Environmental and Social Impact Assessment (ESIA) of Bayat Independent Power Project (Bayat IPP)

Contractor

BAYAT ENERGY

Prepared by

GreenTech CONSTRUCTION & ENGINEERING

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Abbreviation

°C	Degrees Centigrade
ANDS	Afghanistan National Development Strategy
ARAZI	Afghanistan Land Authority
BPC	Bayat Power Company
Ca	Calcium
CCCT	Combined Cycle Combustion Turbine
CHP	Combined Heat and Power
CLOs	Community Liaison Officer(s)
CNG	Compressed Natural Gas
CO	Carbon Monoxide
COx	Oxides of Carbon
Cr	Chromium
Cu	Copper
DABS	Da Afghanistan Breshna Sherkat
dB	Decibel
DNA	Deoxyribonucleic Acid
DO	Dissolved Oxygen
EA	Environmental Assessment
EC	Electrical Conductivity
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
Fe	Iron
GHGs	Greenhouse Gases
GIIP	Good International Industry Practice
GIRoA	Government of the Islamic Republic of Afghanistan
GRC	Grievance Redress Committee
H&S	Health and Safety
H2S	Hydrogen Sulfide
HHV	Higher Heating Value
HIV	Human Immunodeficiency Virus
HV	High Voltage
Hz	Hertz
ICE	Inter-Ministerial Commission of Energy
IFC	International Finance Corporation
IPP	Independent Power Producer
km	Kilometer
LEL	Lower Explosive Limit

m	Mete
m/s	Meter per Second
MAIL	Ministry of Agriculture, Irrigation and Livestock
MCM	Million Cube Meters
mg/l	Milligram Per Liter
mg/m3	Milligram per Meter Cube
mm	Millimeter
MoEW	Ministry of Energy and Water
MoMP	Ministry of Mines and Petroleum
mph	Mile per hour
MW	Megawatts
NEPA	National Environmental Protection Agency
NEPS	North East Power System
NOx	Nitrogen Oxides
O&M	Operations and Maintenance
O3	Ozone
OHS	Occupational Health and Safety
OP	Operational Policy
OSHA	Occupational Safety and Health Administration
PAHs	Poly Aromatic Hydrocarbons
PM	Particulate Matter
PPE	Personal Protective Equipment
PPM	Parts per Million
PS	Performance Standards
RAMP	Risk Assessment Management Plan
RICE	Reciprocating Internal Combustion Engine
ROW	Right of Way
SCCT	Simple Cycle Combustion Turbine
SDS	Safety Data Sheets
SEP	Stakeholder Engagement Plan
SEPS	South East Power System
SOx	Oxides of Sulphur
SPCCP	Spill Prevention, Control and Countermeasure Plan
ST	Steam Turbine
TA	Traffic Assessment
TCMP	Traffic Control Management Plan
TCMP	Traffic Control Management Plan
TSS	Total Suspended Solids
UN	United Nations
USD	United State Dollar
VOC	Volatile Organic Compounds
WB	World Bank
WCS	Wildlife Conservation Society
WHO	World Health Organization
WTN	Waste Transfer Note
Zn	Zinc

PART I

Executive Summary – Non-Technical Summary

1 Introduction

Based on Afghanistan average annual growth rate in gross electricity demand country-wide, the importance of developing domestic energy resources is ever increasing. The proposed project represents such an opportunity and would be one of the first privately financed gas fired power plants in the country. The 40 MW Bayat Independent Power Producer Project (the “Project” or “Bayat IPP”) is proposed as a greenfield development located near Sheberghan province.

The Project would utilize natural gas to be supplied by Afghanistan’s Ministry of Mines and petroleum/Afghan Gas Enterprise from existing gas field nearby in Sheberghan in Jawzjan Province. The Project would generate electricity that would be dispatched to Da Afghanistan Breshna Sherkat, the Afghan national utility entity, under a Power Purchase Agreement over 20 years. The purpose of this Environmental and Social Impact Assessment (ESIA) is to assess the environmental and social risks and recommend whether these risks can be effectively mitigated to acceptable levels.

2 Policy, Leal and Administrative Framework

Planning of the Bayat IPP is being conducted with cooperation and collaboration from the Afghanistan National Environmental Protection Agency (NEPA). NEPA is an independent agency that was created under the responsibility of the President’s Office in May 2005 in order to legitimize the role of environmental management within the Government of the Islamic Republic of Afghanistan (GIRoA). Therefore, this EIA is reflective of the ESIA laws and policies of NEPA as well as the directives and regulations of other governing line ministries and agencies and is aligned with the NEPA policy and guidelines for environmental and social impact assessment. Three national-level documents have been promulgated by the GIRoA with regard to environmental and social impact assessment:

- National Environmental Impact Assessment Policy, November 2007;
- Environmental Impact Assessment Regulations (Official Gazette No. 939, Mar. 10, 2008); and,

- Administrative Guidelines for the Preparation of Environmental Impact Assessments (June 2008).

This ESIA has been generated in compliance with these directives, as well as, through direct cooperation and communication with NEPA authorities. This ESIA also considers the policies, guidelines and standards of the IFC Performance Standards on Environmental and Social Sustainability (2012) and World Bank Performance Standards for Projects Supported by the Private Sector ("WBH Performance Standards") for application to Bank support for project (or components thereof) that are designed, owned, constructed and/or operated by a Private Entity, specifically, the World Bank Group Performance Standards for Private Sector Activities (OP 4.03). According to the terms of reference for this ESIA, the applicable IFC/World Bank Group Performance Standards and relevant part of the IFC Environmental, Health, and Safety (EHS) Guidelines, are incorporated into the ESMP.

3 Project Description

The Bayat IPP is an independent power producer scheme wherein the IPP is the Bayat Power Company, a subsidiary of Bayat Group of Companies. The Bayat Group of Companies has more than a decade of experience building highly profitable enterprises in Afghanistan in telecommunications, media, industrial, infrastructure, security, and logistics sectors. The site proposed by GIRoA for development of the Project is located on government land owned by the Ministry of Energy and Water (MoEW) that will be transferred to the Bayat Power Company through ARAZI, the national land authority, under a renewable lease. Site selection was based on regional and national government energy planning that considers proximity to domestic natural gas reserves, current and future foreign Power Purchase Agreements and high voltage (HV) electricity transmission system assets (figure 1).

The site is located in Yatimtaq area approximately 20 km east of Sheberghan city, Capital city of Jowzjan Province. The nearest residential developments are located greater than 15km. This Project is one part of the larger effort toward development of an interconnected national transmission grid that utilizes available national energy resources

and is synchronized with key import transmission lines to more effectively serve the population and domestic development goals.

Several projects are underway on the upstream and downstream side of the Project that will secure consistent gas supply and electricity evacuation for the Bayat IPP. The Bayat IPP will be integrated with these ongoing projects being developed by the public sector. The upstream and downstream projects are being directed by the MoMP/Afghan Gas Enterprise and DABS, with environmental and social performance under the environmental jurisdiction of the Afghanistan National Environmental Protection Agency. The Work being conducted on gas supply wells and gas processing plants in Sheberghan, gas transmission pipelines, electricity transmission lines and substations are occurring independently of the Bayat IPP with a view on the expansion and development of the nation's energy infrastructure.

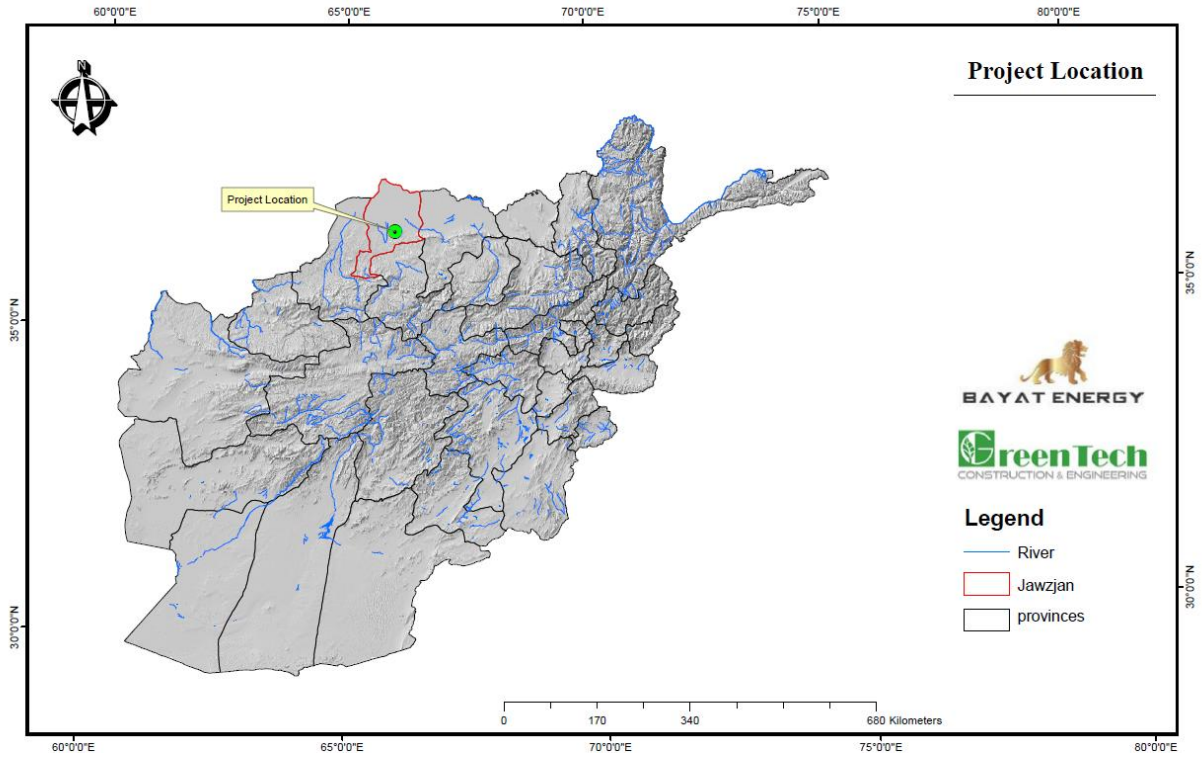


Figure 1 Project Location

4 Environmental and Social Condition

The environmental baseline of the proposed Project and its surroundings has been established as part of this ESIA through consultations with relevant stakeholders, a desktop review of available literature, limited environmental testing and analysis, and site walkovers.

Geography and Climate. The northern plans region is considered subtropical and semi-desert and the study area's climate is strongly influenced by topography Jowzjan has. Climate change projections for Afghanistan show regional differences. However, overall indicate a strong increase in mean annual temperature (higher than mean global temperature projections), with more rapid warming in the spring/summer seasons in the north of Afghanistan. Precipitation in the north is expected to decrease in the spring/summer and increase in the autumn/winter with overall long-term declines in average mean rainfall.

Land. Due to the complex geological history of the Hindu Kush-Himalaya mountain system, both the geology and soils across the northern region are diverse and varied. In general, the mountains forming the northern foothills consist of limestone with inter-bedded marl, conglomerates, and sandstone of Upper Cretaceous/Paleocene origin, as well as later Paleocene and Miocene sedimentary and volcanic rocks. The northern plain consists primarily of thick Quaternary alluvial deposits containing clay, silt, sand, gravel and conglomerate. In general, gravelly subsurface soils along the foothills transition towards finer graded soils moving north, however interbedded sand, clay and gravel can be encountered to depths of 150m even towards the central northern plain.

Water. The only watershed in the area is Sar-e-Pul which drains water from Kohistanat district and Sancharak district of Sar-e-Pul province. Ab-e-Syah (also called Shorab) takes its source from four parallel valleys from the Sancharak district. These four rivers meet in the region of Sabz-l Khan in SozmaQala district. The Sar-e-Pul river originates from a number of complex valley systems in Kohistanat district. The Sar-e-Pul and Ab-I Sya rivers meet 10 km south of Sar-e-Pul town.

Air. According to the UN Environment Programmed working in Afghanistan, dust and vehicle emissions in the country's urban areas are the main factors negatively affecting air quality. At the site of the Project, there is no permanent monitoring station, nor in the wider Project areas. The National Environmental Protection Agency (NEPA) is the authority to determine the permissible limits of air pollution and while clean air protections are inherent in the Environment Law and some clean air policy is under formulation, at this time, national ambient air quality standards are substantively based on World Health Organization guidelines and no specific industry emissions regulations have been formulated.

Socioeconomics. According to Central Statistics Organization, Jowzjan Province has an estimate population of 580,00 which around %78 of population are rural. People dialogue in Uzbaki, Dari, Pashto and Turkmani with Uzbaki being the dominant language spoken in the province. People of the Sheberghan city live a simple life. Unemployment, lack of potable water, basic health and education facilities, electricity and roads are the major issues for them. Because the mode of agriculture is irrigation, the land available for cultivation by these communities is limited by water supply, which in turn is determined by access to irrigation infrastructure, resources to access suitable ground water, and/or harvesting precipitation.

5 Alternative Analysis

An alternative analysis was conducted to address other means of completing the proposed Project. The technical engineering and economic feasibility, together with the environmental, health and safety concerns, flexibility for loading operations and expansion, regulatory and stakeholder requirements, cost effectiveness and ease of operation and maintenance of the system through its design life are important considerations in the overall assessment of alternatives.

A variety of alternatives were proposed and have been analyzed for the power plant Project development. Research and analysis of the natural gas resources of Afghanistan including refurbishment and expansion of the Sheberghan gas fields has been ongoing and is well documented. For the current analysis, such resources provide value and are cited in the alternatives analysis where relevant.

With regard to fuel-type and site location alternatives, evaluation is based on the planning studies and decision-making processes that have occurred to date. For example, numerous studies have pointed out that natural gas derived electricity is the likeliest candidate for large-scale addition of baseload domestic generation in the near term. As a result, several international agencies have conducted feasibility and scoping studies of the northern gas reserves and have evaluated opportunities for gas development projects. With regard to siting, the preferred option is proposed at the national level by parties engaged in the Power Purchase Agreement based on environmental, technical, logistical and security factors.

For the assessment of technology alternatives, literature review and study of the baseline conditions were used to compare steam turbine, simple cycle combustion turbine, combined cycle combustion turbine and reciprocating internal combustion engine (including dual fuel options). The environmental evaluation determined that regardless of the specific technology selected the proposed power plant will use Simple Cycle Combustion Turbine (SCCT) to minimize the generation of NOx and CO emissions to meet IFC/World Bank Group air quality standards. They can be quickly installed at a lower cost than other types of power plants and units require less space, have lower installation and maintenance cost and have simple lubrication and ignition systems. Their performance is also optimized for hot climates. Simple cycle Combustion Turbine is the most suitable plants that can be installed at selected load centers with fewer auxiliaries. They can be brought on load quickly and surely.

6 Environmental and Social Impact Assessment

The potentially significant impact of the project activities during construction and operation were evaluated utilizing Good International Industry Practice (GIIP) for environmental and social impact assessment. Implementation of the risk assessment framework resulted in an assignment of impact significance that was used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact (critical, high, medium, low or negligible).

Following assessment, the significance of environmental and social impacts were all ranked as either low or medium. There is a combination of factors that contribute to the majority of risks being ranked as low following the evaluation; the most important including:

- Good project siting – over 10 km from residential communities. Within an industrial land use area; and situated on non-agriculturally productive land;
- Site is not in close proximity to ecological, historical, religious or culturally sensitive areas
- Limited biodiversity impact due to inherent characteristics of native flora and fauna;
- On a relative scale, very minimal air, liquid, solid, and hazardous waste emissions would result from the preferred technology; and,
- Mitigation and management measures are well understood and achievable.

The potential impact with a significance ranking of medium include:

Construction Phase:

Air quality impacts

- Human health impacts from combustion emissions and dust
- Localized ambient air quality degradation

Occupational Health and Safety Impact

- Construction site health and safety risks resulting in injury or death
- Construction site health and safety risks resulting in impairment of long-term health impacts.

Operation Phase:

Solid and Hazardous Waste Impacts

- Natural resource impact at municipal disposal site from disposition of solid or hazardous wastes

Occupational Health and Safety Impact

- Operation phase health and safety risks resulting in injury or death.

- Operation phase site health and safety risks resulting in impairment or long-term health impacts.

Based on the environmental and social impact assessment, the effects of cumulative impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive cumulative impacts). The cumulative effects on physio chemical factors of wastewater, solid and hazardous waste and water resources is also likely to be very minimal.

7 Mitigation and Management Measures

Mitigation and management measure are recommended for all of the identified potential impacts (even those characterized as low significance) in order to provide the greatest environmental and social protections. Mitigation measures are outlined separately for construction and operation phases and include standard mitigation measures for the following environmental aspects:

- Water Quality and General Environmental Impacts
- Air Quality
- Noise
- Landscape and Visual
- Flora and Fauna
- Transportation
- Public Health and Safety
- Occupational Health and Safety
- Cumulative Impacts

In addition, the mitigation measures consider the special Occupational Health and Safety hazards cited as particular concern in the IFC Thermal Power Plant Guidelines that include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards;
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action as needed.

8 Environmental and Social Management Plan (ESMP)

The ESMP has been prepared in accordance with the environmental and social policies and commitments of Bayat Power Company and in compliance with the legal and regulatory requirements of the Government of the Islamic Republic of Afghanistan. The primary objective of the environmental management and monitoring is to record both environmental and social impacts resulting from the project activities and to ensure implementation of the mitigation measures identified earlier in order to reduce adverse impact and enhance positive impact from specific project activities. It is also meant to address any unexpected or unforeseen environmental and social impacts that may arise during construction and operation phases of the project. The ESMP enforces the IFC Performance Standards (PS) and is compatible with the World Bank Operational Policy 4.03.

The most important factor in successful implementation of the ESMP is the management structure. The ESMP proposes that the Project Proponent/Owner (Bayat Power Company) create an ESMP management unit responsible for assuring that the actions and measures described in the ESMP are incorporated into the contracts and plans of all on-site contractors and operators, and that the ESMP is fully implemented throughout the life of the project. This unit will conduct life-cycle monitoring of the contractors/operators through a process of thorough supervision and field testing, as well as, engaging in stakeholder engagement, grievance redress and Project communications with local and national regulatory agencies and international Financing Institutions.

The ESMP is separated into two plans for Construction Phase (CESMP) and Operation Phase (OESMP) and recognizes the importance of including the necessary management oversight over multi-employer worksites. In addition, the ESMP provides guidance on good OHS practice and details a plan for effective monitoring and reporting throughout the life of the project.

9 Environmental and Social Management System (ESMS)

The Bayat Power Company (BPC) is a newly formed organization out of Bayat Group of Companies. The BPC will be organized in a manner that ensures it will meet the compliance, legal and regulatory requirements of the Government of Islamic Republic of Afghanistan and the IFC PSs. In accordance with IFC PS1, the BPC has established an Environmental and Social Management System (ESMS) that includes policies, procedures and personnel responsible for implementing the system. More detail of ESMS is provided in Sec. 8 , Part II of this report.

10 Stakeholder Engagement

The Stakeholder Engagement Plan (SEP) initiated by the ESIA team was conducted in order to establish communication with direct and indirect stakeholders as well as the greater community and social network that surrounds the proposed Project. This stakeholder outreach and involvement will increase the probability of successful implementation of the ESMP and provide the affected community with a clear and achievable means of voicing concerns and grievances throughout the life of the Project. The dialogue approach detailed in the SEP has been prepared in line with national legislation and country norms as well as IFC/World Bank Standards. For the purposes of this SEP, stakeholders are defined as:

- Parties which are or can be influenced by the Project (positively and/or negatively).
- Parties showing their interest in the Project
- Parties which are able to influence the Project

The list of stakeholders and the plan of engagement with various groups will be issued and revised on a regular basis to ensure that the Project Proponent/Owner is aware of those who are interested and/or concerned with the Project and, consequently, should be involved in the engagement process. Stakeholder engagement will be carried out throughout the Project in stages at key phases in order to disseminate new information on Project details and update stakeholders of timelines and upcoming activities. The initial outreach conducted during preparation of this ESIA is considered Pre-Project?

Preliminary and the planned subsequent stages for outreach to all of the identified stakeholder groups are as follows:

- Stage 1: Pre-Project/Preliminary
- Stage 2: Project Approval/Pre-Construction
- Stage 3: Construction Phase
- Stage 4: Pre-Start Up Operation
- Stage 5: Operation Phase

As part of the SEP, a Grievance Mechanism procedure was established to receive grievances and ensure adequate response to all complaints and appeals by stakeholders including the local population affected by the Project. During the Pre-Project/Preliminary SEP stage, the dialogue included establishing a Grievance Redress Committee (GRC) for public stakeholder groups. The Grievance Mechanism procedures specify the protocols and the management structure for handling complaints and responses.

PART II

Environmental and Social Impact Assessment

Contents

1 INTRODUCTION

1.1 Background and Brief Description

Development of a country largely depends upon its proper electricity service, as it influences the other sectors like industry, education, agriculture and so on. The power sector is considered one of the most vital sectors in Afghanistan. According to the country's Power Sector Master Plan[1] between 2011 and 2032 the average annual growth rate in gross electricity demand country-wide will be 8.7%, with the residential sector being the driving force behind this growth. In light of these projections the Afghanistan Ministry of Mines and Petroleum (MoMP) seeks to develop locally generated power at better prices with more reliability, in part to decrease dependence on imported power and at once to develop the proven energy resources inside the country while spurring economic growth and employment opportunities. Based on assessments by the MoMP and the US Geological Survey two geological formations containing natural gas in northern Afghanistan are estimated at 444bn m^3 of undiscovered recoverable gas aside from the existing identified reserves. The Power Sector Master Plan reports that, if developed, these resources can support multiple regional natural gas fired power plants.[1]

The purpose of this Environmental and Social Impact Assessment (ESIA) is to further evaluate one such development opportunity that is the Bayat 40 MW gas-to-power plant (the "Project" or "Bayat IPP"), a Greenfield development near Shebeghan under an independent power producer scheme. This Project will utilize natural gas to be supplied by the MoMP/Afghan Gas Enterprise from existing gas fields in Sheberghan to generate electricity, which would be dispatched to Da Afghanistan Breshna Sherkat (DABS), the Afghan national utility entity. The IPP owner is the Bayat Power Company, part of the Bayat Group (www.bayat-group.com), which has entered into an Implementation

[1] Islamic Republic of Afghanistan: Power Sector Master Plan (May 2013). Prepared by FICHTNER GmbH & Co. KG, Stuttgart, Germany.

