wood is being produced from Astore, Hunza and Chillas. These areas are quite green and rate of deforestation is quite high in that zone. Due to the increased deforestation rate the chances of the flooding had increased drastically because of the provision of the alternative fuel the rate of the deforestation will reduce significantly.

d. Air Pollution

During winter season, wood is being consumed at the rate of 300 kg per month. During the winter season, a blanket of the smoke is formed over the city due to the high consumption of the wood. SNG is considered as a cleaner fuel as compared to the wood. Due to the provision of the alternative energy source the air quality of the area will be improved significantly.

7.6.2 Positive Social Impacts

Following social impacts are being envisaged due to the installation of the LPG Air Mix Plant:

a. Employment/Poverty Alleviation

The employment opportunities in the project area will be increased due to the installation and operation of the proposed project. As GB has a less population as compared to the other cities. So, the minor increase in the job opportunity will cause a significant impact on the economy of the area. During installation and operation of the LPG Air Mix Plant un-skilled workers will be required as labours, sanitary workers and sweepers as well as for the skilled workers such as; Engineer, Sub-Engineer and other staff will be hired to run the plant. In totality, the overall economic conditions of the area will be improved.

b. Local Economy

The employment opportunities and/or income sources generated by the project installation will be enhanced and will have long term impact on the economy. The local economy will experience a slight boom during the development period.

c. Increased Business Opportunities

A number of raw-material will be required for construction of the proposed project. Many vendors can supply the required stuff to the on daily and weekly basis. This will serve as a new business opportunity and it will enhance the socioeconomic status of the people directly linked with it.

d. Enhanced Living Standards

Installation and operation of LPG Air Mix Plant will enhance the living standard of the people residing in GB. Locals will enjoy the provision of the domestic energy at their doorstep.

e. Infrastructure Development

The installation and operation of LPG Air Mix Plant in this zone will enhance the land values in this particular region. The price of the land will be appreciated in the regions provided with the SNG in the initial phase. So, the more the population will be settled near those areas having SNG facility.

f. Provision of Basic Amenities

Provision of domestic energy is considered as the basic amenity. In the remote hilly areas this amenity is not available. Local consume wood and cylinders. The GOP took initiative to provide burning fuel through a proper distribution channel at the household level. For this purpose, GOP adopted the technology of the LPG-Air Mix Plant is known as SNG to provide burning fuel. So, the people of the remote hilly areas will enjoy the basic amenities.

8. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

This Chapter presents the implementation mechanism in the form of an Environmental Management and Monitoring Plan (EMMP) for the environmental and social mitigation measures identified during a socioeconomic survey is given in Chapter 7 of this EIA Report. The existing environmental regulations in Pakistan, for the Installation and operation of LPG Air Mix Plant have complied with and potential adverse environmental impacts resulting from the project activities are minimized as practically as possible. Implementation of on-going environmental monitoring programs will enable the assessment and modification, if required, of the Environmental Management Plan. This EMMP provides the delivery mechanism to address the adverse environmental as well as social impacts of because of the installation of the LPG Air Mix Plant at the proposed location during the execution and operation phases. To enhance project benefits and to introduce standards of good practice to be adopted for all project works EMMP will be implemented with the true spirit.

Environmental management is carried out in all stages of the project execution, namely; designing, construction and operational phases. The key stakeholders in the environmental management activities are: Proponent, Contractor, Local Government Authorities, Customers and to some extent General Public. The EMMP for the management of the identified environmental impacts associated with this project consists of three main components:

1. Implementing the Impact Mitigation Plan
2. Monitoring the implementation of the EMMP
3. Institutional Framework for Monitoring, Reporting and Supervision of EMP

8.1 Objectives

This Environmental Management and Monitoring Plan (EMMP) aim at ensuring the application of the mitigation and monitoring measures, needed to reduce and control the various environmental and social impacts associated with the implementation of the proposed project. The key objectives of the EMMP are summarized below:

- Minimizing any adverse environmental, social and health impacts resulting from the project related activities
- Implementation of on-going environmental monitoring programs
- Periodic review of the EMP to allow for improvement
- Ensure that all stakeholder concerns are addressed, if any
- Overall, this EMMP aims at ensuring the application of the mitigation and monitoring measures needed to reduce and control the various environmental and social impacts

associated with the implementation of the proposed project

- Provide the mechanism for taking timely action in the face of unanticipated environmental or social situations
- Identify environmental as well as social training requirements at various levels

8.2 Components of EMMP

The EMMP consists of the following components:

- Institutional arrangements
- Mitigation plan to reduce the severity of associated impacts
- Monitoring plan to monitor the impacts and their severity
- Environmental and social trainings to raise awareness

8.3 Institutional Capacity

This section describes the organizational structure required for managing the environmental and social aspects of the proposed project as well as it describes the roles and responsibilities of various authorities. The institutions which are responsible for proper implementation and effective supervision are given below;

Table 24: Roles and Responsibilities

Organization	Duties
Pre-Construction Phase	
Environment Management Committee	Check that EMMP requirements are fully involved in the document of contract
Construction Phase	
EPA-GB	Ensure EMMP is sufficient to control impacts and ensure compliance with the statutory requirement of EPA
Project Manager	<ul style="list-style-type: none"> • Supervising construction works being carried out at site • Schedule preparation and resource forecasting for engineering and other technical activities relating to the proposed project construction • Regular review of implementation status of EMMP for continual improvement of the system via EMMP review meetings.
Contractor	<ul style="list-style-type: none"> • Ensure compliance with the EMMP at all times during construction • Ensure the health and safety of the labor by adopting best practices • Maintain an environmental register which keeps a record of all incidents which occur on the site during construction
HSE Manager	<ul style="list-style-type: none"> • Supervise and monitor environmental management actions and parameters • Commence daily observations of EMMP activities • Confirm that every activity on the site is in the domain of NEQS

	<ul style="list-style-type: none"> • Preparation of environmental monitoring reporting and any permit applications (if any) • Running of day-to-day requirements for EMMP implementation • Overseeing of construction process and ensuring the implementation of avoidance and mitigation measures • Conducting monitoring and review of EMP implementation by contractor
Operational Phase	
GDA	GDA will serve as the ultimate authority to approve the specific designs of the distribution lines
Operation and Maintenance Engineer	Supervise the operational and maintenance activities being carried out at the site
HSE Officer	<ul style="list-style-type: none"> • Supervise and monitor environmental management actions and parameters • Commence daily observations of EMMP activities
EIA Expert	<ul style="list-style-type: none"> • Periodically commissioned to undertake statutory environmental audits • Guide the Proponent during implementation of EMP

8.3.1 Management Approach

The Proponent will appoint a Health, Safety and Environment (HSE) Officer during the construction phase within the organization, in order to handle the environmental, social, occupational health and safety aspects during the construction phase and the operational phase. Other essential features proposed for the project are:

- The incumbent will be responsible for overseeing and monitoring the entire implementation of the EMMP with true spirit
- The contractor(s) will be required to appoint a dedicated field HSE Officer

8.3.2 Monitoring and Reporting

This Section presents more detailed information on the impacts, mitigations and monitoring requirements also given in Chapter 07 of this EIA Report. Mitigation measures aimed to offset any adverse impacts that may result from the construction and operation of proposed project and monitoring is the process of measuring the success of mitigation measures in order to assess their effectiveness.

Reporting is the process of measuring actual performance or how well the mitigation measures have been implemented, including the format, timing and responsibility for reporting of the monitoring results. Although the EIA process does not reveal any high significant impacts, this section provides measures that further reduce the impacts considered to be medium as well as those considered to be low.

Table 25: Environmental Management and Monitoring Plan (EMMP)

Category	Impact	Project Activity	Monitoring Mechanism	Frequency	Monitoring Agency
Construction and Operation Phase					
Land Resource	Solid Waste	Implementation of SW* System	Record keeping and timely transfer of SW to the disposal site	Daily	Proponent/GWM C**
Air Resource	Air Emission	Air quality will deteriorate due to transportation and construction activities	Monitor the air quality as per standards	Once before construction phase and as when required after the completion of construction phase	EA***
	Dust				
Water Resource	Wastewater Disposal	During construction and operational phase wastewater will be generated during the various activities which will pollute the surface water and ground water resource	Monitoring will be done on the regular basis to check the disposal system as per WHO**** Standards	As Required	Proponent and GDA*****
Ecological Resource	Flora	Only few herbs are present, which will be uprooted during construction phase and photographic record will be maintained	Inventory of uprooted herbs and revegetation during operation phase	During Baseline Survey and after the completion of the Project	Proponent and GB-EPA
Noise	Surrounding Community	During the construction phase, nearby community	By using digital sound meter	At the end of every week	Proponent
Water Use	Water Resource	Water will be consumed in various household activities	Water consumption can be measured by installing water meters	At the end of every week	Proponent
Energy Use	Energy Resource	Energy consumption in the offices, allied buildings and process activities	Energy Consumption Audits	After one year	Proponent
Strom Water	Change in the water passage	During the construction process the passage may be alternated. The storm water will be collected in the drains and will be disposed off safely in Hunza River.	Not Required	----	----
*SW= Solid Waste, ** GWM= Gilgit Waste Management Company, ***EA= Executive Agency, , ****WHO=World Health Organization *****GDA =Gilgit Development Authority					