Agreement with the Islamic Republic of Afghanistan (GIRoA) and a Power Purchase Agreement with DABS.

Phase 1 of the Project, using the most advanced and highly efficient equipment available worldwide, with approximate total investment of US$42 million, will provide 40 MW within 4 months. Phase 1 will continue as long as the GIRoA is interested in purchasing electricity from, and selling gas to, Bayat Power. The PPA for Phase 1 is 5 years with a mutual option to extend. Bayat Power 1 will bring domestically generated electricity to Afghan consumers, using national natural gas supplies to fire gas to power generation. Bayat Power 1 is located near the gas fields Yatimaq or Jaruduk in Sheberghan.

1.2 Goal and Objectives

This report has been designed to satisfy the goals and objectives of good international industry practice for environmental and social impact assessment. Specifically, to secure engagement of the World Bank Group, this report addresses the IFC Performance Standards on Environmental and Social Sustainability (2012) and World Bank Performance Standards for Projects Supported by the Private Sector ("WB Performance Standards") for application to Bank support for projects (or components thereof) that are designed, owned, constructed and/or operated by a Private Entity (as defined below), in lieu of the World Bank's safeguard policies.

Underscoring PS1 on *Assessment and Management of Environmental and Social Risks and Impacts* this ESIA aims to provide the foundation for achieving the following core objectives:

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.

- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

In addition, under the terms of reference for this Project, the ESIA process undertaken aims to verify applicable laws and regulations of the Government of the Islamic Republic of Afghanistan (GIRoA) through government stakeholder outreach and review of current statutory policy. Under the joint authority of the IFC/World Bank and the Afghanistan National Environmental Protection Agency (NEPA), the ESIA process has set out to effectively:

- Develop an Environmental and Social Management Plan (ESMP) containing recommended mitigation measures covering each main phase of the project inclusive of the project's area of influence.
- Document stakeholder engagement activities undertaken by the sponsors and ESIA consultants in accordance with IFC Performance Standards, World Bank Operation Manual OP 4.03, and Afghanistan environmental and social impact assessment policies, with outcomes recorded in a project Stakeholder Engagement Plan.

1.3 Approach and Methods

The implementation strategy has primarily been to reveal environmental and social characteristics of the project site and lay the framework for the identification and implementation of the ESMP and the Stakeholder Engagement Plan. A project screening and scoping exercise was undertaken to identify the parameters of the physio-chemical,

biological and socioeconomic environment for the study area. The study included relevant issues and aspects of the environmental and social baseline identified through desk research, field reconnaissance and through primary and secondary stakeholder engagement. The assessment of impacts involved the following:

- The prediction and assessment of impacts from the site preparation, construction, operation and maintenance phases of the project;
- Risk evaluation covering major hazards identification, risk reduction measures and risk management recommendations;
- Classification of impacts as negligible, low, medium, high or critical based on the use of Good International Industry Practice (GIIP) criteria for rating of impacts; and,
- Recommendation of control measures that are required as part of the project design and further measures for avoiding, minimizing and mitigating predicted impacts where necessary or appropriate.

The assessment and evaluation of risk resulted in an assignment of impact significance that was used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact. The significance of an impact was determined by the:

- Consequence of the activity,
- Likelihood of occurrence of the activity; and,
- Calculating the product of these two parameters.

Consequence and likelihood of impacts resulting from planned activities are presented in Section 6. Changes in the planned activities for the proposed Project would affect both the impact assessment and also the planned mitigation activities.

1.4 Summary of Key Impacts

The list of positive outcomes (benefits) anticipated through realization of the proposed project are as follows:

- Provide reliable and consistent power supply with the aim of better satisfying the current and projected regional and national energy demand;
- Generate an autonomous income source through taxes and increased revenue/derivations to the Local and National Governments;
- Promote indigenous Afghanistan investor-led independent power production that shifts the burden of investment capital for power generation from the public to the private sector;
- Produce a stable power supply that stimulates the development of domestic agricultural and industrial based small and medium scale enterprises and promotes further secondary social development;
- Provide direct and indirect employment opportunities on the local, regional and national scale that includes the training and capacity development of energy sector professionals on the ground, management and regulatory oversight levels; and,
- Reduce environmental emissions associated with privately owned diesel generators through development of modern cleaner burning technologies that utilize locally available fuels and enable broader electricity transmission.

2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 General

This ESIA considers the policies, guidelines and standards of the IFC Performance Standards on Social and Environmental Sustainability and Industry Sector Guidelines.

The ESIA is also reflective of the Islamic Republic of Afghanistan (GIRoA) regulatory authorities and governing line ministries and agencies, and is aligned with the NEPA policy and guidelines for environmental and social impact assessment.

2.2 Afghanistan Environmental Laws and Regulations

The overarching Afghan Ministry of Economy's National Development Strategy (ANDS) 2008-2013, considers environment as a cross-cutting and foundational aspect of development. Accordingly, the goals and priorities for the living environment are described as:

> The ANDS strategic vision is to improve the quality of life of the people of Afghanistan through conservation of the nation's resources and protection of the environment. The main goals are to: (i) secure a clean and healthy environment; (ii) attain sustainable economic and social development while protecting the natural resource base and the environment of the country; and (iii) ensure effective management of the country's environment through participation of all stakeholders. Strengthening EIA awareness and the institutional capacity of NEPA and the line ministries will be given priority. Short term and long-term outcomes linked to the thematic objectives (e.g. conservation of biodiversity, abatement of pollution, environmental awareness, etc.) will also be prioritized based on assessment of the expected environmental, social, and health impacts and the institutional, economic and political constraints (p. 156).[2]

Planning and implementation of the Bayat IPP is being conducted with cooperation and collaboration from the Afghanistan National Environmental Protection Agency (NEPA). NEPA is an independent agency that was created under the responsibility of the

[2] Islamic Republic of Afghanistan; Afghanistan National Development Strategy; A Strategy for Security, Governance, Rule of Law, Human Rights, Social-Economic Growth and Poverty Reduction (2008-2013), Volume 1.

President's Office in May 2005 in order to legitimize the role of environmental management within GIRoA. Therefore, all existing NEPA EIA policy will be adhered to by the project proponent and the agency will be required to approve and certify the project prior to commencement of any activities.

2.2.1 Environmental Law (2007)

Through the work of NEPA, the Afghan Parliament ratified the nation's first overarching and legally binding environmental regulation in 2007; the Environment Law. The law is based on international standards of environmental protection and lays the framework for environmental management in Afghanistan. The Environment Law is the main source of environmental law in Afghanistan. The law provides the basic principles of environmental protection and its structure is as follows:

- **Chapter One**: General Provisions
- **Chapter Two**: Functions and Powers
- **Chapter Three**: Management of Activities Affecting the Environment
- **Chapter Four**: Integrated Pollution Control
- **Chapter Five**: Environmental Considerations Relevant to Water Resource Conservation and Management
- **Chapter Six**: Biodiversity and Natural Resource Conservation and Management
- **Chapter Seven**: Environmental Information, Education and Training, and Research
- **Chapter Eight**: Compliance and Enforcement
- **Chapter Nine**: Miscellaneous Orders

Regarding the proposed Project, Chapter Three, Articles 19 and 21 require project proponents to ensure adequate provisions for public participation including dissemination of project information and opportunities for affected persons to voice concerns; and, that project proponents implement international best environmental impact assessment practices in coordination with NEPA. Chapter Four, Article 28 states that NEPA shall grant

pollution control licenses, with or without conditions, provided the discharge will not have significant adverse effects or the effects have been adequately mitigated. Subsequently, GIRoA has also promulgated laws for the protection of water, procedures regarding protected areas, etc., that were published for protecting the key elements of the environment.

In terms of thee categorization of the development projects in Afghanistan, projects are divided into two categories:

- Category 1: a proposed project is classified Category 1 if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented, and affects an area broader than the sites or facilities subject to physical works.
- Category 2: a project is classified as Category 2 if its potential adverse environmental impacts on human populations or environmentally sensitive areas (e.g. wetlands, forests, grasslands and other natural habitats) are less adverse than those of Category 1 projects. These impacts are site specific, and few are irreversible.

2.2.2 National Environmental Impact Assessment Statutes

Two national-level documents have been promulgated by the GIRoA with regard to environmental and social impact assessment:

ESIA Regulation (2017)

The Environmental and Social Impact Assessment regulation follows on from the Environment Law and sets forth a policy vision, principles, strategy, and process for environmental and social assessment in Afghanistan. The emphasis is on ensuring that projects with potentially significant impacts are identified to the national environmental regulator, NEPA, and follow adequate due diligence procedures. The document provides a range of additional information on NEPA and environmental assessment in the Afghanistan context. The initial environmental and social assessment of projects/actives

reports contain the following points: to provide a forum for the people and authorities that they can share their views and concerns and include it in the initial environmental and social assessment report in order to reduce the negative effects and increase its positive effects. The procedure of this environmental impact assessment should be complied. Furthermore, the initial environmental and social assessment report shall contain annexes, location maps, project areas and reliable documentation of the participation of the people and relevant local authorities.

Based on the ESIA Regulations, Schedule 1, Screening of Activities, the construction, upgrading, installation or development of thermal power generation facilities less than 200 MW are classified as a Category 2 activity wherein they have potentially significant adverse effects on human environments or environmentally sensitive areas, however, are less adverse than Category 1 activities and in most cases, impacts are site specific and are reversible.

Environmental and Social Impact Assessment Regulation (2017)

The Environmental and Social Impact Assessment Procedure has been prepared by the NEPA in February 2017. This procedure consists of two chapters and fourteen articles. The first chapter deals with the rationale, purpose, implementing agency, terminology and implementation of this regulation. The second chapter describes the stages of environmental and social impacts.

2.2.3 Regulation on Reduction and Prevention of Air Pollution

Based on regulation approved by the Afghanistan Council of Ministers, the National Environmental Protection Agency (NEPA) will determine the permissible limits of air pollution and broadcast it through public media. While clean air protections are inherent in the Environment Law and some clean air policy is under formulation, at this time, national ambient air quality standards are substantively based on World Health Organization guidelines and no specific industry emissions regulations have been identified.

2.2.4 National Waste Management Policy 2008

In 2005, the World Bank described the situation concerning functions and responsibilities for waste management as “being unclear”. This policy was prepared to manage the solid and develop an approach to waste management which is designed to implement the relevant clauses of the Environment Law. For this purpose, it is designed to clarify the role played by the National Environmental Protection Agency (NEPA) in implementing the Law. Apart from this introductory section, the policy document contains the following sections:

- Section 2: identifies the policy vision, principles and scope of this policy document.
- Section 3: presents the issue concerning clinical waste and background to the problem, the strategy to deal with it and the approach proposed by this policy.
- Section 4: presents the issue concerning hazardous waste and background to the problem, the strategy to deal with it and the approach proposed by this policy.
- Section 5: presents the issue concerning municipal solid waste and background to the problem, the strategy to deal with environmental considerations and the approach proposed by this policy.
- Section 6: looks at the next steps that are required to implement this policy over the specified time period.
- Section 7: identifies a total of 20 recommendations that cover the three main areas of this policy. Time frames are presented for each recommendation.

2.2.5 Labour Law

The Afghanistan’s Ministry of Justice enacted Labour Law (February 4, 2007) in accordance with Article 48 of the Afghanistan’s Constitution to regulate and explain the issues related to obligations, rights, allowances and social security of workers. The law contains 14 chapters that cover issues related to recruitment and service contracts, hours of work, right to rest and leave, salary, training, standards and guiding rules of work, work discipline, financial responsibilities of workers, occupational health and safety, women and youth, disputes and social security. The Bayat Power Company has committed to adopting the provisions of the Labour Law in its corporate management practices, with

full intentions of compliance and endorsement of this law in relation to the proposed Project. As matter of course, the provisions of the Labour Law will be referenced in all contract and subcontract documents.

2.2.6 Water Law of Afghanistan (Official Gazette No. 980, Apr. 26, 2009)

The purpose of the Water Law is to establish the conservation, equitable distribution, and efficient and sustainable use of water resources while strengthening the national economy and securing the rights of the water users. According to Article 21 a usage license or activity permit, including for government projects, is necessary and an application submission is mandatory in the following circumstances:

1. Surface and groundwater use for newly established development projects.
2. Disposal of wastewater into water resources.
3. Disposal of drainage water into water resources.
4. Use of water for commercial and industrial purposes.
5. Use of natural springs with mineral contents or hot springs for commercial purposes.
6. Digging and installation of shallow and deep wells for the commercial, agricultural, industrial and urban water supply purposes.
7. Construction of dams and any other structures for water impoundment, when the storage capacity exceeds 10,000 cubic meters.
8. Construction of structures that encroach the banks, beds, courses or protected rights-of-way of streams, wetlands, Karezes, and springs.

Based on Article 25, water usage for generating energy on micro and macro scales shall be based on a feasibility study and managed in accordance with the Water Law. Under Article 38, project proponents will require an application submittal and license or activity permit for any deep wells for agriculture, commercial, industrial and urban water supply purposes and supply wells may only be constructed after obtaining agreement of line ministries and issuance of permit/license by the Ministry of Mines (MoMP). While the MoMP holds jurisdiction over permits for deep groundwater wells, Article 39 states the

Ministry of Agriculture, Irrigation and Livestock (MAIL) and the Ministry of Energy and Water (MEW) shall anticipate the source of the required water for leases of barren or undeveloped land in such a way that the water right of the downstream communities is not harmed.

2.2.7 The Law on Land Acquisition (2017)

The law on Land Acquisition (2017) replaces The Law on Land Expropriation (2009) in providing the legal basis for land acquisition and compensation. Article 4 confirms Municipalities in urban areas and MUDL in rural areas as the enforcement authorities of the law. Article 5 sets out the range of public interest projects, including a range of infrastructure projects, for which an individual's property and assets may be expropriated; Article 6 reconfirms the types of properties (cultural and historic) and land (required for environmental protection) where expropriation is either prohibited or limited; Articles 9-12 set out the various responsibilities of the expropriating authority, affected person and evaluation committee; Articles 13-18 describe the different types of expropriation. The arrangements for transfer of Government Property in order to enable a Project are described in Articles 19-21. Articles 22-37 are devoted to a set of issues around the valuation of expropriated properties including the establishment of a Panel of Developing Bill of valuation of Expropriated Properties in every province (article 22), appraisal of compensation for different assets (articles 25-33); Articles 36 and 37 deal respectively with expropriation of property of an absent person and timing of compensation payments; Articles 38-41 set out the resettlement procedures and responsibilities of the Resettlement Committee. Various miscellaneous provisions related to land acquisition including assessment of property related conflicts and enforcement are set out in articles 42-53.

2.2.8 Land Management Law (2017)

This law replaces the *Law on Managing Land Affairs (2008)* and aims to create a legislated unified, reliable land management system This Law also aims to provide a standard system for land titling, land segregation _ subdividing land into a number of parcels of land and registration; prevent illegal land acquisition and distribution; access

to land to people; and conditions for appropriation of lands. Article 40 states that government lands are regulated by the Land Authority and Article 50 states that public welfare projects cannot be implemented on government lands without acquiring the agreement of the Land Authority.

2.2.9 Law on the Protection of historical and Cultural Properties

The GIRoA Law on the Protection of Historical and Cultural Properties (May 21, 2004) was adopted pursuant to Article 9 of the Constitution in order to protect historical and cultural properties. These properties are defined in the Law as “any product of mankind, moveable or immovable, which has an outstanding historical, scientific, artistic and cultural value and is at least one hundred years old”, with a caveat for the inclusion of, “objects which are less than one hundred years old, but which because of their scientific artistic and cultural value, should be recognized as worthy of being protected”. The Law goes on to provide instruction for landowners with regards to procedures for protection of such products and objects:

- Whenever municipalities, urban or residential building corporations, irrigation projects, and any other government or private corporations, in undertaking construction, expansion or improvement projects, come across historical and cultural properties, they are bound to stop their work and inform the Institute of Archaeology on the issue.
- In the case that construction work endangers an archaeological property or tis site, the project is suspended until a definitive solution is found for their protection.

2.2.10 Presidential Decree regarding Protection of Lands

The Presidential Decree regarding Protection of Agricultural Lands, Gardens, Amusement Parks and Other Green Areas (No. 4252, dated 19/7/1389) was designed to protect agricultural lands, gardens, parks and green areas from allocation or construction of residential development, buildings, industries, urban infrastructure or any other purpose that would damage or destroy the land and result in environmental pollution. Based on this mandate, NEPA shall have authority to monitor and supervise the execution

of the decree and will provide a biannual report for the Presidential Office. As the mandated agency, an EIA Certificate of Compliance issued by NEPA would be inclusive of necessary approvals required under this decree.

2.3 International Laws and Conventions

The Islamic Republic of Afghanistan ratified the UN Convention against Corruption on August 25, 2008, covering five areas including preventive measures, criminalization and law enforcement, international cooperation, asset recovery, and technical assistance and information exchange. The system of Afghanistan's legal hierarchy places international law conventions as the third source of law following the Constitution (ratified January 26, 2004) and sharia law, which no law can contrive.[3] Afghanistan's major international treaties affecting environmental management and their status are provided below:

- United Nations Convention on Law of the Sea: signed 1983; not ratified
- Kyoto Protocol: no position yet expressed
- Framework Convention on Climate Change: ratified 2002
- Convention of Biological Diversity: ratified 2002
- Vienna Convention for the Protection of the Ozone Layer: ratified 2004
- Montreal Protocol on Substances that Deplete the Ozone Layer: ratified 2004
- Convention to Combat Desertification: ratified 1995
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): date of enforcement: January 28, 1986
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposals (Basel Convention): signed 1989; not ratified
- Comprehensive Test Ban Treaty: ratified 2003
- Convention Concerning the Protection of the World Cultural and Natural Heritage: ratified 1979

[3]Implementation Review Group, Seventh Session. Vienna, 20-24 June 2016. Review of implementation of the United Nations Convention against Corruption.

- Nuclear Non-Proliferation Treaty (1968): ratified 1992
- Desertification Convention UNCCD
- The International Covenant on Economics, Social and Cultural Rights (CESCR)
- The Convention on the Rights of the Child
- Convention on the Elimination of all forms of Discrimination Against Women (CEDAW)
- Equal Remuneration Convention, 1951 (No. 100) dated 22 Aug 1969
- Abolition of Forced Labour Convention 1957 (No.105) dated 16 May 1963
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111) dated 01 Oct 1969
- Minimum Ae Convention, 1973 (No. 138) dated 07 Apr 2010 – Minimum age specified: 14 years
- Worst Forms of Child Labour Convention, 19999 (No. 182) dated 07 Apr 2010
- Tripartite Consultation (International labour Standards) Convention, 1976 (No. 144) dated 07 Apr 2010
- White Lead (Painting) Convention, 1921 (No. 13) dated 12 Jun 1939
- Weekly Rest (Industry) Convention, 1921 (No. 14) dated 12 Jun 1939
- Underground Work (Women) Convention, 1935 (No. 45) dated 14 May 1937
- Protection of Wages Convention, 1949 (No. 95) dated 07 Jan 1957
- Weekly Rest (Commerce and Offices) Convention, 1957 (No. 106) dated 16 May 1963
- Dock Work Convention, 1973 (No. 137) dated 16 May 1979
- Occupational Cancer Convention 1974 (No. 139) dated 1 May 1979
- Paid Educational Leave Convention, 1974 (No. 140) dated 16 May 1979
- Rural Workers' Organization's Convention, 1975 (No 141) dated 16 May 1979
- Human Resources Development Convention, 1975 (No. 142) dated 16 May 1979
- Vocational rehabilitation and Employment (Disabled Persons) Convention, 1983 (No. 159) dated 07 Apr 2010

2.4 OPIC Guidelines

According to Environmental and Social Policy Statement of OPIC, thermal power is examined under Energy Intensive Sectors. Likewise, according to the Environmental and Social Policy Statement of OPIC, projects in Energy Intensive Sectors must meet energy efficiency guideline and benchmarks established by international organizations or develop and implement an energy management program to achieve these guidelines and benchmarks within a feasible period of time. In this concern, OPIC, without having its own statement for thermal power plants refers to IFC Environmental, Health and Safety Guidelines.

2.4.1 IFC/World Bank Group Overview

The IFC is an international financial institution, which offers investment, advisory, and asset management services to encourage private sector development in projects. It was established in 1956 as the private sector arm of the World Bank Group to advance economic development by investing in strictly for-profit and commercial projects which reduce poverty and promote development. To provide a means of managing the social and environmental risks and impacts on projects, the IFC has developed Performance Standards on Social and Environmental Sustainability (amended in 2012). The Performance Standards are designed to help avoid, mitigate, and manage risks and impacts as a means of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project level activities. The 2012 edition of IFC's Sustainability Framework, which includes the Performance Standards, applies to all investment and advisory clients whose projects go through IFC's initial credit review process after January 1, 2012.[4] These standards are compatible with the World Bank Performance Standards for Projects Supported by the Private Sector under Operational Policy 4.03 that will be applied as applicable. The performance standards include:

[4] https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 7: Indigenous Peoples
- PS 8: Cultural Heritage

These PS provide a means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. Based on screening and project research, the applicable IFC/World Bank Performance Standards include PS-1, 2, 3, 4 and 6. A brief on the requirements as laid down in the performance standards is described in the following subsections.

The following guidelines of the IFC, which are deemed relevant to the Project, to be followed during the ESIA study are as follows:

- The IFC General EHS Guidelines, dated April 30th, 2007;
- The IFC EHS Guidelines for Thermal Power Plants, dated December 19th, 2008;
- The IFC EHS Guidelines for Electric Power Transmission and Distribution, dated April 30, 2007;

2.4.2 IFC Performance Standards

The Performance Standards (PS) are directed towards the party responsible for implementing and operating World Bank Group funded projects. OPIC with respect to environmental and social policies and procedures adopts, as a standard for the environmental and social review process, the International Finance Corporation's (IFC) Performance Standards on Social and Environmental Sustainability (Performance

Standards) and Industry Sector Guidelines and any subsequent revisions to those standards. The PS provide a structure to assist clients in identifying risks and impacts prior to implementing project activities so that systems and designs are instituted to help avoid, mitigate and manage these risks and impacts. In order to achieve the objectives of the applicable PS to this project, effective means that are appropriate to the nature and scale of the project and commensurate with the level of social and environmental risks (likelihood of harm) and impacts will be generated and incorporated into the Environmental and Social Management System (ESMS). The outline below lists the requirements under each PS that are applicable to the project. If addressed appropriately, alignment with these standards will lead to sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

- Environmental and Social Assessment and Management System
- Overarching policy defining the environmental and social objectives and principles
- Identification of Risks and Impacts
- Management Programs describing mitigation and performance measures
- Organizational Capacity and Competency
- Emergency Preparedness and Response
- Monitoring and Review
- Stakeholder Engagement
- External Communications and Grievance Mechanisms
- Ongoing Reporting to Affected Communities

PS 2: Labor and Working Conditions

- Working Conditions and Management of Worker Relationship

- Protecting the Work Force
- Occupational Health and Safety
- Workers Engaged by Third Parties
- Supply Chain

PS 3: Resource Efficiency and Pollution Prevention

- Resource Efficiency
- Pollution Prevention

PS 4: Community Health, Safety, and Security

- Community Health and Safety
- Security Personnel

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

- General
- Protection and Conservation of Biodiversity
- Management of Ecosystem Services
- Sustainable Management of Living Natural Resources

2.4.3 IFC/World Bank Group EHS Guidelines

The IFC/World Bank Group Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and sector-specific examples of good international industry practice. IFC uses the EHS Guidelines as a technical source of information during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.[5] The General EHS Guidelines contain measures to manage broad environmental, health, and safety issues potentially applicable to all industry sectors and can be combined with relevant

[5] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

Industry Sector Guidelines. Stated performance levels must also be compatible with applicable national requirements or internationally accepted standards required by the host-country.

General EHS Guidelines (2007)

The General EHS Guidelines cover areas pertaining to Environmental; Occupational Health and Safety; Community Health and Safety; and, Construction and Decommissioning. Based on the approach for the management of environmental issues at the Project level, the General EHS Guidelines provide the following directives:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle,
- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks,
- Understanding the likelihood and magnitude of EHS risks, based on the nature of the project activities and the potential consequences to workers, communities, or the environment if hazards are not adequately managed,
- Prioritizing risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment,
- Favoring strategies that eliminate the cause of the hazard at its source,
- When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences,
- Preparing workers and nearby communities to respond to accidents, and
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability.

In addition to these core directives, the General EHS Guidelines provide performance levels for ambient air quality that correspond to national target levels. Based on the WHO

Ambient Air Quality Guidelines[6], these target levels for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM 10/2.5) and ozone (O_3) are as follows:

SO_2: 20 µg/m^3 (24-hour mean);
500 µg/m^3 (10-minute mean)

NO_2: 40 µg/m^3 (annual mean);
200 µg/m^3 (1-hour mean)

$PM_{2.5}$: 10 µg/m^3 (annual mean);
25 µg/m^3 (24-hour mean)

PM_{10}: 20 µg/m^3 (annual mean);
50 µg/m^3 (24-hour mean)

O_3: 100 µg/m^3 8-hour mean

The General EHS Guidelines go on to provide instruction on demonstrating attainment with these air quality guidelines using qualitative or quantitative assessments; instruction on design of stack height for point source emissions with consideration to other source emissions in the vicinity; and monitoring approaches for gaseous fuel-fired turbines.

2.4.4 Electric Power Transmission and Distribution

The EHS Guidelines for Electric Power Transmission and Distribution (2007) include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. In the case of this Project, the cooperative agreement established between the gas supplier (MoMP/Afghan Gas Enterprise), the national utility entity (DABS) and the Project Proponent will demarcate the roles and responsibilities for the construction of upstream and downstream components and the management of environmental and social performance including transmission and distribution of electricity produced by the Bayat IPP.

[6] http://www.who.int/en/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health

2.4.5 Thermal Power

The EHS Guidelines for Thermal Power (2008) provides guidance applicable to combustion processes fueled by gaseous, liquid and solid fossil fuels and biomass and designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of the fuel type with a total rated heat input capacity above 50-Megawatt thermal input (MWth) on Higher Heating Value (HHV) basis. These EHS guidelines apply to boilers, reciprocating engines, and combustion turbines in new and existing facilities and is structured as follows:

Section 1.0 – Industry Specific Impacts and Management
Section 2.0 – Performance Indicators and Monitoring
Section 3.0 – References and Additional Sources
Annex A – General Description of Industry Activities
Annex B – Environmental Assessment Guidance for Thermal Power Projects

While emissions guidelines applicable to facilities with a total heat input capacity of less than 50 MWth are presented in Section 1.1 of the General EHS Guidelines, Annex A of these EHS guidelines contains a detailed description of industry activities for this sector, and Annex B contains guidance for Environmental Assessment (EA) of thermal power projects that is relevant to the proposed Project.

2.4.6 Gaps Between Local Legislation and International Guidelines

The most prominent issue which requires further elaboration in national EIA legislation is “Social Impact Assessment (SIA)”. Additional studies and implementations are required for SIA under OPIC Environmental and Social Policy Statement. For example, implementation of detailed socio-economic surveys at Project site and the establishment of a Grievance Mechanism are not stipulated by the national EIA legislation. However, these are required by international standards. All these requirements will be considered and fulfilled within the scope of the project.

3 PROJECT DESCRIPTION

The Bayat 40 MW gas-to-power plant (the “Project” or “Bayat IPP”), is an independent power producer scheme wherein the IPP is the Bayat Power Company, a subsidiary of Bayat Group of Companies. The Bayat Group of companies has more than a decade of experience building highly profitable enterprises in Afghanistan in the telecommunications, media, industrial, infrastructure, security, and logistics sectors, and have a proven ability to work successfully with government officials/organizations at both national and regional levels in order to help build out industries that generate profitable returns and also set the base for long term economic growth for the nation.

Bayat Power 1 - is a %100 equity financed power pat to be located in Sheberghan, capital of Jowzjan Province which will have a 40MW capacity. Subsequent phases will scale to more than 200MW of capacity, utilizing advance aeroderivatie technology. the fully completed gas-fired power plant will be able to generate in excess of 200MW of power and is expected to have an operational life of at least 20 years.

The project will utilize natural gas that will be supplied under an existing Implementation Agreement with the MoMP/Afghan Gas Enterprise from gas fields in Sheberghan. Electricity generated by the Bayat IPP will be dispatched by Da Afghanistan

Breshna Sherkat (DABS), the Afghan national utility entity, under an existing Power Purchase Agreement. During the phase 1 of the project, using the most advance and highly efficient equipment available worldwide, will provide 40 MW. Phase 1 will continue as long as the GoIRA is interested in purchasing electricity from, and selling gas to, Bayat Power. The PPA for the phase 1 is 5 years with a mutual option to extend.

The site selected for development is located on government land that was transferred to the Bayat Power Company through ARAZI, the national land authority, under a renewable lease (Annex 1).

Site selection was based on regional and national government energy planning that considers proximity to domestic natural gas reserves, current and future foreign Power Purchase Agreements and high voltage (HV) electricity transmission system assets. Currently the North East Power System (NEPS) contains the major northern and northeastern load centers in Afghanistan serving Kabul, Mazar-e Sharif, Kunduz, Baghlan and Jalalabad. Electricity generated from natural gas in the Sheberghan gas fields is expected to feed into the NEPS once online. Several regional interconnection projects are underway to link NEPS with the country's other major non-connected networks; the South East Power System (SEPS), the Turkmenistan System and the Herat System. Thus, this Project is one part of the larger effort towards development of an interconnected national transmission grid that utilizes available national energy resources and is synchronized with key import transmission lines to more effectively serve the population and domestic development goals.

Regarding Afghanistan's energy sector governance, the Inter-Ministerial Commission of Energy (ICE) plays the role of coordination and policy making body for energy sector activities while the Ministry of Energy and Water (MEW) is the nodal ministry for power sector development and tariff setting. The Ministry of Mines and Petroleum (MoMP) is the authority overseeing the Afghan Gas Enterprise, a secondary division of the MoMP that

carries out activities such as exploitation, development, production, processing and delivery of natural gas to its clients.[7]

The Bayat IPP will be integrated with several other ongoing projects being developed by the public and private sectors. The upstream and downstream projects that have been undertaken previously or that are ongoing are directed by the MoMP/Afghan Gas Enterprise and DABS, and environmental and social performance associated with these operations is conducted under the environmental jurisdiction of the Afghanistan National Environmental Protection Agency.

IFC defines a project's area of influence as the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of a project; areas potentially impacted by cumulative impacts from further planned development of a project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without a project or independently of a project. Work being conducted on gas supply wells and gas processing plants in Sheberghan, gas transmission pipelines, and electricity transmission lines are currently underway and serve multiple purposes and parties. These are therefore projects occurring independently of the Bayat IPP and they are outside the area of influence.

The source of gas supplied to the Bayat IPP by Afghan Gas Enterprise will be from wells in the Sheberghan gas fields located in Jowzjan Province in close approximately to the Project site. Wells in these fields currently supply gas for the Northern Fertilizer and

[7] CAREC: Study for Power Sector Financing Road Map, Mobilizing Financing for Priority Projects. Afghanistan 2016. ADB TA 8727 REG.

Power Plant (NFPP, Compressed Natural Gas (CNG) for use in transport and power generation, and cooking and heating in the Sheberghan area.

Gas supply wells

According to recent estimations by the MoMP, the gas wells of the Sheberghan gas fields are producing 400 MCM of gas from 35 wells in four fields located within approximately 20 km of Sheberghan city:

- Gerquduq (sweet) (online 1980);
- Shakarak (sweet) (online 2011);
- Khoja Gogerdak (sweet) (online 1967);
- Yatimtaq (sour) (online 2015).

Most of these supply wells were drilled by Russian exploration teams and have been refurbished following abandonment in the 1990s (Figure 3-2). The gas from these wells contains varying concentrations of hydrogen sulfide (H_2S) generally in the range of 0%-1.4%. The MoMP is committed to providing gas supplied from Sheberghan gas fields to the Bayat IPP. Gas samples from the Yatimtaq field was analyzed and the results are presented in Annex 8.

Gas processing plant

Aside from H_2S, other elements and compounds naturally present in raw natural gas include nitrogen, water, ethane, butane, pentane and other heavier hydrocarbon molecules. Before the natural gas can be used by an IPP, it must undergo initial processing at the gas field manifold to remove water and condensate and then be conveyed to a processing plant for “sweetening”. Currently, this is accomplished for sour gas from the Yatimtaq gas field that supplies the NFPP in Mazar-e Sharif. This processing plant is an amine plant that utilizes a liquid desiccant (monoethanolamine or diethanolamine) that is passed through the natural gas to remove hydrogen sulfide and carbon dioxide (the “acid gas” fraction of raw natural gas). Further processing includes dehydrating the gas, stripping other impurities, and compressing the gas stream prior to

conveyance into the gas pipeline.[8] The processing plant is operated by the MoMP under the environmental jurisdiction of the Afghanistan National Environmental Protection Agency.

Gas Transmission Pipeline

A 12-inch diameter gas transmission pipeline that was constructed in 1967 between the Khoja Gogerdak gas field and Mazar-e Sharif currently conveys natural gas from the Yatimtaq gas field to the NFPP. In order to improve operational efficiencies and increase the volume and pressure of gas supplied through this pipeline seven sections of piping totaling 15 km were repaired in 2013. According to GG, the pipeline has the capacity to supply 850,000 m^3 of natural gas per day. A figure depicting the gas pipeline transect in the vicinity of the Mazar IPP has been provided in Figure 3-1.

In addition to the upstream infrastructure described above other independent projects associated with the downstream electrical infrastructure are ongoing. Currently, Afghanistan's power system operates off of numerous grid 'islands' with different power supply sources, and 110 or 220 kV links, that are not synchronized. Efforts are underway to operationalize a major backbone-forming interconnection between the North East Power Supply (NEPS) serving Kabul, Mazar-e Sharif, Kunduz, Baghlan and Jalalabad, and the Southeast Power Supply System (SEPS) serving the southern urban load centers of Kandahar and Helmand (Lashkar Gah). The Da Afghanistan Breshna Sherkat (DABS) was created in 2008 as part of the strategy to upgrade, commercialize and market a new electricity infrastructure, and is charged to operate and manage power generation, import, transmission, and distribution infrastructure on a commercial basis throughout Afghanistan.

With regard to the power produced by the Bayat IPP, DABS is expected to determine whether to utilize the power in the north to offset current imports from Uzbekistan and

[8] AEAI. Sheberghan Gas Field Development Project (SGFDP). Critical Path for Sheberghan Gas Field Development. February 15, 2011.

Turkmenistan; transmit the power into the NEPS and SEPS; or, sell power to one or more potential military or industry anchor customers in the region.

Electricity transmission lines

Currently a new 220 kV transmission line between Sheberghan and Mazar-e Shariff is underway to replace a previously damaged 110 kV line. The Bayat IPP will transmit power to this line via a new 220 kV overhead tie-in transmission line that will be constructed by DABS under the environmental regulatory requirements of the Afghanistan NEPA.

3.1 Project Location

The project site is located on an unproductive and undeveloped land in Yatimtaq area approximately 20km east of Sheberghan City, Capital city of Jowzjan Province. The site is located adjacent to Northern Fertilizer & Power Plant (NFPP). The nearest residential developments are located greater than 10km.

Figure 3-1 Northern Fertilizer and Power Plant

Figure 3-2 Sheberghan Gas Well

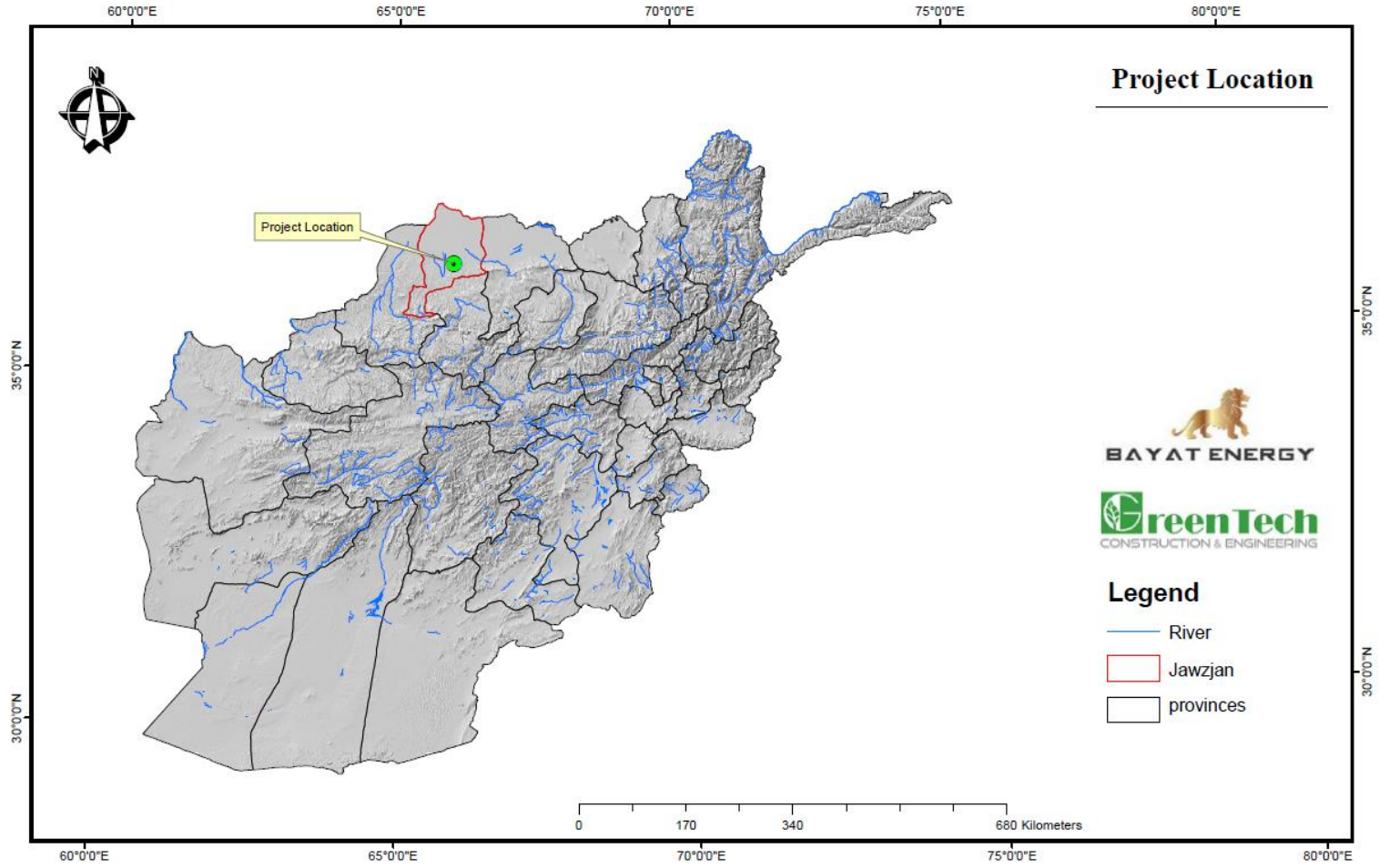


Figure 3-3 Project Location

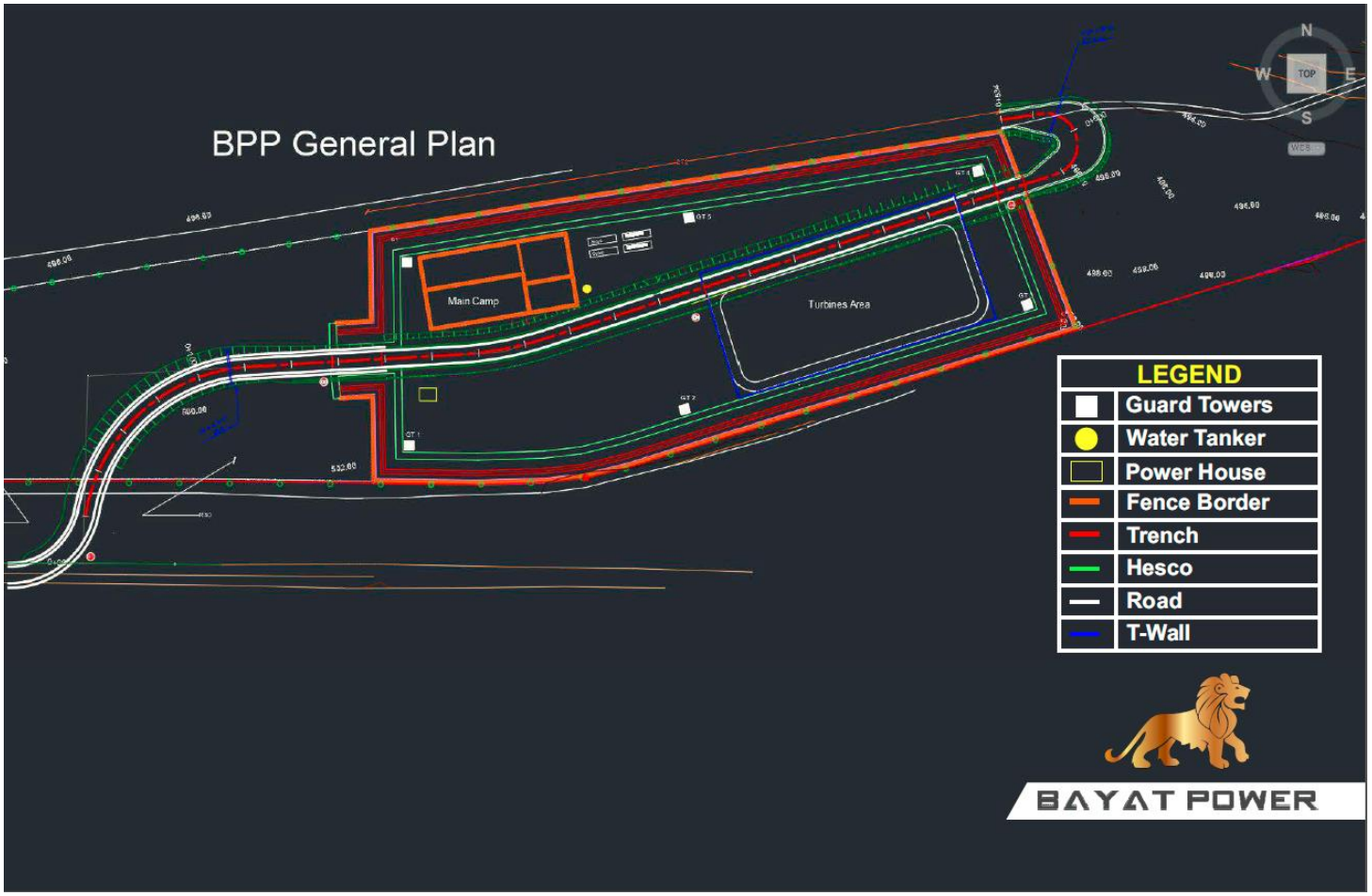


Figure 3-4 Bayat Power General Plan

4 ENVIRONMENTAL AND SOCIAL CONDITION

4.1 General

The environmental and social baselines of the proposed Project and its surroundings has been established for each environmental aspect under consideration. This has been achieved largely through consultations with relevant stakeholders, a desktop review of available literature, limited environmental testing and analysis, and site walkovers.