8.4 Training, Awareness and Capacity Building

To enhance the capacity of the Proponent/EA as well as the Contractor, training will be imparted related to the environmental and social issues of the project implementation of mitigation measures, the monitoring protocols and reporting mechanism. Project will ensure in-house training for the project staff, contractor and the supervisory staff of the Proponent/EA and the Consultants through the provision of one day basic training and one day advanced training, covering environmental and social aspects for the installation and operation phases in general and implementation requirements will emphasis on the development projects in general, implementation requirements with emphasis on the roles and responsibilities of the Proponent/EA and the Contractor staff while executing the environmental monitoring plan in particular. The training protocols will include the following aspects:

- Procedures for monitoring the air quality parameters and measures to be adopted for avoiding or minimizing air pollution, particularly from the concrete batching plant and haul-trucks
- Procedures for monitoring water quality parameters and measures to be adopted for avoiding or minimizing water pollution, particularly from the wastewater effluent generated from the raw-material preparation, machinery, washing yards and other obnoxious chemicals whose leaching can deteriorate the quality of the ground water resource
- Training on the incident control will be given to the workers on the regular basis to eliminate the risk associated with the out-burst of fire and leakage of the LPG/SNG
- Safe waste disposal practices to manage the generated solid waste during the constructional and operational phases
- Safe noise levels from the operation of the construction machinery during the constructional as well as operational phase. The noise will be determined on the weekly basis by the Contractor
- Safety measures against the hazards for the workforce and the local communities arising from the constructional and operational activities
- Use of safety equipment and gadgets by non-skilled workers will be enforced

8.5 Impact and their Mitigation Measures

The impact and their mitigation measures are a key component of the EMMP. It lists all the potential effects of each activity of the project and their associated mitigation measures identified during the impact assessment process. For each project related activity, the following information is presented in the plan:

- A listing of the potential impact associated with that project activity
- A comprehensive listing of mitigation measures (actions)
- The person(s) responsible for ensuring the full implementation of the action
- The person(s) responsible for monitoring the action
- Timely implementation of the environment management and monitoring plans to ensure that the objectives of mitigation are fully met

It should be emphasized that the mitigation measures will have to be translated into environmental as well as social requirements and specifications to be made part of the contract for the construction activities, with legal binding.

8.5.1 Summary of Impacts and their Mitigation Measures

The summary of the impacts along with proposed mitigation measures and the risk associated with each parameter is given below in details:

Table 26: Summary of Impacts and their Mitigation Measures

Environmental Parameters	Risk Assessment		Recommended Mitigation and Management	Monitoring and Responsibility
	Construction Phase	Operational Phase		
Location	+2p	+3p	<ul style="list-style-type: none"> No Mitigation is required as the project is located at the distance 4.04 km from the community The topography of the site is flat The site had an accessible metaled road network No earthquake and massive land sliding had been reported in the proposed area No ecologically importance ecosystem is present in the close proximity of the proposed site that could be impacted No flood has been reported at site due to the difference of the elevation 	Monitoring not required
Design	+2p	+4p	<ul style="list-style-type: none"> The LPG-Air Mix Plant is specifically design for the northern areas as its most efficient system for the provision of the SNG at the household level. The installation of the proposed plant will not cause any adverse impacts Emergency shutdown system will be installed, to immediately close the system in the case of the emergency Design stability report can be obtained from the concerned departments Inspection of the plant for the leak detection, maintenance and fire-safety will be carried on the regular basis 	Not required
A: Physical				
<i>Land Resources</i>				