The prevailing environmental conditions of the study area within which the proposed Gas-to-Power Plant would be sited, as well as the socio-economic situation is presented in this chapter. The assessment is divided into three broad categories:

- Physio-environment (geology, climate, sediment, soil type and distribution, surface water and groundwater characteristics);
- Biological environment (fisheries, flora and fauna characteristics); and
- Socio-economic conditions describing; demographic structure, culture, social and health status of the host community.

Baseline conditions presented are based on information sourced from literature as well as findings from field sampling and surveys. Also reported are laboratory analyses and interpretation of samples obtained. Information acquired during this ESIA will be used in further environmental management decisions and future monitoring of changes, if any, in the environmental characteristics.

It is important to note the limitations of the baseline study based on the site-specific conditions. Due to the nature of recent political events in the country, many public records as would typically be available regarding socio-economic data are absent from the record. For example, rigorous data on trends in baseline income levels and other socio-economic indicators are less available in the current Afghan context. In addition, certain scientific resources and infrastructure such as accredited analytical laboratories are limited or absent. This study has therefore used available resources and the knowledge of subject matter experts to extrapolate from the best available information as needed.

4.2 Physio-Chemical Conditions

The geographical context for the project is northern Afghanistan, especially, Yatimtaq region of Sheberghan, Jowzjan Province. Afghanistan geography is shaped by the Hindu Kush Mountains that run on a southwest-northeast transect through the middle of the country and are flanked by foothills, deserts and plains. The Project area is located near gas fields Yatimtaq and Jarquduk in Sheberghan city, Jowzjan Province.

4.3 Climate

The northern plains region is considered subtropical and semi-desert and the study area's climate is strongly influenced by topography Jowzjan has semi-desert and desert climate. The southern of Jowzjan, branches of Turkestan Mountain, the altitude is about 1200 meters, and elevation in Khamab, the northern of Jowzjan is 259 meters. It is snowy in mountainous areas in winter, and in the spring up to early summer, it causes the land greenery and liveliness. The precipitation in the mountainous areas is between 800 to 1000 mm, but at the margin of Amo, Khamab region, which extends along the Shortapa sabulous area, the precipitation is between 100 to 200 mm.[9]

Temperature

According to geographical location of Sheberghan city, this city generally has warm temperature and the difference in temperature of the boarding table does not exceed 20 degrees. Sheberghan city is mild in spring and fall, but warm in the summer, the temperature rises to 42ºC in summer and in winter the temperature down to -3ºC. Table 4-1 and Figure 4-1 show the temperature of Sheberghan City.[10] Additionally, Mean temperature during the seasons of the year is represented in Table 4-2[11].

Table 4-1 Monthly Mean temperature During the Year

Year	Level	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	Max	10	14	22	22	33	36	40	38	33	25	16	12
	Ave	6	11	19	19	30	33	36	34	29	21	13	9
	Min	2	6	12	13	24	26	28	26	21	13	8	4

[9]North Region Development Plan Report, MoUD, 1386.
[10]https://www.worldweatheronline.com/Sheberghab-weather-averages/Jowzjan/af.aspx.
[11] Azimi, Mohamad Azim, 1391. An Introduction to the Physical Geography of Afghanistan, Khorasan Publisher).

2010	Max	13	11	23	28	33	38	39	38	31	27	18	13
	Ave	9	8	18	25	30	35	36	34	28	24	14	8
	Min	4	3	12	19	24	28	28	27	20	17	8	2
2011	Max	9	9	18	28	35	38	38	38	32	24	12	8
	Ave	6	6	14	25	31	35	35	34	28	21	10	5
	Min	0	2	8	18	26	30	29	28	22	16	6	0
2012	Max	7	6	16	28	32	37	39	38	31	24	16	9
	Ave	5	4	13	25	30	34	36	34	27	21	13	6
	Min	0	0	8	20	25	29	30	28	22	16	9	2
2013	Max	9	14	20	25	32	39	40	38	36	25	17	10
	Ave	6	11	17	22	29	35	36	34	32	22	15	7
	Min	2	6	11	17	24	30	30	28	26	16	10	3
2014	Max	10	4	18	26	35	39	39	38	34	24	14	12
	Ave	7	1	14	23	32	36	36	35	31	21	11	8
	Min	3	-3	9	18	28	31	31	30	25	16	7	3
2015	Max	11	14	17	28	35	40	42	38	32	27	16	11
	Ave	8	11	14	25	32	37	38	34	29	24	13	9
	Min	4	7	9	20	28	33	32	29	24	18	10	5
2016	Max	13	17	22	26	35	39	40	38	36	24	16	13
	Ave	11	13	19	23	33	36	37	35	33	20	13	10
	Min	7	7	14	19	29	32	33	30	27	15	8	6
2017	Max	10	10	18	26	37	40	41	38	32	26	19	12
	Ave	8	7	15	23	34	37	38	35	29	22	16	9
	Min	4	3	10	18	29	32	32	29	24	16	11	4

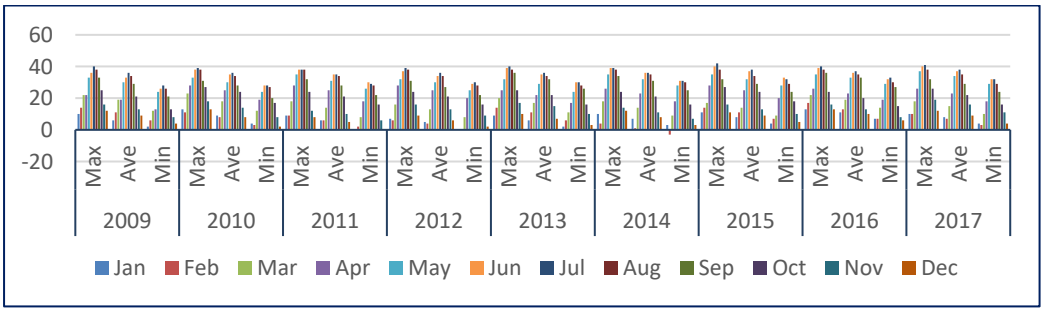


Figure 4-1 Mean temperature during the year

Table 4-2 Mean temperature during the seasons of the year.

Station	Altitude	Latitude	Elevation	Spring	Summer	Fall	Winter	Yearly average
Sheberghan	65.43 ºC	36.40 ºC	360 ºC	16 ºC	29 ºC	16 ºC	4 ºC	16.17 ºC

Rainfall

About 90% of the annual precipitation occurs between November and May in Sheberghan City. In April of 2009, the rainfall reached to 123.9 mm. Between June and September, the rainfall was reduced to minimum, so these months are the driest months of the year. The average rainfall of Sheberghan from 2009 to 2016 is provided in Table 4-3 and Figure 4-2.

Table 4-3 Monthly Average Rainfall in the Project Area (2009- 2017)

Month	Year									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Jan	54.8	27.1	9.8	27.69	29.09	14.62	46.28	38.17	42.4	32.21
Feb	72.52	120.73	103.07	52.19	28.77	26.9	56.73	6.81	60	58.63
Mar	31.38	40.88	22.3	27.76	26.63	74.74	33.24	50.61	37.8	38.37
Apr	123.9	23.11	13.48	15.14	22.43	41.21	20.1	31.99	19.6	34.56
May	21.96	26.9	6.61	14.81	4.58	9.2	9.69	7.3	5.5	11.83
Jun	1.6	1	0.7	1.6	0.2	0.3	0.6	1.3	0	0.81
Jul	0	0.2	0	0	0	0	0	1.5	0.1	0.2
Aug	0	0.06	0	0	0	0	0.1	0	0.1	0.028
Sep	0.2	0	0	0.1	0	0.29	0	0	0	0.06
Oct	9.91	1.8	7.9	6.53	9.3	3.42	2.7	0	0	4.61
Nov	47.55	2.81	62.42	28.56	19.02	28.28	39.38	9.8	2.1	26.65
Dec	61.6	2.4	2	31.51	25.18	10.8	26.38	16.6	0.8	19.69

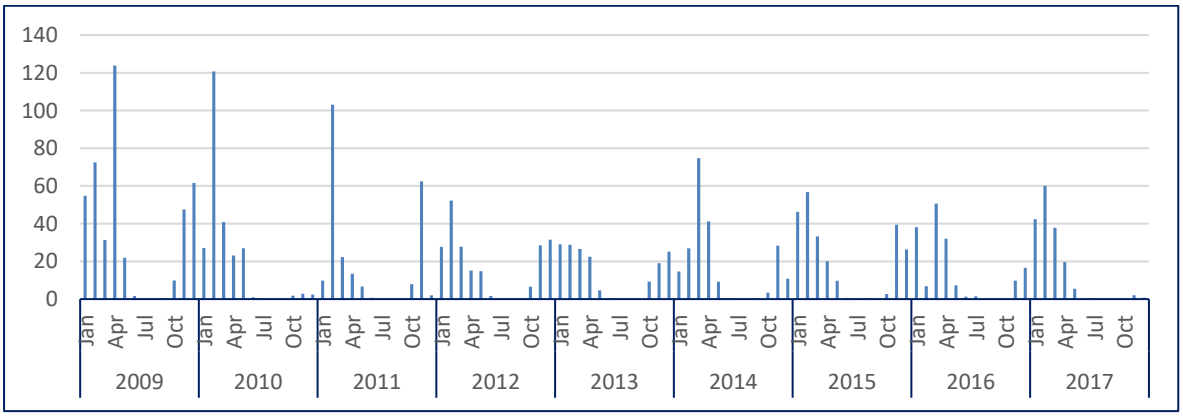


Figure 4-2 Monthly Average Rainfall in the Project Area

Snowfall

In Sheberghan city snowfall starts in early winter and continues till late winter and the highest snowfall in Sheberghan city is during January and February. Table 4-4 and

figure 4-3 show the snowfall of Sheberghan city. The annual snowfall average in Sheberghan city is 5.3 cm.

Table 4-4 Monthly average snowfall in the Project area

Month	Year									Average
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Jan	23.6	6.5	2.3	6.5	4.3	0.9	2.5	1.7	0.2	5.38
Feb	6.4	21.8	18.9	5.9	0.7	21.7	7.5	4	32.1	13.22
Mar	0	0	3.7	3.1	7.7	1	0.4	0	0	1.76
Apr	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0	0
Jun	0	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0	0	0	0
Nov	0	0	18.1	0	0	0	0	6.2	0	2.7
Dec	12.9	0	0	14.8	3	1.6	12	8.9	0	5.91

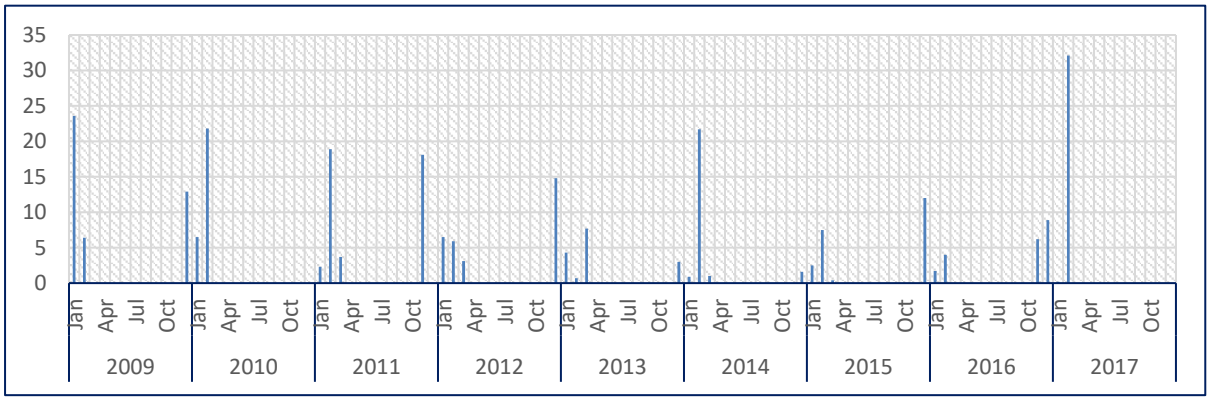


Figure 4-3 Monthly Average Snowfall in the Project Area

In Jowzjan Province, the wind speed does not change significantly throughout the year. In study area, however, the wind speed is minimum (6.1 mph); and the maximum speed is 19.9 mph. Table 4-5 and Figure 4-4 indicate the speed of wind in study area from 2009 to 2017.

Table 4-5 Monthly average wind speed data in the Project area.

Month	Year									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avrg
Jan	8.6	10.1	9.7	14	15.5	10.8	13.7	15.1	14	12.38
Feb	12.2	12.2	11.2	15.8	14.8	10.4	16.9	13.3	12.6	13.26
Mar	11.5	11.9	10.4	18.7	16.9	15.5	13.7	16.2	14.4	14.35
Apr	11.2	10.8	10.4	13.7	13	13.7	15.8	13.7	15.8	13.12
May	10.1	9.4	13.7	13.7	13.7	13.7	15.8	13.7	12.6	12.93
Jun	11.9	10.4	15.1	14	15.1	14.8	12.6	14.8	14.8	13.72
Jul	11.5	11.9	14.8	15.1	14.8	16.2	19.8	15.1	18.8	15.33
Aug	10.8	10.4	14.8	13.3	14.8	13	14.8	14	14	13.32
Sep	9.7	9.4	11.5	11.2	10.8	11.9	11.2	11.2	11.9	10.97
Oct	8.6	8.6	11.5	9.7	10.8	12.6	13.3	11.2	11.5	10.86
Nov	11.2	6.1	10.8	10.4	9.7	11.5	13.3	12.6	9.7	10.58
Dec	9	8.3	11.5	12.6	12.6	10.8	12.6	14	13.3	11.63
Ave	10.52	9.95	12.11	13.51	13.54	12.90	14.45	13.74	13.61	

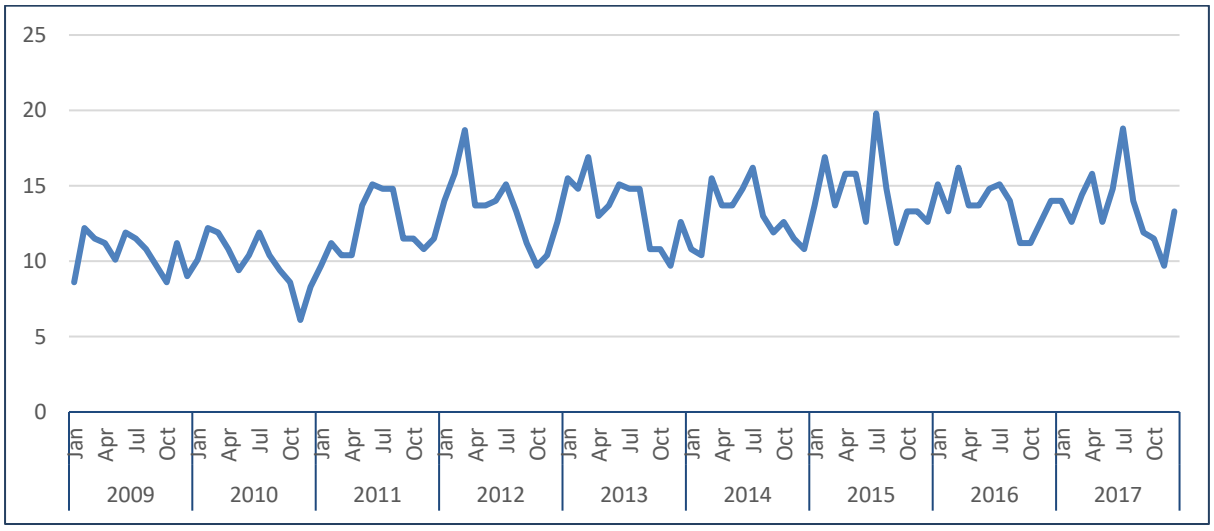


Figure 4-4 Monthly average wind speed data in the Project area

Humidity and Cloud Cover

The relative humidity of Jowzjan Province has good condition in most of the months. In summer and/or warm months, the humidity is not that much low. The relative humidity of the air in Sheberghan City also indicates that the average relative humidity during the winter months, especially in July, is higher than other months (70 percent), and gradual decrease of its relative velocity towards the spring and summer months continues to fall in the middle of the month (11 percent), indeed, July and

August are the driest months of the year in Sheberghan City. This is depicted by the data as shown in the Table 4-6 and Figure 4-5 for relative humidity of Sheberghan during the period of 2009 to 2017.

Table 4-6 Monthly average of cloud and humidity data in the Project area

Year	Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	Cloud	32	33	20	29	11	5	2	1	5	5	22	33
	Humidity	64	59	41	53	27	15	12	15	22	22	45	65
2010	Cloud	30	38	23	17	14	3	2	7	4	9	7	10
	Humidity	51	69	46	37	28	15	13	13	18	29	43	44
2011	Cloud	29	48	23	12	8	4	0	1	3	16	40	16
	Humidity	54	68	46	27	20	15	12	13	16	32	66	51
2012	Cloud	29	38	28	17	11	3	1	1	2	11	25	26
	Humidity	59	60	47	31	25	17	14	13	15	26	47	55
2013	Cloud	29	31	26	17	5	3	1	3	1	8	20	25
	Humidity	58	52	47	33	19	13	13	16	13	28	40	59
2014	Cloud	35	28	32	21	10	3	1	0	1	10	23	17
	Humidity	58	69	53	39	20	13	11	11	14	28	53	49
2015	Cloud	41	49	37	22	13	2	3	2	2	14	33	29
	Humidity	59	62	51	36	22	11	13	12	17	28	53	49
2016	Cloud	33	25	35	22	10	4	3	1	2	11	29	27
	Humidity	52	43	21	41	25	18	15	12	17	22	35	55
2017	Cloud	35	42	25	18	4	1	0	0	2	3	27	18
	Humidity	55	70	48	38	18	13	12	12	15	23	33	35

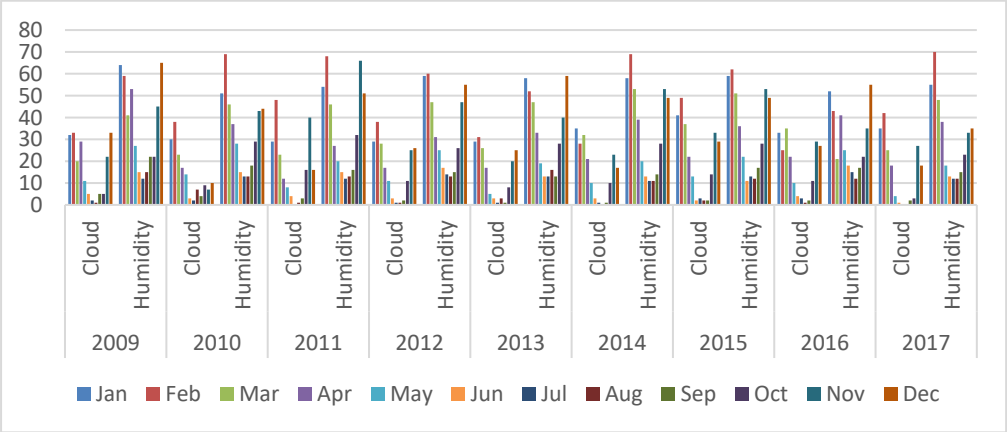


Figure 4-5 Monthly average of cloud and humidity data in the Project area

Sun Hours and Sun Days

As illustrated in Table 4-7 and Figure 4-6, the average relative frequency of sunny hours/days per month follow the seasonal patterns that characterize humidity and cloud cover with sunnier summers and less sun hours/days in the winter months. The highest average sun hours/days occur in June, July and August.

Table 4-7 Monthly Average sun hours and sun days' data in the Project area

Year	Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	hr	79	74	121.5	133	153.8	150	155	155	140.8	93	80.8	82
	day	16	8	21	14	21	28	31	31	29	28	16	18
2010	hr	82.8	71	125	147	154.8	150	155	155	141	93	89.5	92
	day	22	7	19	19	19	27	30	31	30	27	17	30
2011	hr	81.3	56	121.5	149	154.5	150	155	155	143	90	71.3	92
	day	23	10	18	23	24	27	31	31	30	23	12	25
2012	hr	79.8	66	115.8	147	155	150	155	155	140.8	92	80.5	80
	day	18	15	12	20	18	28	31	31	29	29	18	23
2013	hr	84.5	75	115	148	155	150	155	155	141	93	85.3	82
	day	21	14	17	20	27	29	31	31	30	27	24	19
2014	hr	81	71	110	141	154.8	150	155	155	141	92	83.3	89
	day	19	19	13	18	23	28	31	31	29	25	20	21
2015	hr	69.5	60	106.3	139	152	150	155	155	142	90	74	74
	day	15	10	18	16	27	29	31	30	30	28	20	23
2016	hr	73	77	100	139	153	150	155	155	141	91	74.3	83
	day	20	26	16	19	22	26	30	31	30	31	25	22
2017	hr	100.5	139	152	150	155	155	141.7	94	82.3	83	74.3	79
	day	17	19	23	28	30	31	30	29	26	23	19	18

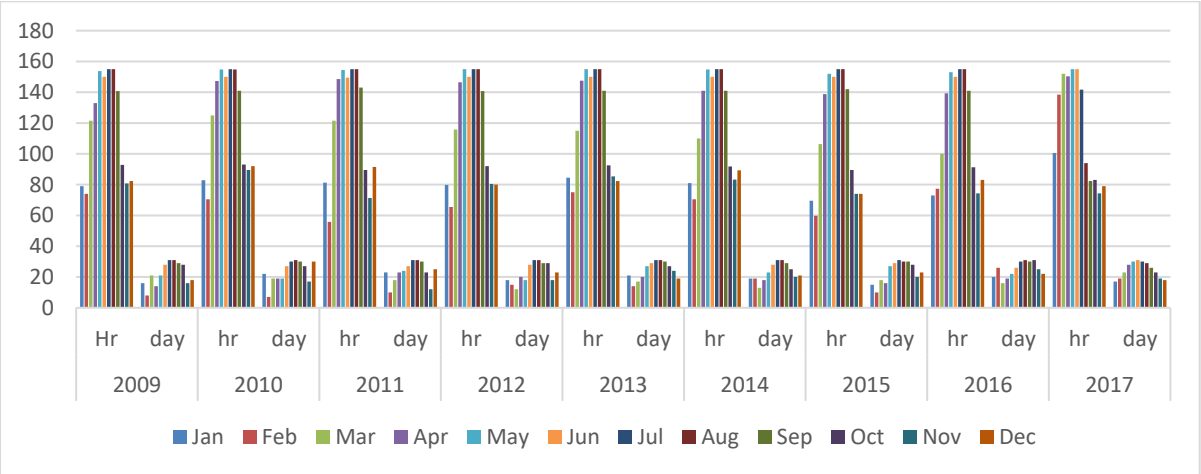


Figure 4-6 Monthly average sun hours and sun days' data in the Project area

Climate Change

Since 1960, the mean annual temperature has increased by 0.6 °C in Afghanistan. It is expected that the temperature will increase by 1.4 to 4.0 by the 2060. Furthermore, the mean precipitation over Afghanistan has decreased slightly (at an average rate of 0.5 mm per month (or 2 %) per decade). It has been recently perceived that a slight decrease was observed mainly during the spring season. [12]

Precipitation in the north is expected to decrease in the spring/summer and increase in the autumn/winter with overall long-term declines in average mean rainfall. Projections also indicate an increase in the intensity and frequency of flooding due to heavy precipitation events and increased thawing of snow/ice pack. The effects of flooding are further exacerbated by poor land use practices including overgrazing and deforestation. Further, drought is expected to increase in frequency from the historical trend of droughts occurring in approximately 15-year cycles lasting for 2-3 years. In short, drought is expected to become more of a norm as opposed to a cyclical event. The impact on agriculture is expected to increase agricultural water demand due to lower soil moisture levels and increased evapotranspiration.[13]

[12]Climate Change in Afghanistan: Perspectives and Opportunities, Vincent Thomas, 2016

[13]USAID. *FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to Inform USAID/Afghanistan Program Design*. February 2017.

4.3.1 Geological Studies

Due to the complex geological history of the Hindu Kush-Himalaya mountain system, both the geology and soils across the northern region are diverse and varied. In general, the mountains forming the northern foothills consist of limestone with inter-bedded marl, conglomerates, and sandstone of Upper Cretaceous/Paleocene origin, as well as later Paleocene and Miocene sedimentary and volcanic rocks. The northern plain consists primarily of thick Quaternary alluvial deposits containing clay, silt, sand, gravel and conglomerate. In general, gravelly subsurface soils along the foothills transition towards finer graded soils moving north, however interbedded sand, clay and gravel can be encountered to depths of 150 m even towards the central northern plain.

Tectonic Segmentation

The geology of Afghanistan is structurally complicated, consisting essentially of a succession of narrow northeast-trending terranes of continental fragments of Paleozoic to Tertiary age. These have moved northward, colliding obliquely with the Asian continental land mass. The last arriving fragment was the large Indian continental block. It docked obliquely, imparting much additional folding and Faulting and causing changes in structural trends. The accreted blocks are separated by sutures along which ophiolites are present. The latter apparently are the only remnants of subducted oceanic crust, representing oceanic spaces of unknown widths. The following structures have been established on the territory of Afghanistan by Shareq and Chmyriov (1980);

1. Regions of Hercynian Folding
2. Epi-Early Cimmerian Platform
3. The Region of Middle Cimmerian Folding
4. Median masses;
5. Regions of Alpine Folding.

The Project is located in Epi-Early Cimmerian Platform.

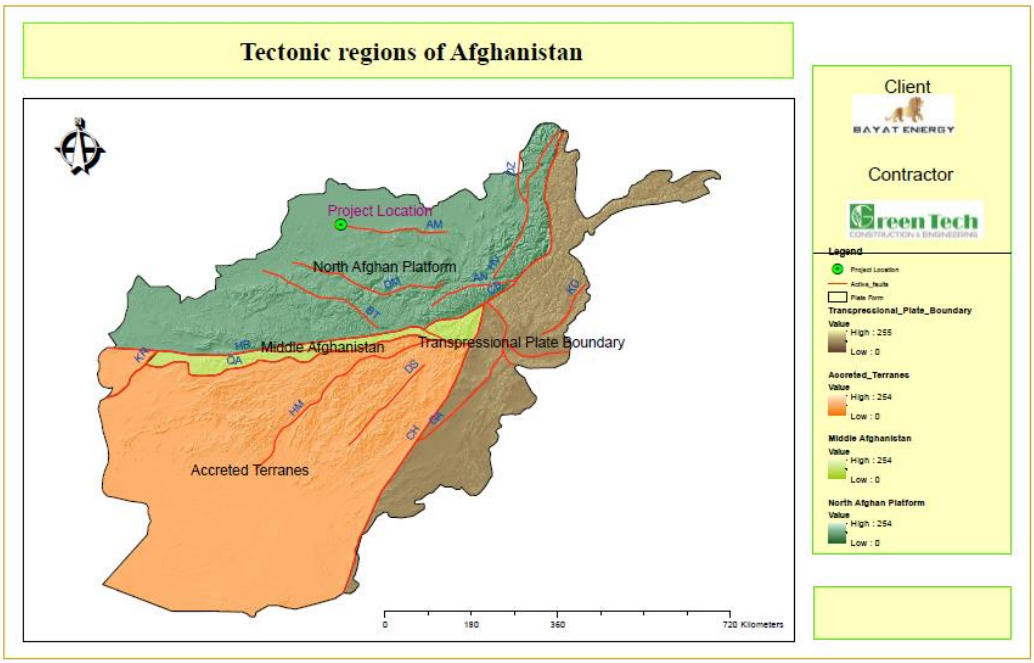


Figure 4-7 The location of Project in tectonic of Afghanistan

Earthquakes

The North Afghan platform is also an active plate boundary. There are different mechanisms of earthquakes in the region both strike-slip and reverse. Tahernia and Gheitanchi, 1384, state that the Hindu Kush seismic zone along the northwestern border of Pakistan to the northeastern border of Afghanistan and Tajikistan, is one of the most active average depth seismic regions that occurs via subduction of continental crust over the long-term, releasing seismic energy every year. While earthquakes are frequent in the central Hindu Kush due to their great depth the intensity is generally low and earthquakes occurrences are more prevalent near the major faults. Therefore, the study and location of active faults and tectonic structures are effective in understanding earthquake occurrence and intensity. The intensity of earthquakes with different depths are shown in the following Figure 4-9.

Sheberghan gas study area is located in the Afghanistan northern plains, in Jowzjan province. Around one fourth of this province is covered with mountains, Semi Mountains, and three quarter is formed with flat lands. The overall topography of this plain area is covered with loess, which from north site to the Hindukush and from north site has continued across border of Turkmenistan and Uzbekistan. The loess is mostly

transmitted with north-western winds toward central Asian plains, and will be disposed to the mountain ranges where its velocity become low.[14]

[14] Damaging Historical Earthquakes in the Afghanistan Region, Margaret G. Hopper, Kenneth S. Rukstales, Margo L. Johnson, James W. Dewey, 2006

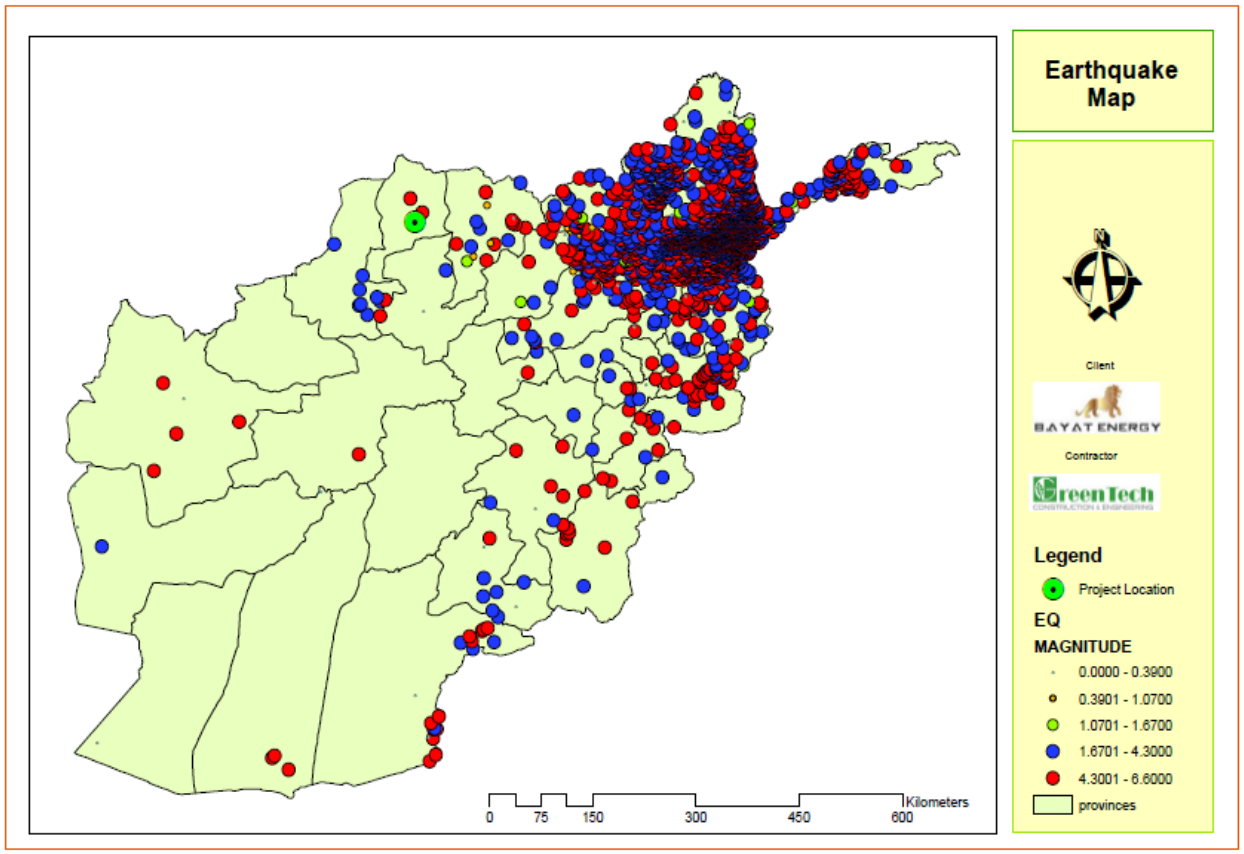


Figure 4-8 Earthquake Map of Study Area

Faults

In general, active faults are useful in a hazard assessment to the degree that they allow either estimation of the locations, sizes, and dates of large prehistoric earthquakes, or estimation of the rate of fault slip averaged over several earthquake cycles. Wheeler and others (2005) [15] suggest that 10 large Afghan faults are seismically active. The 10 large Afghan faults that are active include: AlburzMarmul (AM); Andarab; Chaman (CH); Central Badakhsan (CB); Darafshan (DS); Darvaz (DZ); Hari Rod (HR); Konar (KO); Panjshir (PJ); and, Sarobi (SA) (Figure 4.2)[16].

The nearest fault of study area is AlburzMarmul and MirzavalanDosi faults. The Alburz-Marmul fault lies in the north of Afghanistan, and it may be left-lateral transpression zone (Thomas and others, 1996). The Project is located approximately 12.75 km north of the Alburz fault. The largest of Mirzavalag faults strike east-west; the Alburz-Mormul and Mirzavalang faults in north and east-north of Afghanistan.[17] The Project is located approximately 102.5 km north of the Mirzavalang fault. Figure 4-9 depicts the location of the Project site and Sheberghan City in relation to the Alburz-Marmul and Mirzavalang faults.

Soil

Soil in the Project area primarily consist of sediments eroded from the mountains and comprise alternating layers of gravels, sands, silts and clays. Adjacent to the mountains, the sediments are dominated by coarse deposits such as gravels and pebbles, deposited by the runoff water from the mountains. Further, away from the mountains, the deposits would be expected to become increasingly dominated by finer sediments such as fine sands/silts. Soil compositions in the study area is Xerorthents with Xeropsamments (Figure 4-10).

[15]Wheeler, R. L., Bufe, C. G., Johnson, M. L., Dart, R. L., & Norton, G. A. (2005). Seismotectonic map of Afghanistan, with annotated bibliography. US Department of the Interior, US Geological Survey.
[16]USGS, Seismotectonic Map of Afghanistan, with Annotated Bibliography,Russell L. Wheeler, Charles G. Bufe, Margo L. Johnson, and Richard L. Dart, 2005.
[17] Wolfart and Wittekindt, 1980

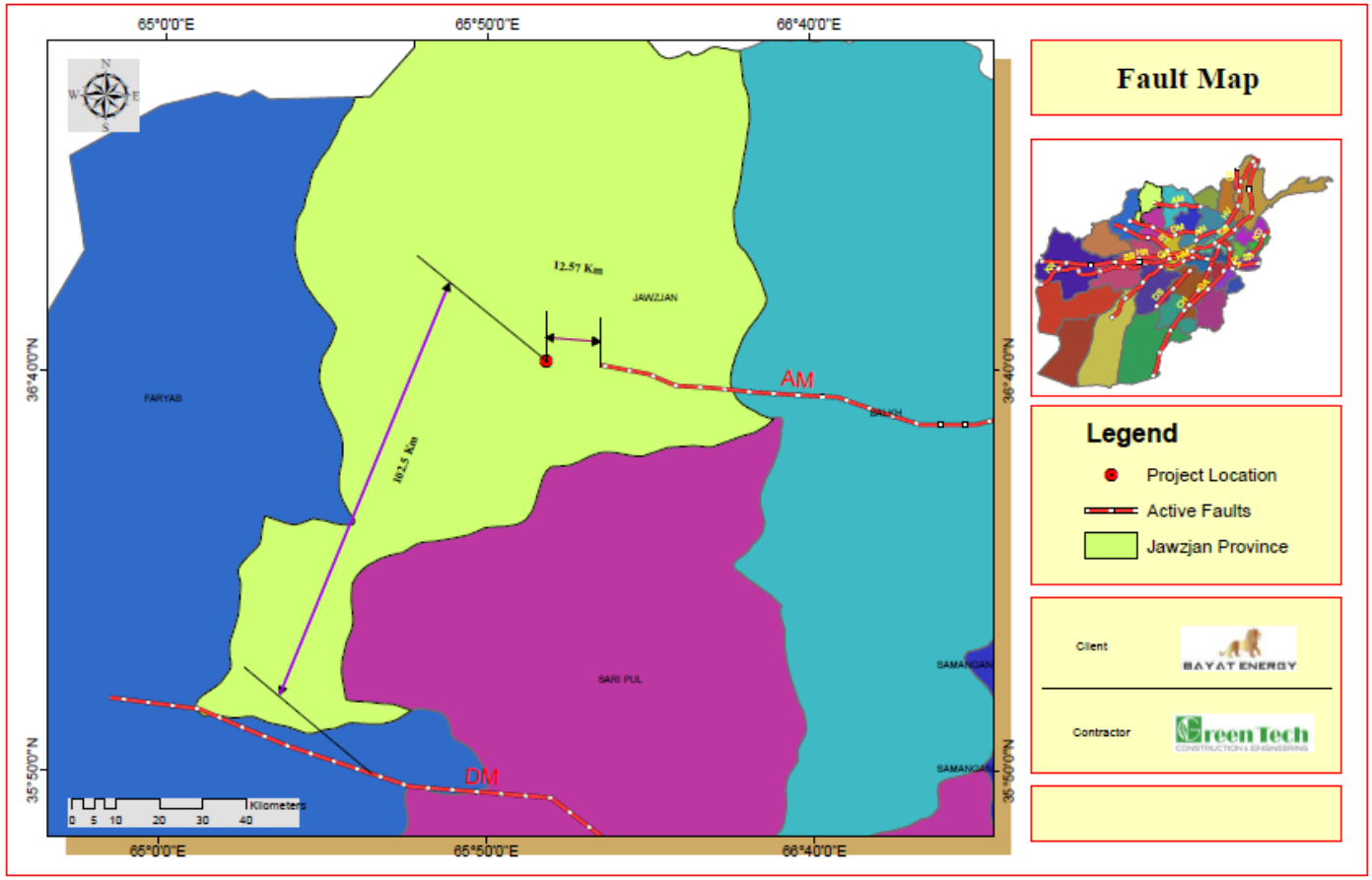


Figure 4-9 Alburz-Marmul and Mirzavalang Faults

Xeropsamments are the Psamments that are of Mediterranean climates and that have weatherable minerals, commonly feldspars, in the sand fraction. These soils are moist in winter and dry in summer. They have a frigid, mesic, or thermic temperature regime. Most Xeropsamments formed in deposits of late Wisconsinan or more recent age. Some are on terraces and glacial outwash plains. Others are on dunes. Because the supply of winter moisture is reliable, few of the dunes are shifting. Some of these soils have supported coniferous vegetation, but most have supported and still support a mixture of grasses and xerophytes shrubs or trees.[18]

[18]Soil Survey Staff, Soil Taxonomy, second edition, 1999, United States Department of Agriculture Handbook Natural Resources Conservation Service.

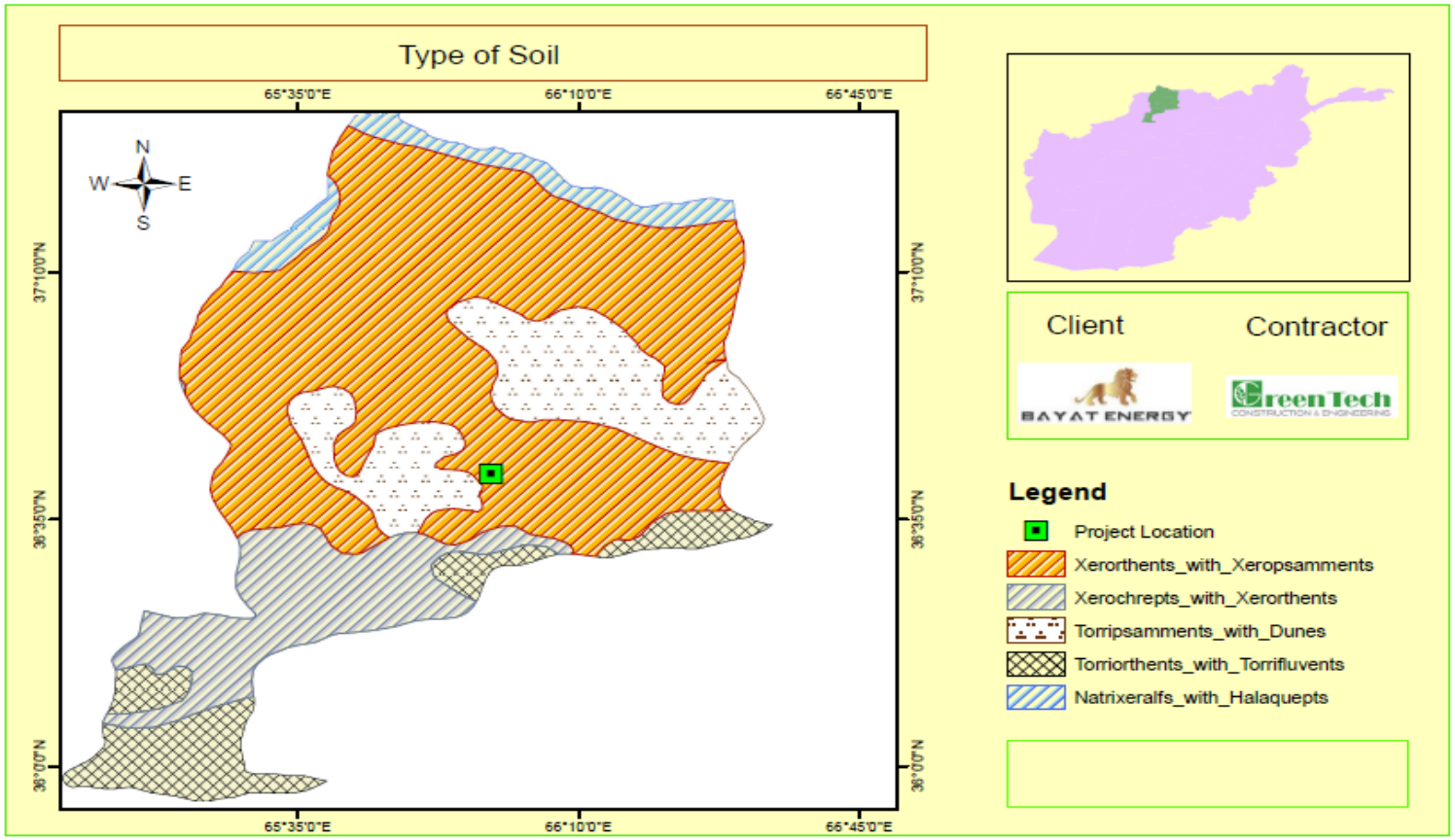


Figure 4-10 The Project site Soil Taxonomy

4.3.2 Hydrology

Sar-e-Pul Watershed

The Sar-e-Pul watershed (Figure 4-11) drains water from Kohistanat district (Sar-e-Pul River) and Sancharak district (Ab-i-Sya River) of Sar-e-Pul province. Ab-i-Syah (also called Shorab) takes it source from four parallel valleys from the Sancharak district. These four rivers (Jifan, Lar-I Badamak, Lar-iSurkh and Kashan) meet in the region of Sabz-I Kalan in SozmaQala district. The Sari-e-Pul River originates from a number of complex valley systems in Kohistanat district. The Sar-e-Pul and Ab-I Sya Rivers meet 10 km south of Sar-e-Pul town. The river then takes the name of Sar-e-Pul until the diversion structure splits established it into natural channels: the Darya-I Syah, on the east side, irrigates the area of YangiAregh, and the Darya-I Safid, on the west side, irrigates the Khwaja Du Koh district.[19]

Hydrometric Studies

Hydrometric Station: Sar-e-Pul River in Asiabad

Coordinate: latitude 36°12’ Northern, Longitude 65°57’ Eastern.