Waste Management	-1t	-2p	<ul style="list-style-type: none"> • The solid waste will be disposed off by using the standard practices • The solid waste generated will be collected in the bins placed at site • The bins will be collected by GWMC and the waste will be disposed off • Excavation waste should be re-used or backfilled reusable and recyclable wastes, such as skids, fibre/nylon, rope spacers, pallets, drums and scrap metals should be stockpiled and salvaged • Hazardous wastes should be stored in areas away from watercourses • In the case of spillage of oil during construction the soil will be removed and disposed off by using standard practices in the area • Non-recyclable waste should be sent to the EPA licensed waste facility. 	Visual inspection on the daily basis by the Proponent
Scrap and Debris	-1t	NA	<ul style="list-style-type: none"> • Integrated waste management system will be adopted for the proper management of the waste at site • At the end of the construction phase, left-over waste will be removed by using the standard waste management procedures • All the idle machinery and equipment will be immediately removed from the site • Scrap and the debris will be removed from the site at the end of the construction stage after appropriate segregation of the material 	Once at the end of the construction phase by the proponent
Land Use	-1p	+2p	<ul style="list-style-type: none"> • No mitigation measure is required as the project is being constructed on the barren, open and dry-land. • Landscape system will be devised to reduce the visual impacts • Trees will be planted in the specified green zones 	Monitoring not required

Storage and Spillage	NA	-2p	<ul style="list-style-type: none"> • Keep a log of tank volumes and make calculations to confirm that the tank(s) can accept the volume of LPG ordered. • When the SNG system has more than one tank, provide a plant person during the transfer to ensure the LPG goes in to the correct tank • Confirm that the tanks are not over filled • In the case of LPG spillage, the LPG will be converted to the vapours and mix with the air. The walls around the storage tanks will be high to prevent the spreading. Moreover, pressure control valves will be installed which will prevent the leakage further. • Pressure in an LPG storage tank is related to temperature Tanks are required to be painted silver or white — only. These colours reflect sunlight and keep the tank as cool as possible. 	On the quarterly basis by the Proponent
Air Resources				
Air Emission	-1p	+4p	<ul style="list-style-type: none"> • During the construction phase, water will be sprinkle on the daily basis due to the dry climatic conditions • No excavation activity will be carried out during windy days • Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions • Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions • Vehicles transporting soil, sand and other construction materials shall be covered • Prohibit prolonged engine idling. • Sensitize construction workers on measures to reduce air pollution 	On the quarterly basis by the Proponent
Noise	-1t	-1t	<ul style="list-style-type: none"> • Generators will be enclosed in a sound dampening enclosures • Regular maintenance of the machinery will be done to reduce the noise • Vehicles will be tuned on the regular basis • Drivers will be instructed to avoid unnecessary gunning of vehicles, hooting and buzzing. 	On the monthly basis

Water Resources and Wastewater Management				
Water Resource	-1p	-2p	<ul style="list-style-type: none"> • Effective strategies for the management of the generated wastewater will be devise • During construction phase, wet concrete and cement will be covered and will be protected to damage the waterways • Stockpiled material will be kept away from the surface water body • Exposed ground and stockpiles should be minimized to reduce silty runoff, and if necessary measures such as geotextiles will be used to shield spoil mounds. • The wastewater will only consist of the sewerage waste which will be disposed off by using the standard practices being used in the area • Regular inspection and maintenance of the machinery will be done to reduce the risk of water pollution 	Physio-chemical analysis of the river water quality on the quarterly basis by the Proponent
B : Ecological				
Flora and Fauna				
Flora and Fauna	-1p	+2p	<ul style="list-style-type: none"> • No flora and fauna is present at site that could be impacted due to the installation of the LPG-Air Mix Plant • The flora of the site should be restored at the end of the construction phase by landscaping and planting native vegetation • It should be ensured that non-native/introduced plants are present in the vicinity • A 'no-hunting' policy should be strictly enforced. • Artificial nests should be placed in the within the plant and in its close proximity 	Inspection of the flora should be done once at the end of the construction phase and then after the quarterly basis by the Proponent
C: Socio-Economic				

LPG Transportation	0	-2p	<ul style="list-style-type: none"> • Truck driver should be experienced and aware of the nature of product he is transporting. • Proper inspection of truck must be carried out before departure • Safety precautions must be clearly displayed on the tanker • Vehicular emission testing should be carried out on regular basis by 3rd party • Inspect the general parking area to reduce the hazards • Position the truck correctly and chock the wheels while parking the truck • Inspect the truck regularly to check the damage • Strick speed limit for the movement of vehicles should be regulated • Avoid unnecessary movement of the vehicles • Enforce traffic rules with true spirit • Implementation of traffic management plan • Strick speed limits will be enforced to reduce the chances of the incidents • Transport through densely populated area should be avoided • Control speed and operation of construction vehicles 	Regular inspection and maintenance of the vehicles should be done by the Proponent
Gas Leakage	NA	-2p	<ul style="list-style-type: none"> • Detect and locate any activity which may interact with the pipeline including unauthorized third party activity • Locate any local changes or ground conditions which may threaten the pipeline including areas of ground erosion, movement or subsidence • Regular inspection of the pipelines to detect the leakages • The storage tanks will be calibrated in order to avoid any unfortunate incident • Leakage detection test will be performed on the regular basis by the certified company • Skilled workers will be hired for the maintenance and operation exercise 	Regular inspection and maintenance as stated in the standards

HSE	-1t	-2p	<ul style="list-style-type: none"> • Training regarding HSE should be given on the regular basis • Workers will be given PPEs such as; helmets, mask, ear-plugs/muffs, safety boots, etc. • It should be strictly enforced to wear PPEs while working • Workers will be trained on the regular basis regarding personal safety and disaster management • Incidents should be reported directly to the concerned authority 	HSE Manager will check the HSE of the workers on the daily basis
First Aid	NA	-1p	<ul style="list-style-type: none"> • First aid box will be available at the site • First aid training will be given to the employees on the regular basis • Numbers of all the concerned/authorized persons that will be contacted in the case of emergency will be displayed on-site 	Monitoring will be done on the quarterly basis by the Proponent

Fire Hazards	NA	-2p	<ul style="list-style-type: none"> • Firefighting equipment will include; fire-extinguishers, smoke detection system, fire pumps, fire-fighting hoses, firefighting nozzles, fire and water monitors, fire trolleys, hooters, hydrants and sand buckets will be installed inside the facility • The NSFP-15 and 20 standards will be followed for the fire-fighting at plant site • All the equipment will be placed at strategic locations where the risk of out-burst of the fire is high • Smoking will not be permitted in the vicinity of the plant • A proper firefighting plan will be implemented during the constructional and operational phases • Emergency preparedness and firefighting training and drills will be given to the employees on the regular basis • Regular site inspection will be done to eliminate all the chances of the hazards • Checking and maintenance of the fire-fighting equipment will be carried out on the regular basis • Emergency evacuation routes and the fire extinguishers strategic placement is shown on the layout plan is attached at Annex-X of this EIA Report. 	Site inspection, trainings and drills will be carried out on the daily basis by the HSE Manager
Employment	+1p	+1p	<ul style="list-style-type: none"> • During this phase, skilled and unskilled labour will be required. • Employment opportunities for the un-skilled workers will therefore increase which will enhance the positive benefits for the local people who are in dire need of income for sustenance. • Indirect opportunities for employment will arise from the provision of services to the construction teams, such as sale of raw-material such as cement, bricks, sand etc., as well as food and beverages for the labour and after completion of construction phase serve as a permanent business opportunity. 	Monitoring not required

Aesthetic	-1t	+2p	<ul style="list-style-type: none"> • Debris and construction material waste will be removed from the site at the end of the construction phase • The aesthetics of the area will be improved significantly by planting trees at the boundaries, planting flowering plants in the green zones and trees could be planted as the compensation of the deforestation 	Visual inspection on the daily basis
Energy Consumption	NA	-1t	<ul style="list-style-type: none"> • Energy efficient equipment and appliances should be installed in order to conserve energy • The design of the building can be green having green-roofs to conserve the energy requirements of heating and cooling • Renewable energy options can be considered for the production of electricity such as solar system as installed for lightening • Avoid using conventional appliance and equipment, that would save the significant amount of energy 	Visual check on the daily basis by the Proponent
Security and Site Access	-1t	-1p	<ul style="list-style-type: none"> • A boundary walls of height not more than 10m from the ground will be constructed • Ensure general safety and security all the time by providing day and night security guards and adequate lighting within and around the facility • No person will be allowed to enter the facility without prior permission from the concerned authority • The CNIC of all the visitors should be noted at the entrance along with their arrival and departure 	Regular visual inspection by the concerned person
<p> Legends: 1= Low; 2= Medium; 3= High; 4= Extremely High; NA= Not Applicable; t= Temporary; p= Permanent; app= Applicable; 0= Negligible All adverse environmental impacts except natural calamities are manageable easily by implementing EMMP </p>				