Station Drainage Area: 6,950 km2

Elevation: 642 meter above seas level

In the following table minimum and maximum of monthly and yearly flow of Sar-e-Pul River is shown, also the maximum of flow velocity in the Sar-e-Pul River is shown.[20]

[19] Watershed atlas of Afghanistan, 2004

[20] https://afghanistan.cr.usgs.gov/water

Table 4-8 SARE PUL RIVER AT ASIABAD, Continued Statistics of monthly and annual mean discharges [m3/s, cubic meters per second][21]

Month	Maximum		Minimum		Mean			
	Discharge (m3/s)	Water year of occurrence	Discharge (m3/s)	Water year of occurrence	Discharge (m3/s)	Standard deviation (m3/s)	Coefficient of variation	Percentage of annual discharge
Oct	13.1	1970	4.74	1972	7.21	2.23	0.31	7.60
Nov	11.7	1970	5.38	1973	7.70	1.75	0.23	8.12
Dec	10.3	1976	5.11	1973	7.36	1.75	0.24	7.76
Jan	9.41	1976	5.73	1973	7.01	1.29	0.18	7.39
Feb	9.81	1976	5.80	1968	7.59	1.26	0.17	8.00
Mar	15.7	1969	6.29	1967	9.31	2.53	0.27	9.81
Apr	31.1	1969	6.36	1966	12.2	7.06	0.58	12.9
May	29.9	1969	3.77	1971	12.5	8.19	0.66	13.2
Jun	23.6	1969	3.14	1977	7.91	5.62	0.71	8.34
Jul	15.6	1969	2.27	1977	5.52	3.53	0.64	5.82
Aug	12.1	1969	2.19	1977	4.90	2.71	0.55	5.16
Sep	12.4	1969	3.27	1966	5.65	2.56	0.45	5.95
Annual	15.3	1969	5.57	1974	7.90	2.74	0.35	100

[21] https://afghanistan.cr.usgs.gov/water

Table 4-9 SARE PUL RIVER AT ASIABAD, Continued Monthly and annual flow duration, in cubic meters per second [ng, not given][22]

% Q	Month												Annual
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
95	4.25	5.23	4.73	5.23	5.68	6.06	5.28	3.42	2.51	2.11	1.93	2.56	2.80
90	4.82	5.69	5.26	5.54	5.88	6.36	5.64	4.22	2.88	2.43	2.28	3.01	3.63
85	5.30	5.94	5.51	5.70	6.08	6.63	5.91	4.93	3.38	2.59	2.47	3.32	4.21
80	5.49	6.13	5.69	5.80	6.23	6.87	6.15	5.22	3.63	2.92	2.72	3.51	4.79
75	5.68	6.40	5.96	5.92	6.36	7.09	6.40	5.53	3.89	3.23	2.97	3.81	5.24
70	5.87	6.59	6.24	6.05	6.57	7.30	6.73	6.22	4.23	3.55	3.18	3.97	5.60
65	6.01	6.78	6.47	6.12	6.77	7.51	7.09	6.76	4.63	3.79	3.40	4.19	5.95
60	6.17	7.04	6.68	6.20	6.93	7.73	7.67	7.54	5.02	4.00	3.66	4.41	6.26
55	6.39	7.37	6.88	6.29	7.10	7.95	8.24	8.17	5.62	4.21	3.80	4.69	6.56
50	6.77	7.52	7.13	6.46	7.25	8.17	8.79	8.84	6.05	4.42	3.91	4.94	6.86
45	7.11	7.70	7.35	6.82	7.37	8.39	9.33	9.79	6.80	4.79	4.20	5.13	7.21
40	7.40	7.86	7.55	7.13	7.57	8.69	9.98	10.7	7.48	5.08	4.73	5.82	7.56
35	7.66	7.98	7.71	7.45	8.02	9.05	10.8	11.9	8.13	5.35	5.05	6.10	7.94
30	7.97	8.09	7.87	7.68	8.54	9.70	12.1	13.0	9.19	5.64	5.33	6.45	8.39
25	8.32	8.45	8.21	7.85	8.84	10.1	13.5	14.6	9.95	6.33	5.92	7.03	8.83
20	8.63	8.78	8.76	8.45	9.06	10.4	14.6	17.8	10.9	7.34	6.65	7.45	9.60
15	9.11	10.1	9.67	9.01	9.27	10.9	16.3	21.9	12.7	8.25	8.33	8.42	10.5
10	10.1	10.5	10.4	9.24	9.64	12.8	22.0	25.3	15.9	10.6	9.06	8.97	12.1
5	12.7	11.1	10.8	9.44	10.2	16.1	30.4	30.9	20.7	14.6	11.7	12.0	15.8

Table 4-10 SARE PUL RIVER AT ASIABAD, Continued Probability of occurrence of annual high discharges [m3/s, cubic meters per second; ng, not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous discharge (m3/s)	Maximum daily mean discharge (m3/s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	5.00	15.20	15.08	15.36	5.73
0.95	1.05	11.3	8.28	7.33	7.04	6.98
0.90	1.11	17.0	10.6	8.99	8.25	7.89
0.80	1.25	27.6	14.5	11.6	10.1	9.29
0.50	2	64.9	26.2	19.3	15.7	13.4
0.20	5	141	47.8	33.3	25.9	20.7
0.10	10	205	65.8	44.7	34.5	26.8
0.04	25	300	92.8	62.0	47.7	36.2
0.02	50	378	116	77.0	59.4	44.5

[22] https://afghanistan.cr.usgs.gov/water

0.01	100	462	142	93.9	73.0	54.0
0.005	200	552	171	113	88.6	65.1
0.002	500	679	ng	ng	ng	ng

Table 4-11 SARE PUL RIVER AT ASIABAD, Continued Probability of occurrence of annual low discharges [m3/s, meters per second]

Non exceedance probability	**Recurrence interval (years)**	**Minimum daily mean discharge (m3/s) Number of consecutive days**								
		1	3	7	14	30	60	90	120	183
0.05	20	1.34	1.52	1.60	2.05	2.15	2.23	2.38	2.57	3.26
0.10	10	1.54	1.70	1.79	2.31	2.43	2.55	2.72	2.93	3.62
0.20	5	1.86	2.00	2.10	2.70	2.85	3.01	3.22	3.46	4.14
0.50	2	2.81	2.91	3.03	3.81	4.01	4.27	4.55	4.84	5.50

Table 4-12 SARE PUL RIVER AT ASIABAD, Continued Annual peak discharges [m3/s, meters per second]

Annual peak discharge, from highest to lowest					
Water year	**Date**	**Peak discharge (m3/s)**	**Water year**	**Date**	**Peak discharge (m3/s)**
1965	May 6, 1965	24.5	1976	April 28, 1976	220
1966	March 22, 1966	15.0	1977	May 29, 1977	195
1967	May 1, 1967	97.2	1972	March 27, 1972	170
1968	November 27, 1967	58.0	1975	April 22, 1975	150
1969	March 29, 1969	95.0	1967	May 1, 1967	97.2
1970	March 8, 1970	30.0	1978	April 26, 1978	97.0
1971	April 15, 1971	23.9	1969	March 29, 1969	95.0
1972	March 27, 1972	170	1973	March 25, 1973	60.4
1973	March 25, 1973	60.4	1968	November 27, 1967	58.0
1974	May 3, 1974	11.8	1970	March 8, 1970	30.0
1975	April 22, 1975	150	1965	May 6, 1965	24.5
1976	April 28, 1976	220	1971	April 15, 1971	23.9
1977	May 29, 1977	195	1966	March 22, 1966	15.0
1978	April 26, 1978	97.0	1974	May 3, 1974	11.8

Table 4-13 Monthly and annual mean discharges, in cubic meters per second [Data may not be rounded in accordance with U.S. Geological Survey publication standards]

Water year	Monthly mean discharge												Annual discharge
	October	November	December	January	February	March	April	May	June	July	August	September	
1965	6.96	7.62	7.56	7.43	8.08	9.37	8.87	9.96	6.67	4.71	4.35	5.88	7.28
1966	7.82	7.39	6.64	5.93	7.73	9.31	6.36	4.70	3.33	2.95	2.81	3.27	5.68
1967	5.20	6.05	5.57	5.90	6.00	6.29	7.52	15.4	7.49	4.97	4.20	4.48	6.59
1968	5.76	7.09	5.57	5.83	5.80	7.25	9.76	12.5	9.79	6.38	5.84	6.58	7.34
1969	7.98	8.39	9.75	7.81	8.55	15.7	31.1	29.9	23.6	15.6	12.1	12.4	15.3
1970	13.1	11.7	10.2	9.31	9.55	11.3	11.0	7.27	4.72	4.63	4.43	5.41	8.55
1971	7.53	7.90	7.97	7.33	7.30	6.83	7.16	3.77	3.16	2.90	3.05	3.59	5.70
1972	4.74	5.51	5.58	6.19	7.13	11.1	7.91	14.3	7.60	3.89	3.38	3.91	6.77
1973	5.41	5.38	5.11	5.73	6.75	11.1	14.5	10.6	7.31	4.45	4.14	5.63	7.17
1974	6.23	6.53	6.36	6.05	6.65	7.06	6.67	6.58	4.21	3.45	3.21	3.94	5.57
1975	6.02	7.05	6.72	5.97	7.55	8.93	20.6	28.6	15.1	9.96	8.15	8.37	11.1
1976	9.67	10.3	10.3	9.41	9.81	10.7	19.3	17.5	10.1	7.38	7.60	8.17	10.8
1977	8.80	8.76	7.73	8.26	8.88	7.80	12.4	6.39	3.14	2.27	2.19	3.61	6.67
1978	5.74	8.17	8.01	6.96	6.44	7.56	8.14	7.45	4.51	3.81	3.15	3.83	6.15

Figure 4-11. Watershed Map

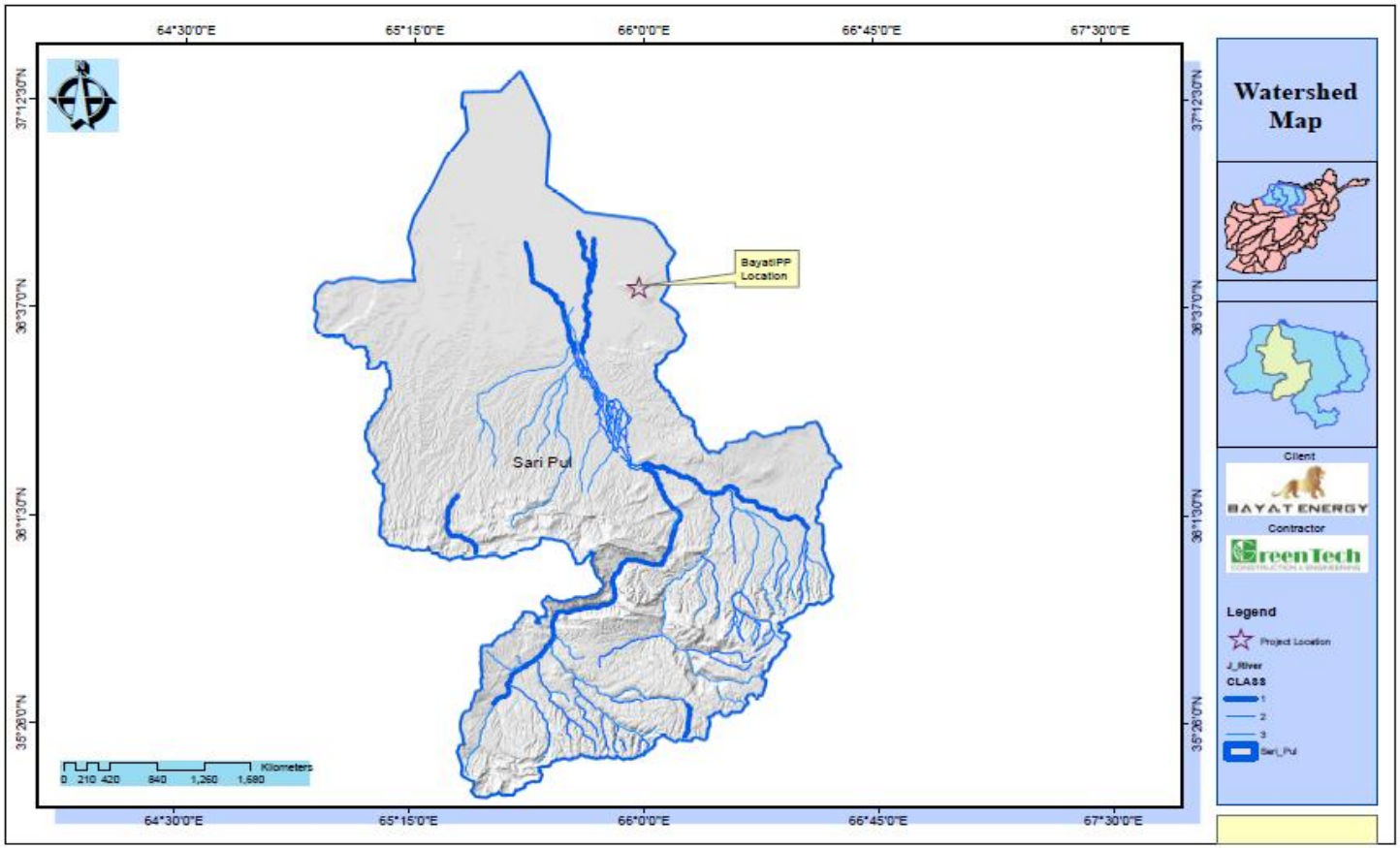


Figure 4-11 Watershed of Study Area

Groundwater

The aquifer systems in this region are characterized by large capacity springs that form the headwaters of many rivers and streams that drain the northern flanks of the Hindu Kush range. Consolidated Bedrock units consist principally of crystalline and igneous rocks and sedimentary rocks such as sandstones, siltstones, and conglomerates. The Sar-e-Pul River valley is filled with alluvial proluvial deposits saturated with fresh water (sand gravel, cobbles and boulders) from Sar-e-Pul to Sheberghan. The Qarakent groundwater pumping station located in the lower Sar-e-Pul River valley about 10 km south of Sheberghan, provides water for the Gerqudug and Khaja Gergudug gas treatment plants, as well as for domestic supply. Groundwater resources, where present, are likely Quaternary aquifers recharged in the foothills by rivers and streams descending from the high mountains and infiltrating into coarse grained alluvial fans. In addition, there may be infiltration of water into the aquifers through the bed of the Sare-Pul River and from irrigation channels along the Sar-e-Pul valley. Based on this interpretation, groundwater resources are likely limited to areas immediately surrounding the Sar-e-Pul River.

4.3.3 Field Observation, Sampling and Measurement

Surface water and groundwater sample collection and analysis program including an air quality and noise assessment survey, was conducted to document baseline conditions in and around the proposed Project site. Samples were collected, observed and documented in fieldwork notebooks with still photographs attached.

Surface and Groundwater Sampling

Water sampling (Figure 4-12) and analysis was undertaken to understand the overall baseline water quality characteristics of the surface and groundwater in the study area. Samples had taken from representative selected water body and groundwater sources representing different parts of the study area.

The surface water sampling was collected from the Sari Pul River which is adjacent to the power plant. Groundwater sampling locations were selected to obtain a representative water sample from various zones within the study area. The samples were collected from existing ground water sources. A total of four (4) samples, two (2)

surface water and two (2) ground water samples were collected. Detail of the sampling location is provided in the following tables.

Surface water samples were collected and sent to the Green Tech Co. Chemical-laboratory in Kabul for analysis. The results are provided in Tables 4-14, 4-15,4-16, and 4-17. These surface water samples from the Sar-I Pul River and Shoraroq cannal were collected.

Figure 4-12 Surface and groundwater sampling

Water Quality

The quality of a groundwater sample and surface water sample from the study area was analyzed in the Kabul lab. The following tables show the results of water testing.

Table 4-14 Ground water quality report

Analytical Report							
Project:**zir-zamini** Company:					sample no : **18-147**		
Type of Sample: water ☒ wastewater ☐ Sample Source: well ☐ Surface Water ☐					Sampling Date:**04/11/2018**		
Chemical analysis							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	8.18	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Conductivity	1855	µs/cm	D1125-91		2510 B	-	-
Salinity	0.94	%	-		2520 B	-	-
Total Dissolve Solid (TDS)	935	mg/l	D5907-10		2540 C	1000	1000
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Chloride	92	mg/l	D512-10		4500-Cl C	250	250
Copper	0.03	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Hardness	688	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	69.0	mg/l	D511-09		3500-Ca	75	-
Magnesium	96.2	mg/l	D511-09		3500-Mg	30	-
Iron, Total	0.06	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Nitrate	2.8	mg/l as $N\text{-}NO_3$	D3867-09	300.1	4500-NO_3-D	10	10
Total Alkalinity (pH 4.5)	514	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	514	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Sulfate	260	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Potassium	8.6	mg/l	D4192.08		3500-K C	10	50

Microbiological Test		
Test	Result	Method
Total coli form	0 MPN/100mL	Standard Methods-9221
Fecal coli form	Absent	Standard Methods-9230
E-coli	Absent	Standard Methods-9223 F
MCL-Maximum Contaminant Level drinking purpose.		

Remarks:
Total hardness is 188 units more than ANSA/WHO Standards.

Table 4-15 Ground water quality report.

Analytical Report							
Project:**Maktab** Company:					sample no : **18-147**		
Type of Sample: water ☒ wastewater ☐ **Sample Source:** well ☒ Surface Water ☐					Sampling Date:**04/11/2018**		
Chemical analysis							
Test	**Result**	**Unit**	**Method**			***MCL as Per ANSA**	***MCL as Per WHO**
			ASTM	**EPA**	**Standard method**		
Physical Test							
PH	7.20	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Conductivity	5040	µs/cm	D1125-91		2510 B	-	-
Salinity	2.71	%	-		2520 B	-	-
Total Dissolve Solid (TDS)	2690	mg/l	D5907-10		2540 C	1000	1000
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Chloride	201	mg/l	D512-10		4500-Cl C	250	250
Copper	0.49	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Hardness	2356	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	105.4	mg/l	D511-09		3500-Ca	75	-
Magnesium	78.9	mg/l	D511-09		3500-Mg	30	-
Iron, Total	0.15	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Nitrate	0.7	mg/l as $N\text{-}NO_3$	D3867-09	300.1	4500-NO_3-D	10	10
Total Alkalinity (pH 4.5)	346	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	346	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Sulfate	1800	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Potassium	40	mg/l	D4192.08		3500-K C	10	50
Microbiological Test							
Test		**Result**			**Method**		
Total coli form		27 MPN/100mL			Standard Methods-9221		
Fecal coli form		Present			Standard Methods-9230		
E-coli		Present			Standard Methods-9223 F		
MCL-Maximum Contaminant Level drinking purpose.							
Remarks: TDS, Total hardness, Calcium, Magnesium and sulfate concentration are more than ANSA/WHO standards. Microbiological test is failed. (Total Coliform, Fecal Coliform and E-Coli are present)							

Table 4-16 Surface water quality analysis

Analytical Report							
Project:Shor-Aroq Company:						sample no : 18-147	
Type of Sample: water ☒ wastewater ☐ Sample Source: well ☐ Surface Water ☒						Sampling Date:04/11/2018	
Chemical analysis							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	8.14	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Conductivity	779	µs/cm	D1125-91		2510 B	-	-
Salinity	0. 38	%	-		2520 B	-	-
Total Dissolve Solid (TDS)	381	mg/l	D5907-10		2540 C	1000	1000
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Chloride	44	mg/l	D512-10		4500-Cl C	250	250
Copper	0.09	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Hardness	306	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	77.7	mg/l	D511-09		3500-Ca	75	-
Magnesium	27.1	mg/l	D511-09		3500-Mg	30	-
Iron, Total	0.03	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Nitrate	3.3	mg/l as $N\text{-}NO_3$	D3867-09	300.1	4500-NO_3-D	10	10
Total Alkalinity (pH 4.5)	202	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	202	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Sulfate	97	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Potassium	5.5	mg/l	D4192.08		3500-K C	10	50
Microbiological Test							
Test	Result				Method		
Total coli form	50 MPN/100mL				Standard Methods-9221		
Fecal coli form	Present				Standard Methods-9230		
E-coli	Present				Standard Methods-9223 F		
MCL-Maximum Contaminant Level drinking purpose.							
Remarks: Microbiological test is failed. (Total Coliform, Fecal Coliform and E-Coli are present)							

Table 4-17 Surface water quality analysis

Analytical Report							
Project:Daria- Sar-e- Pol Company:					sample no : 18-147		
Type of Sample: water ☒ wastewater ☐ Sample Source: well ☐ Surface Water ☒					Sampling Date:04/11/2018		
Chemical analysis							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	8.06	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Conductivity	649	µs/cm	D1125-91		2510 B	-	-
Salinity	0. 32	%	-		2520 B	-	-
Total Dissolve Solid (TDS)	316	mg/l	D5907-10		2540 C	1000	1000
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Chloride	35	mg/l	D512-10		4500-Cl C	250	250
Copper	0.10	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Hardness	261	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	68.5	mg/l	D511-09		3500-Ca	75	-
Magnesium	21.8	mg/l	D511-09		3500-Mg	30	-
Iron, Total	0.02	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Nitrate	4.0	mg/l as $N\text{-}NO_3$	D3867-09	300.1	4500-NO_3-D	10	10
Total Alkalinity (pH 4.5)	162	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	162	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Sulfate	85	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Potassium	4.9	mg/l	D4192.08		3500-K C	10	50
Microbiological Test							
Test		Result			Method		
Total coli form		70 MPN/100mL			Standard Methods-9221		
Fecal coli form		Present			Standard Methods-9230		
E-coli		Present			Standard Methods-9223 F		
MCL-Maximum Contaminant Level drinking purpose.							
Remarks: Microbiological test is failed. (Total Coliform, Fecal Coliform and E-Coli are present)							

Air Quality

During the monitoring, the priority pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM_{10}) were monitored and the results are provided in Tables 4-18, 4-19, and 4-21.

Figure 4-13 Air sampling

Table 4-18 Air Quality Analysis

Location:		**36° 41' 33'' 65° 58' 30''**					
Parameter	**Averaging period**	**Ambient Air Quality Standards**			**Test Result**		
		ANSA µg/m3	**WHO µg/m³**	**IFC µg/m³**	**Test 1**	**Test 2**	**Test 3**
NO2	1-year	40	40 (guideline)	10 (25 % of guideline) *	-	-	-
	24-hour	80	-	-	66.2	69	73.15
	1-hour	-	200 (guideline)	50 (25 % of guideline) *	-	-	-
SO2	24-hour	50	125 (Interim target-1) 50 (interim target-2) 20 (guideline)	31.25 (25 % of interim target 1)*	53	45.99	47.48
	10-min	-	500 (guideline)	125 (25% of guideline)*	-	-	-
PM10	1-year	70	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)	-	-	-	-
	24-hour	150	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)	-	133.55	169	123
PM2.5	1-year	35	35 (Interim target-1) 25(Interim target-2) 15 (Interim target-3) 10 (guideline)	-	-	-	-
	24-hour	75	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)	-	69.52	63	33.5

**Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed. (US EPA Prevention of Significant Deterioration Increments Limits applicable to non-degraded airsheds.)*

Table 4-19 Air Quality Analysis

Location:		**36° 41 35'' 65° 58' 42''**					
Parameter	**Averaging period**	**Ambient Air Quality Standards**			**Test Result**		
		ANSA µg/m3	**WHO µg/m³**	**IFC µg/m³**	**Test 1**	**Test 2**	**Test 3**
NO2	1-year	40	40 (guideline)	10 (25 % of guideline) *	-	-	-
	24-hour	80	-	-	78	87.12	63.03
	1-hour	-	200 (guideline)	50 (25 % of guideline) *	-	-	-
SO2	24-hour	50	125 (Interim target-1) 50 (interim target-2) 20 (guideline)	31.25 (25 % of interim target 1)*	184.3	166.51	152.47

	10-min	-	500 (guideline)	125 (25% of guideline)*	-	-	-
PM10	1-year	70	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)	-	-	-	-
	24-hour	150	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)	-	95.763	47.570	42.108
PM2.5	1-year	35	35 (Interim target-1) 25(Interim target-2) 15 (Interim target-3) 10 (guideline)	-	-	-	-
	24-hour	75	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)	-	40.48	40.4858	41.606

Table 4-20 Air Quality Analysis

Location:				**36° 41' 37'' 65 58' 46''**			
Parameter	**Averaging period**	**Ambient Air Quality Standards**			**Test Result**		
		ANSA µg/m3	**WHO µg/m³**	**IFC µg/m³**	**Test 1**	**Test 2**	**Test 3**
NO2	1-year	40	40 (guideline)	10 (25 % of guideline) *	-	-	-
	24-hour	80	-	-	54.3	82.11	74.37
	1-hour	-	200 (guideline)	50 (25 % of guideline) *	-	-	-
SO2	24-hour	50	125 (Interim target-1) 50 (interim target-2) 20 (guideline)	31.25 (25 % of interim target 1)*	102	163.22	155.601
	10-min	-	500 (guideline)	125 (25% of guideline)*	-	-	-
PM10	1-year	70	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)	-	-	-	-
	24-hour	150	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)	-	169.01	169.906	49.875
PM2.5	1-year	35	35 (Interim target-1) 25(Interim target-2) 15 (Interim target-3) 10 (guideline)	-	-	-	-
	24-hour	75	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)		164.935	33.81	65.675

Noise

Noise levels exceeding 85 dB are generally harmful to human health. Excessive noise levels damage the eardrum and very high noise levels damage human lungs. Continuous exposure to excessive noise causes depression and can damage the nervous system. The sound levels were monitored at the Project site using a portable digital sound meter (Table 4-22).

Figure 4-14. Noise level of study area

Table 4-21 IFC Noise guideline

Receptor	IFC Guideline	
	Daytime (07-22:00)	Nighttime (22:00-07:00)
Residential, institutional; educational	55	45
Industrial; commercial	70	70

Table 4-22 Noise Level of Project site

Distance (m)	Noise Level (dB)
0	75.6
100	65.3
500	55
1000	53.2

Land Use

Land use/cover inventories are an essential component in land resource evaluation and environmental studies due to the changing nature of land use patterns in the study area. Land use within the vicinity of the Bayat IPP and surrounding area are open land. Also, there is two industrial facilities are existed near the Bayat IPP, and the settlements are located about 5, 10, and 15 km for from the project site. Open land is generally used for animal herding activities (primarily cattle, goats and sheep).

The land use study for the proposed power plant and area within its 5, 10, and 15 km buffer was undertaken with the following objectives:

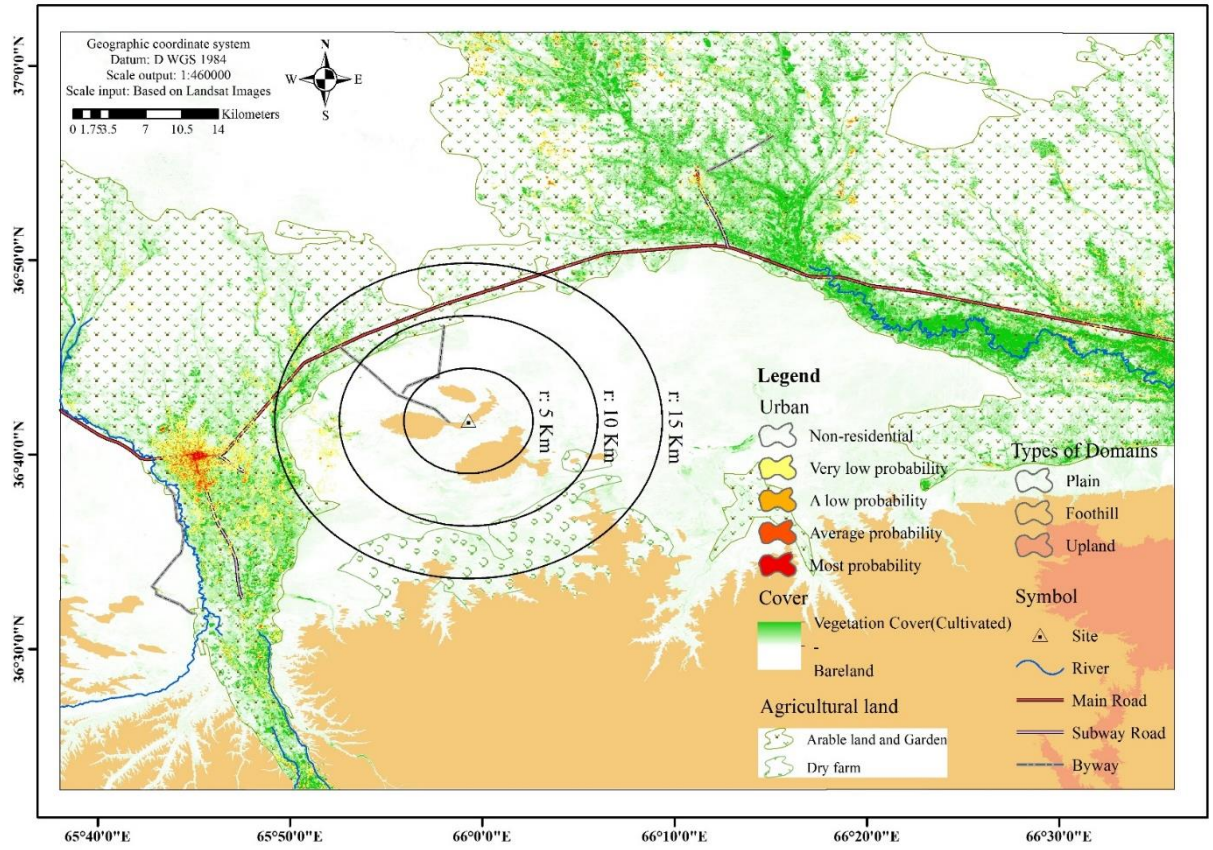
- To study the land use/cover in the 15 km radius area of the proposed power plant site and provide inputs for environmental planning of the proposed plant by analyzing the existing land use/land cover scenario;
- To establish the existing land use of project site using a Landsat data for incorporation of thematic information on the different physical features including drainage and water bodies, settlements, and transport networks.
- To identify and map land cover, drainage and the streams in the study area.

The detail of land use of in the 5, 10, and 15 km radios are presented in the following table and figure.

Table 4-23 The land use of project area within in the 5, 10, and 15 km radios

River(Km)			Road(Km)			Agricultural land(Km^2)		Types of Domains(Km^2)				
Segment's	Area	River (Length) m	Main Road	Subway Road	Byway	Arable land and Garden	Dry farm	Upland	Foothill	Plain	Urban Area	Vegetation Cover (Cultivate)
Project (Km^2)	6221.5	163.1	96	24.8	43.7	2287.6	186.9	129.7	1435.8	4655.9	106.640	1695.730
%	100	100	100	100	100	100	100	100	100	100	100	100
r: 15 (Km)	707.222	0	23.2	0	2.2	98.851	83.410	0	2.018	705.203	1.355	71.640
%	11.367	0	24.166	0	5.034	4.321	44.628	0	0.1405	15.146	1.270	4.224
r: 10 (Km)	314.418	0	0	0	12.5	6.168	0.822	0	10.075	304.343	0.091	6.642
%	5.0537	0	0	0	28.604	0.269	0.440	0	0.7017	6.5367	0.085	0.391
r: 5 (Km)	78.594	0	0	0	10.8	0	0	0	24.576	54.017	0.0171	0.025
%	1.263	0	0	0	24.713	0	0	0	1.711	1.160	0.0161	0.0015

Figure 4-15. The land use of project area within in the 5, 10, and 15 km radios



4.3.4 Biological Condition

This section deals with the methodology for biodiversity assessment of Flora (tree, shrubs, and herbs) and Fauna (birds, reptiles, amphibians, mammals) as well as the surrounding ecosystems. Most of the field work within the Project study area addressed these groups although each group was dealt with different approaches and requirements. A four-person multidisciplinary team was organized to deal with these various aspects. The status of the flora and fauna of the study area (both terrestrial and aquatic environments) was determined by:

- Reconnaissance survey of Project area and surrounding area
- Interviews and discussion with local informants
- Review of IUCN-Afghanistan Red Data Book relevant to the area, and
- Through different secondary sources.

Fauna

In Afghanistan, many factors such as loss of forest cover, soil erosion, desertification, pollution from trans-boundary air-borne particulates, agriculture and industry and the steady drainage of wetlands in the quest for more fertile arable land, have disturbed the natural environment of the wild animals and plants. In addition, Afghanistan has a culture in which the collection of plants, trapping of birds for the caged bird trade, and hunting of birds and animals are unregulated, resulting in excessive removal and even in some cases in extermination of the animal and plant species. Animal skins, including those of internationally protected or endangered species such as tigers, leopards, foxes and jackals, are traded daily in the markets all over the country. Recently, trade in birds of prey like eagles and falcons has become a common practice, endangering the overall existence of some of these species endemic to the Hindu Kush. Pleasure hunting of gazelles, mountain goats and other mammals by foreigners is another business that is unregulated and encouraged by warlords and profit seekers.

Using explosives for fishing or so-called dynamite fishing is another trend that has become very popular during the past 22 years and is common practice all over the country. This not only endangers the population of endemic fish species of the

mountain streams, but threatens the life and the existence of many other species of animals that live in or around the waters.

All these activities together contribute to the sharp decline in numbers of animals and plants and a contraction in their ranges, with the result that a disturbing number should be listed as endangered. The most important task for the Afghans and concerned parties should be to immediately put an end to these irresponsible and rootless practices. Taking a holistic view, wildlife in Afghanistan is endangered to an unprecedented extent; a problem that has to be addressed by a joint effort of national and international institutions.

During the site surveys conducted as part of this study, there were insects, rodents and a few small mammals that are known in the area and that have been observed in the vicinity of the site. The majority of animals in the study area are domesticated livestock and poultry.

Birds (Avifauna)

The study area is mixed land with barren land. This vegetation is supporting the bird species for their nesting in the study area. Some common birds were seen during the field visit. A total of about 10 bird species were observed within the study area.

Figure 4-16 Rare birds in Sheberghan

Mammals

Some wild and domestic mammal species were observed during the site survey as represented in below figures.

Figure 4-17 Domestic Mammals in Sheberghan

Flora

The diversity of the geographical environment of Afghanistan has created a variety of ecological conditions that have evolved over time. Historically, the Project area was native grassland however land use and climate change have altered the natural landscape. Several factors such as depth, temperature, moisture and type of soil affect the vegetative conditions supporting flora. The northern plains region of the country is primarily subtropical steppe that support semi-desert plants such as AlhagiCanolrum, SaliconicumHaloxycon, MaritinaArtomisia, Acacia Modosta, ColotropisProcora and ViscosaDodonaoa and Ziziphus jujube. Based on temperate weather and annual rainfall levels the Project area has a great variety of vegetation, however the vicinity of the site is limited to native grasses and shrubs that emerge following the onset of the spring wet season.

Fruit Trees

Jowzjan Province is very rich with natural resources in particular with potential that exists in the province for Agriculture, Livestock, Fishery, Poultry, and Forestry. The important trees in Sheberghan that bears fruits are Grape, Walnut, Apple, mulberry, Common fig, Apricot, Nectarine, Prune, plum, Peach, Lemon, Orange, Bitter Orange, Almond. The vegetation pattern of Sheberghan is closely related to the topographic, soil features and climatic conditions. Due to varied geographical features, there is no orchard and environmentally sensitive places in the Project area; therefore, no orchards and agriculture lands will be affected.

Medicinal Plants

Medicinal plants including short grasses and short leaved forbs appear in the spring after the rains around Sheberghan City. They consist of different sorts as following: Cinnamon, Plantago major, Eremurus, Merendera, Gagea, Absinthium, Cousinia, Lactucaorientlisboiss, Alhagi, Astragalus, Arundo and Thymus. Their growth activity is restricted to the brief moist period, which lasts for about 4- 8 weeks during they complete their life cycle and set seeds before the dry period starts. These have high ecological amplitude and grow on a variety of ecologically different sites.

Figure 4-18 Medical Plants observed around the Project site

Grasses and Shrubs

Grasses and shrubs grow in monsoon and spring season and cover all hill slopes of the Sheberghan district and its vicinity. Some of them are aquatic plants and natural vegetation that are palatable for livestock. These grasses and shrubs include: Phragmitesaustralis, Chara, Tulip, Brassica, Thistle, eremurus, merendera, absinthium, Plantago major, gagea, cousinia, alhagi, astragalus, arundo and etc.

Figure 4-19 Shrubs plant of study area

Agriculture and Orchards

Agriculturally, the northern plains are able to produce winter clovers, alfalfa (Medicago sativa) and shaftal (Trifoliumresupinatum) and hay-making is common for winter feed production of small ruminants. Irrigation of riparian and near-river areas is common with orchards complimenting cereals and vegetable production. Where irrigated and tended nearby villages, mulberry, poplars, Russian olive (Elaeagnus sp.)

and Ailanthus trees are found. The northern region retains numerous biogeographically indigenous fruit and nut trees. Native and introduced varieties of pomegranate, walnut, apple, mulberry, fig, apricot, nectarine, prune, plum, peach, lemon and almond are grown locally. The vegetation pattern of Sheberghan City is closely related to the topographic relief, soil features and climatic conditions. No forested, agricultural areas or orchard are located on or immediately adjoining the Project area; therefore, no agriculture lands will be affected.

Figure 4-20 Agriculture plant of Sheberghan

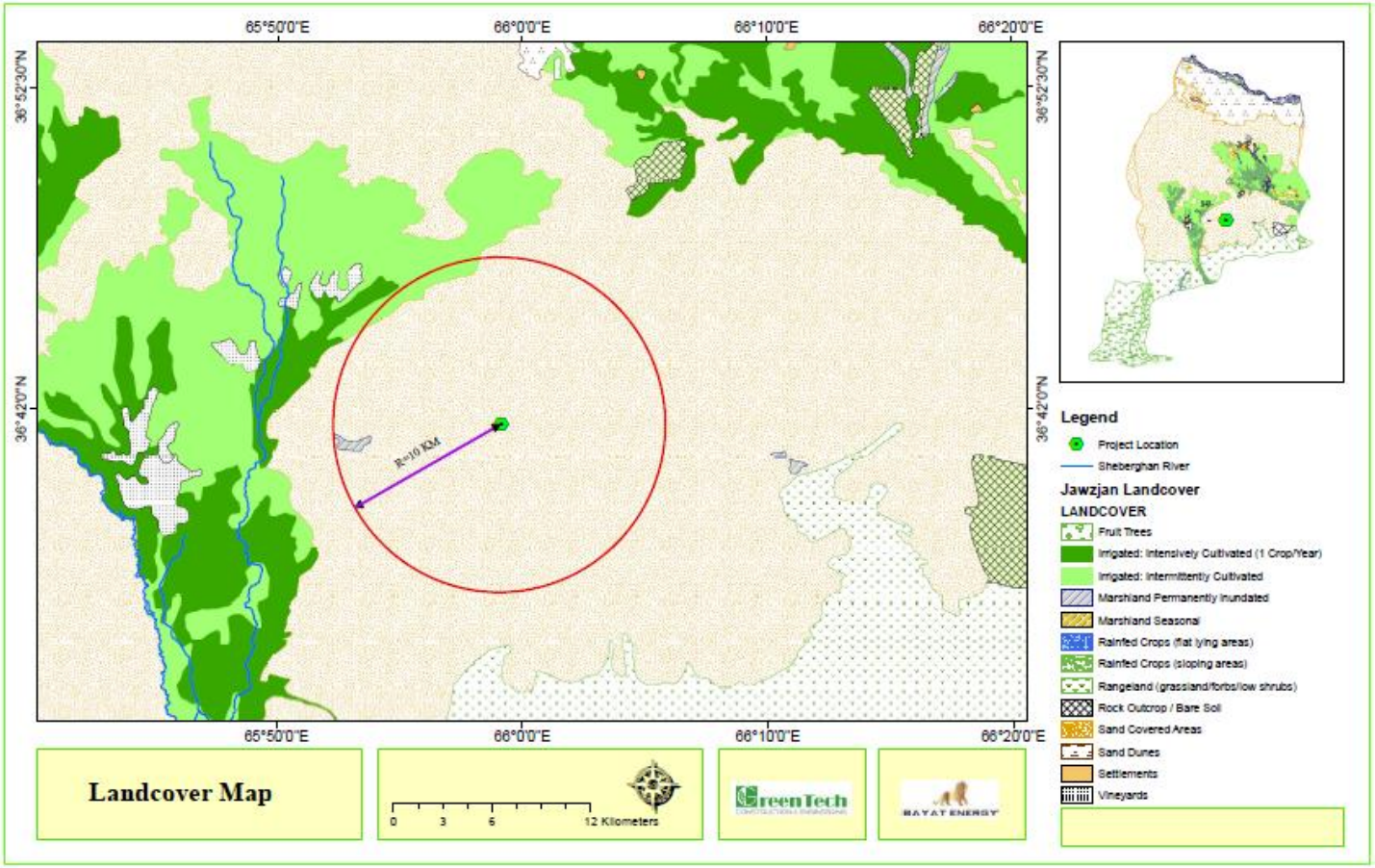


Figure 4-21 Landover of Project site

Biodiversity

The World Database of Key Biodiversity Areas™ hosts data on Key Biodiversity Areas (KBAs). This database can support strategic decisions on protected areas by governments or civil society. It also guides the identification of sites under international conventions and in the setting of private sector policies and standards. The database is managed by the KBA Partnership, which comprises 11 founding partners and is served by the KBA secretariat hosted jointly by Bird Life International and IUCN.