8.6 Equipment Maintenance Details

The proposed project is the installation of the LPG-Air Mix Plant; plant machinery will be maintained by the proponent according to the design and as suggested by the contractor. No equipment will be kept on-site that need maintenance except fire-fighting equipment that would be installed in the plant vicinity and will be maintained on the regular basis. Only fire safety equipment such as; fire-extinguishers, smoke detection system, fire pumps, fire-fighting hoses, firefighting nozzles, fire and water monitors, fire trolleys, hooters and hydrants which will need regular maintenance and check in order to eliminate hazards of associated risk for the gas leakage and out-burst of fire. The NSFP-15 and 20 standards will be followed for the fire-fighting at plant site. Following are the maintenance details for the portable fire extinguisher:

Table 27: Maintenance Plan for Portable Fire Extinguisher

Task	Weekly	Monthly	Semi-Annually	Annually
Visual Inspection	✓			
Testing and Inspection		✓		
Check for Leakage		✓		
Recharging				✓
Fire Mains and Nozzles		✓		
Containers/Cylinders			✓	
Control and Section Valves			✓	

8.7 Environmental Budget

The environmental budget consists of the cost of plantation, monitoring (noise, air and water), maintenance of fire-fighting equipment and reporting. During the construction phase few herb species will be removed from the site and after completion of the construction phase the area will be re-vegetated. The monitoring of the impacts associated with the proposed project construction and operation will be carried out as and when required. The environmental budget will also include the cost of the solid waste management, water management through water conservation campaign and installation of the water efficient toilets and taps, energy conservation by the installation of the energy saver bulbs and lights. The environmental budget for the installation of the LPG-Air Mix Plant is considered **PKR 4.60 million.**

The installation of the LPG-Air Mix Plant is itself energy efficient technique for the production of the energy. The installation of the proposed project will act as environment enhancement measure by reducing the rate of deforestation and air pollution.

9. CONCLUSION AND RECOMMENDATIONS

The findings of EIA Report showed that the provision of SNG at household level in Gilgit Baltistan through the installation of the LPG-Air Mix Plant will have insignificant negative impacts on the environment during the installation and its operational phases. Moreover, the anticipated impacts can be further reduced by adopting relative mitigation measures as proposed in the Chapter 6 of this EIA Report. In addition, the proposed project will have significant favourable environmental and social impacts specifically on the nearby community. As the rate of the deforestation will be reduced significantly with immediate improvement of the air quality.

The impacts of the proposed project were assessed by frequent site visits, studying related projects and by review the documents. Generally, the proposed project is planned to follow efficient environmental management systems. Specific environmental and social benefits have been mentioned below which depend on the proper application of mitigation measures as suggested in EMMP and by adopting best engineering practices.

9.1 Merits and Demerits

The major positive impacts of the proposed project include; increased job opportunities, environmental enhancement through provision of alternative fuel of the wood at the subsidized rates and tree plantation in the proximity of the proposed project. The project will raise the income of the persons directly associated with project construction and operation as well as it will also improve the socioeconomic status of the area mainly due to the provision of the basic amenity. The project is expected to stimulate the local economies around the project area and will provide the jobs to the people who are directly linked with the project development activities and living below the poverty line.

In general, potential adverse environmental effects resulting from the proposed project will be temporary, short-term and of low magnitude. Through the application of standards, recommended mitigation measures, adhering to applicable permit conditions and regulations, any adverse effects can be effectively minimized for all phases. The project is not likely to have significant adverse environmental impacts. Negligible negative impacts that likely occur during project implementation includes; air pollution due to movements of vehicles, removal of trees from the project area, potential impact of the local water resources and social impacts may affect the locals residing in the nearby community can be foreseen. Mitigation measures

will be implemented to minimize environmental impacts, though they are still negligible. There are certain mitigations suggested to cater for the aforesaid issues.

9.2 Recommendations

Intensity and severity of impacts, occurred due to the construction and operation of the proposed project varies with changes in the nature and magnitude of the project as well as depends upon the baseline environmental conditions of the area. In general, potential adverse environmental effects resulting from the proposed project will be temporary, short-term and of very low magnitude. Following recommendations measures are suggested:

- The adverse environmental impacts can be reduced significantly by adopting best management and monitoring practices as well as by implementing EMMP with true spirit
- The supply of the SNG should be continued around the year
- It is advised to regularly maintain the fire-fighting equipment and drills for the emergency response should be carried out properly
- Over consumption of SNG should be avoided by organizing awareness campaigns on grass root level
- For the heating of water, solar-energy based heating system should be installed at grass-root level
- It is recommended to construct the green allied building instead of conventional allied building, having green-roofs, insulation as well as maximum utilization of the sunlight
- It is recommended that the Proponent should obtain an Environmental Approval (NOC) from the GB-EPA before proceeding further into the construction activities