Sites qualify as global KBAs if they meet one or more of 11 criteria, clustered into five categories:

- threatened biodiversity;
- geographically restricted biodiversity;
- ecological integrity; biological processes; and,
- Irreplaceability.

The KBA criteria can be applied to species and ecosystems in terrestrial, inland water and marine environments. Although not all KBA criteria may be relevant to all elements of biodiversity, the thresholds associated with each of the criteria may be applied across all taxonomic groups (other than micro-organisms) and ecosystems. Afghanistan has 16 sites that are documented KBAs. The closest KBA to the Project site is Imam Sahib (37o 15' 0" N, 68o 49' 59" E) located approximately 180 km northeast along the Amu Darya river and is not expected to be impacted by the Project.

NEPA, with help from the Wildlife Conservation Society, Kabul University, and the Ministry of Agriculture, Irrigation and Livestock, created the Afghanistan Wildlife Executive Committee (AWEC) to facilitate the listing process for protected species. NEPA's job includes managing these protected species by writing up recovery plans for the threatened species. They re-evaluate the species every five years to see if the populations have recovered to the point where they can be removed from the protected species list. The 33 species on the list, include 20 mammals, seven birds, four plants, an

amphibian and an insect, and all are protected against illegal hunting or harvest. According to the IUCN, seven of these species have ranges overlapping the vicinity of the Project site. Information provided by the IUCN on the status of these species is provided below:

Gray wolf (Canis lupus). Although the Grey Wolf still faces some threats, its relatively widespread range and stable population trend mean that the species, at global level, does not meet, or nearly meet, any of the criteria for the threatened categories.

Saker falcon (Falco cherrug). This species has been uplisted to Endangered because a revised population trend analysis indicates that it may be undergoing a very rapid decline. This negative trend is a result of a range of anthropogenic factors including electrocution on power lines, unsustainable capture for the falconry trade, as well as habitat degradation and the impacts of agrochemicals, and the rate of decline appears to be particularly severe in the species's central Asian breeding grounds.

Eastern barbastelle (Barbastellaleucomela). This species is listed as Least Concern. Although it seems to be rare, it is very widespread and is unlikely to be declining fast enough to qualify for listing in a more threatened category.

Blanford's fox (Vulpescana). This species is listed as Least Concern as available evidence suggests that Blanford's Fox has a relatively wide distribution albeit largely confined to mountainous regions. It is fairly common in some parts of its range, and while the species may possibly be undergoing some localized declines, there is at present no evidence to suggest any range-wide decline that would meet the thresholds for a threatened category or for Near Threatened.

Eastern imperial eagle (Aquila heliaca). This species has a small global population, and is likely to be undergoing continuing declines, primarily as a result of habitat loss and degradation, adult mortality through persecution and collision with powerlines, nest robbing and prey depletion. Estimated range covers approximately 15,400,000 km2.

Marbled teal (Marmaronettaangustirostris). This species appears to have suffered a rapid population decline, evidenced in its core wintering range, as a result of widespread and extensive habitat destruction. It therefore qualifies as Vulnerable. Estimated range covers approximately 14,600,000 km2.

Sociable lapwing (Vanellus gregarious). This species is listed as Critically Endangered because its population has undergone a very rapid reduction, for reasons that are poorly understood but are likely to be at least partly due to hunting along the migration flyway. Estimated range covers approximately 1,670,000 km2.

4.4 Social-Economic Conditions

4.4.1 Survey Methodology

The following specific assessment methods have been used during the survey;

1. **Public Consultation**. Public meetings provide an opportunity to consult large numbers of people. Meetings had organized to allow for small group discussions with oral feedback. There were often opportunities for participants to set or influence the agenda and to ask questions. The consultation was also to obtain background information relevant to impact assessment and environmental management and, in particular, to identify any areas of specific concern which needed to be addressed. Finally, the purpose of the consultation was to reaffirm free, prior, and informed consultation leading to broad community support for the project. Additional public consultations were conducted during the preparations of the present project. Before each meeting, all villages around the project area were informed about the meeting, date and place of the meeting. Due to security problems and according to the recommendation of Sheberghan Commander, meetings were held in Sheberghan city and transportation costs were given to the participants. During the meetings, attendees were informed about type and duration of the project, the scope of the project and the ways of complaining people from the project or workers. Also, two GRCs (male and female GRCs) were conducted by transparent elections during these public consultations.

2. **Focus Groups**. Focus groups allow people to discuss their ideas in an open and relaxed atmosphere. Workshops can take a variety of formats. They can be designed to exchange information; to discuss the strengths, weaknesses, opportunities and threats of an idea or project; to obtain ideas and innovative thinking for a way forward for a project; or they can be specifically geared towards prioritization and the production of an action plan. Focus groups by contrast are designed to specifically concentrate on a single issue or a program of topics.

   We have held ten Focus Groups with different people of the society In Sheberghan city and we tried to find out the views of all groups in the context of the Bayat Power IPP. The FGDs consists of the majority of communities of Sheberghan's urban and rural people and it is found in all kinds of people groups.

   To identify the type of FGDs, we used “Quota Sampling”. Quota sampling is a non-probability sampling technique wherein the assembled sample has the same proportions of individuals as the entire population with respect to known characteristics, traits or focused phenomenon. By this method, we divided the stakeholders into ten groups (FGDs).

   We used a “Snowballing Sampling” to select FGD’s members and we chose 12 people for each FGD. Snowball sampling uses a small pool of initial informants to nominate, through their social networks, other participants who meet the eligibility criteria and could potentially contribute to a specific study. The term "snowball sampling" reflects an analogy to a snowball increasing in size as it rolls downhill.

   Each FGD had a questionnaire that asks some information such as the current electricity, the project's benefits, project losses, the challenges facing the project from their point of view, the environmental problems that the project may cause, and their suggestions for better project implementation.

3. **Household Surveys (Questionnaire**). Questionnaire surveys can be undertaken to identify the needs and views of a large number of people in a standard format.

The main stages involved are: defining the sample size and the type of information required; deciding on the type of survey to be used (postal, drop and collect, telephone or interview); survey design; piloting the survey; undertaking the survey and post-completion analysis of the results. It is often best to use a short and concise questionnaire. In this project we used a socio-economic questionnaire (Annex 11) and 45 respondents have been interviewed and basic information on the profile of their households was collected.

Regarding lack of the systematic urban system and lack of addresses and house numbers, the distribution of the affected people and large populations of the studied area, we were not able to use a systematic research method, and for this project we used a randomized research method. Because in the randomized research method, all people who will study, have the same chance of being interviewed, and this method has scientific value in irregular urban societies. Respondents were randomly selected from Sheberghan city as well as villages close to the project.

4. **Interview**. Interviews are key qualitative data collection methods for social research. There are many reasons to use interviews for collecting data and using it as a research instrument. They are mainly useful in cases where there is a need to attain highly personalized data, as well as in cases where there are opportunities for probing to get underlying factors. They also become a viable option where there are limited respondents and a good return rate is important. In this method, we identified the directories that will be affected by the Bayat Power IPP, and then we interviewed each of them individually. 20 directories were interviewed by specific questionnaire for each directorate and we put the information that we had taken from directories, in the relevant sections in the report.

4.4.2 Overview

The 2017/2018 population of Afghanistan is estimated to be 29.7 million, however no national census has been conducted post-1979 due to war and conflict. In the northern

region the population is comprised of several of the country's 14 major ethno linguistic groups and includes Hazara, Pashtun, Tajik, Turkmen and Uzbek. According to 2011-12 poverty assessment data 31.6% of the Afghan population was poor (living on levels of expenditure insufficient to satisfy basic food and non-food needs).[23] In addition, disparities in poverty are more directly influenced by regional differences in international aid and vulnerability to weather related shocks than to the rural/urban divide. With regard to Northern Afghanistan the northeast provinces of Badakshan, Baghlan and Kunduz are considered lagging in terms of poverty alleviation compared with the northern provinces of Balkh, Jowzjan and Samangan.

At the national level, the majority of the population is rural and roughly one quarter of rural Afghans are landless, relying on intermittent farm labor for survival. Village population sizes vary widely between 3 and 30,000 with a mean village population size of 481. The average household size is 6.3 members. The system of land ownership is often complex and exposes inequalities along ethnic and tribal/clan lines that date back centuries or longer. Land ownership in the northern region was evenly distributed between state-owned land, privately owned land and common land. The majority of households in northern Afghan communities are either landless or small-scale farmers operating farms between 0.2 and 1 ha in size (less than one-third of farmers owned land greater than 1 ha in area).[24]

With regard to gender, while women account for approximately 43% of the agricultural labor force, they suffer extreme social and economic disparity in terms of access to inputs, outputs and markets. Traditionally, men are more involved with cash crop production and seasonal farm labor while women maintain the sustenance-based household plots, care

[23] The World Bank. *Poverty Status Update, An analysis based on National Risk and Vulnerability Assessment (NRVA)*. 2007/08 and 2011/12.

[24] USAID Afghanistan Office of Agriculture and Office of Project and Program Development. *Preliminary Inventory and Assessment for Irrigation and Watershed Management in the North, South and West Regions of Afghanistan*. February 2015.

for small livestock and only occasionally access markets for income generation. Tackling disparity is complex due to the wide differences among women's roles based on age, ethnicity, region and socio-economic strata. Institutionalizing the role of women in decision-making is being addressed through support for policy reform and mainstreaming of inclusion-based strategies by international and government agencies.

Jowzjan province is located in northern Afghanistan and shares an international border with Turkmenistan to the north, Faryab to the west, Saripul province to the south and Balkh to the east. Jowzjan's economy is based on agriculture mostly located in the southern and central districts of the province due to the fertile soil and the vicinity to Sheberghan River. In the north, residents are occupied with raising livestock because of the presence of hills and mountains. Jowzjan is most famous for its karakul skins, carpets and wool.

4.4.3 Demography and Population

According to Central Statistics Organization, Jowzjan Province has an estimated population of 579,833 with 294,030 male and 285,803 females.[25] Around 78% of the population are rural and 22% are urban. The total population of Sheberghan is 184,964 people including 92,958 males and 92,006 females. People dialogue in Uzbaki, Dari, Pashto and Turkmani with Uzbaki being the dominant language spoken in the province.

Table 4-24 Gender Population Data

No	Districts	Rural			Urban			Total		
		Female	Male	Both Sexes	Female	Male	Both Sexes	Female	Male	Both Sexes
1	Sheberghan	47,193	48,529	95,722	44,813	44,429	89,242	92,006	92,958	184,964

[25] Central Statistics Organization, *Estimated Population of Afghanistan*, 2017 (http://cso.gov.af/Content/files/%D8%B1%DB%8C%D8%A7%D8%B3%D8%AA%20%D8%AF%DB%8C%D9%85%D9%88%DA%AF%D8%B1%D8%A7%D9%81%DB%8C/population/Final%20Population%201397.pdf)

2	Khwaja Dukoh	14,364	15,021	29,385	-	-	-	14,364	15,021	29,385
3	Khanaqa	12,568	12,838	25,406	-	-	-	12,568	12,838	25,406
4	Mingajik	22,827	24,008	46,835	-	-	-	22,827	24,008	46,835
5	Qush Tepa	12,566	13,095	25,661	-	-	-	12,566	13,095	25,661
6	Khamyab	7,438	7,831	15,269	-	-	-	7,438	7,831	15,269
7	Aqchah	28,085	29,143	57,228	13,318	13,384	26,702	41,403	42,527	83,930
8	Faizabad	22,186	23,238	45,424	-	-	-	22,186	23,238	45,424
9	Mardyan	20,776	21,312	42,088	-	-	-	20,776	21,312	42,088
10	Qarqin	9,234	9,501	18,735	4,155	4,278	8,433	13,389	13,779	27,168
11	Darzab	25,135	26,319	51,454	1,145	1,104	2,249	26,280	27,423	53,703
	Total	222,372	230,835	453,207	63,431	63,195	126,626	285,803	294,030	579,833

Household Composition, Structure and size

The household, rather than family, has been used as the unit of inquiry for gathering some of the primary socio-economic data in the nearby villages. The household, in this study, has been defined by the following:

- They live together and share or depend on a common source, to which one, two or more of the contribute, i.e.' eating from the pot'
- They accept the authority of one head; and
- They have lived together in this relationship for some time before this study. Staying together s not time specific, but none of the members of the household is a visitor who has come for a brief stay.

The typical household in the study area has a head who is the father or in the case of is demise, his wife or adult son. It comprises the father, mother and children.

4.4.4 Socio-Economic Baseline Study

Households are an important and fundamental socio-economic unit in Afghanistan, defined by group of persons living together and sharing a kitchen. Structured household questionnaires were used to gather information on household. Information such as age, village, status, occupation, education, language, resource of water they are using for drinking and for irrigation, common occupation, common disease in their area, status of electricity and resource of current electricity. This information was collected through interview with the mature member of the family or household head.

The study team obtained views and opinion of the key informants on project and social issues by meeting with central government officials particularly with the Information & Culture Directorate, Education Directorate, Urban Development and Land Directorate, Refugees and Repatriations Directorate, Municipality of Sheberghan, Statistics Organization Directorate, DABS, Environment Protection Directorate, Public Health Directorate, Commerce and Industry Directorate, Mines Directorate, Disaster Management Directorate, Rural Rehabilitation and Development Directorate, Public Works Directorate, Provincial Council, Women Affair's Directorate, Agriculture, Irrigation and Livestock Directorate, Labor, Social Affairs, Martyrs, and Disabled Directorate and Land Authority Directorate (ARAZI). The team also met provincial governor of Jawzjan provinces. The survey team also interviewed with one national and one international NGOs.

The study team conducted FGD in the Sheberghan in order to collect population's perspective about the project. The team conducted 10 FGDs with Religious Scholars, Civil Society, Employed Women, Housewives, Refugees and Repatriations, University's Students, Landowners & Farmers, Chiefs, Elders and Alley representative and University professors. The FGD also helped the study team to validate the survey data collected by the survey team.

Survey of Baseline Data

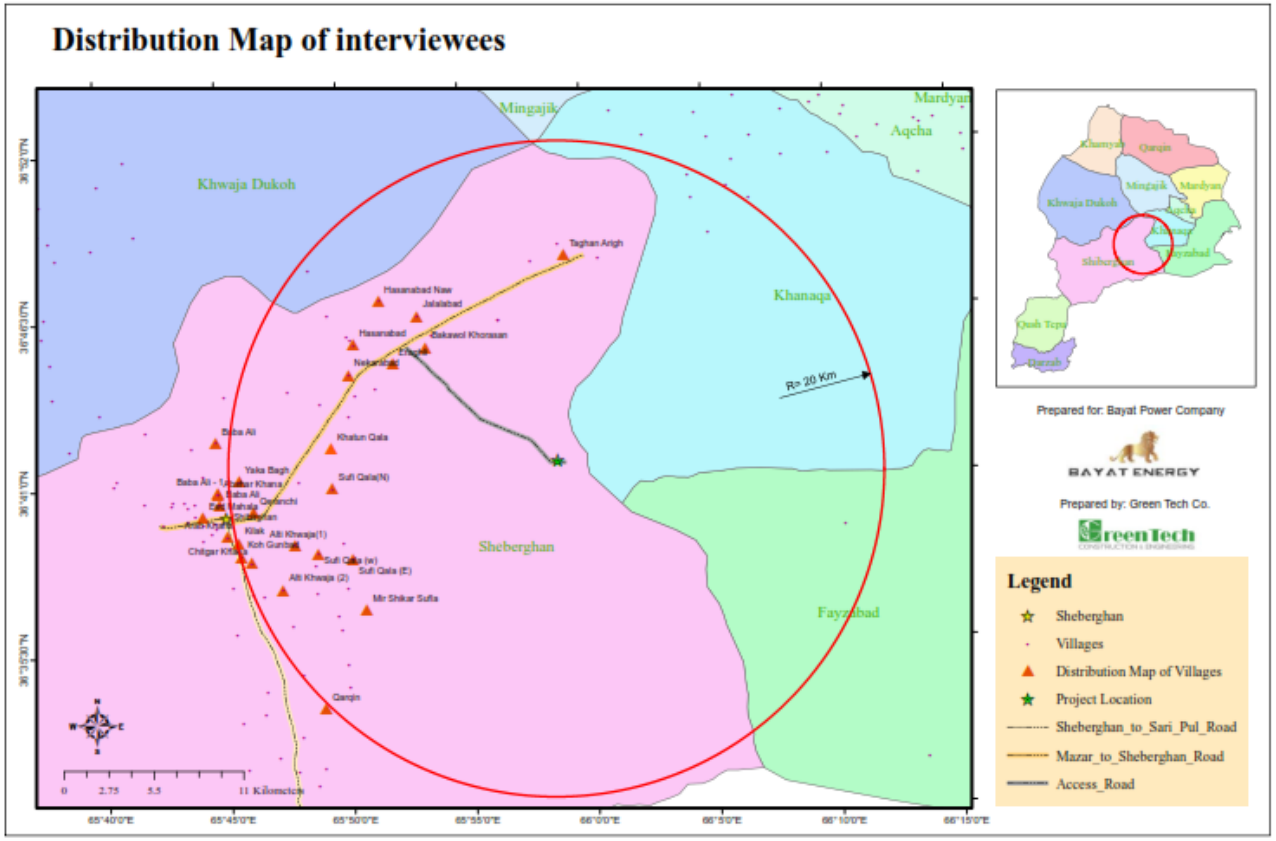
Data was collected In the Socio-Economic baseline study, on all major critical parameters on the affected families identified during the survey. This data will be used to derive the baseline estimates for the purpose of future evaluations. In the study area 12 villages/ districts were selected randomly for the survey. In total 45 households in the villages were interviewed for establishing baseline household data.

Table 4-25 No. of respondents, by village

S. No.	Village/District	No. of Respondents
1	District 1	10
2	District 2	8
3	District 3	5
4	District 4	8
5	District 5	2
6	District 6	2
7	Proje Jadid	2
8	Charm Garm Khana	1
9	Sufi Qala	2
10	Qezel Qush	1
11	Mirwais Mina	3
12	Hazar Family	1
Total		45

In addition to the household survey Focus Group Discussions (FGDs) and interviews of key informants were also conducted to collect information and understand the perspective of the community towards the project.

Figure 4-22. Coverage area of the survey



Profile of respondents

In all, 45 respondents have been interviewed and basic information on the profile of their households was collected a summary of the profile of respondents is provided below:

Table 4-26 No. of respondents, by gender

S. No.	Gender	(%) of Respondents
1	Female	**51**
2	Male	**49**
Total		**100**

49% respondents interviewed were male and 51% female respondents could be interviewed and it is worth mentioning that the number of males is more than female in FGDs.

Table 4-27 No. of respondents, by language

S. No.	Ethnicity	(%) of Respondents
1	Dari	**39**
2	Pashtu	**11**
3	Uzbiki	**40**
4	Turkmani	**10**
Total		**100%**

Majority of the respondent's language (40%) were Uzbiki, (39%) were Dari and (11%) were Pashtu.

Table 4-28 No. of respondents, by age group

S. No.	Age Group	No. of Respondents
1	Up to 30 years	**21**
2	31 to 50 years	**18**
3	51to 65 years	**6**
4	Above 65 years	**0**
Total		**45**

It was primarily attempted to interview the head of the households in order to obtain complete socio-economic information about the families. 21 respondents were in the age group of under 30, 18 respondents were 31 to 50 years and 6 respondents were from age 51 to 65 years.

Common Occupation

This study shows that the Sheberghan is well versed in diversity and people in this city earn a living in various jobs. The majority of people in Sheberghan are occupied by shop keeping, teaching, driving and farming.

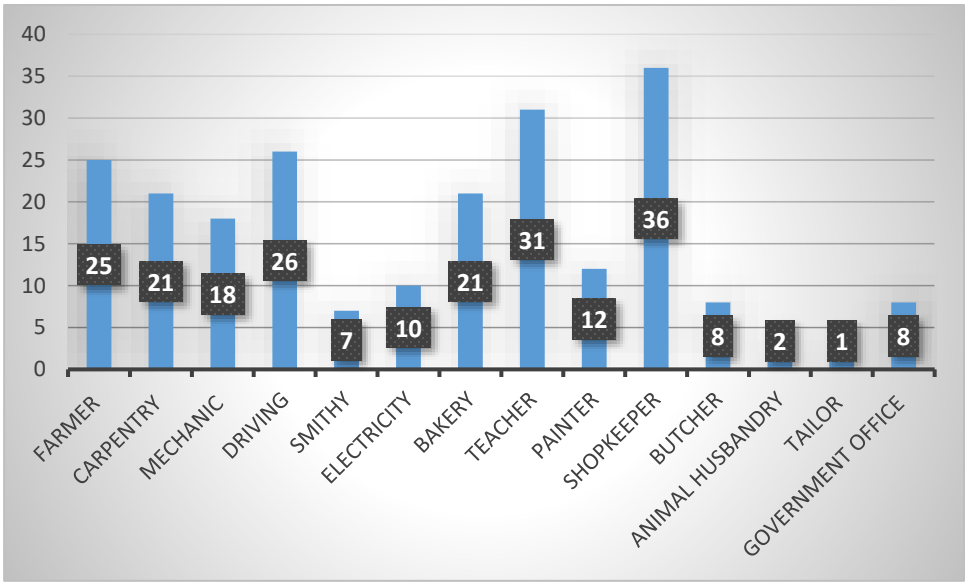


Figure 4-23 Common Occupation Sheberghan (ESIA team survey)

Education Level

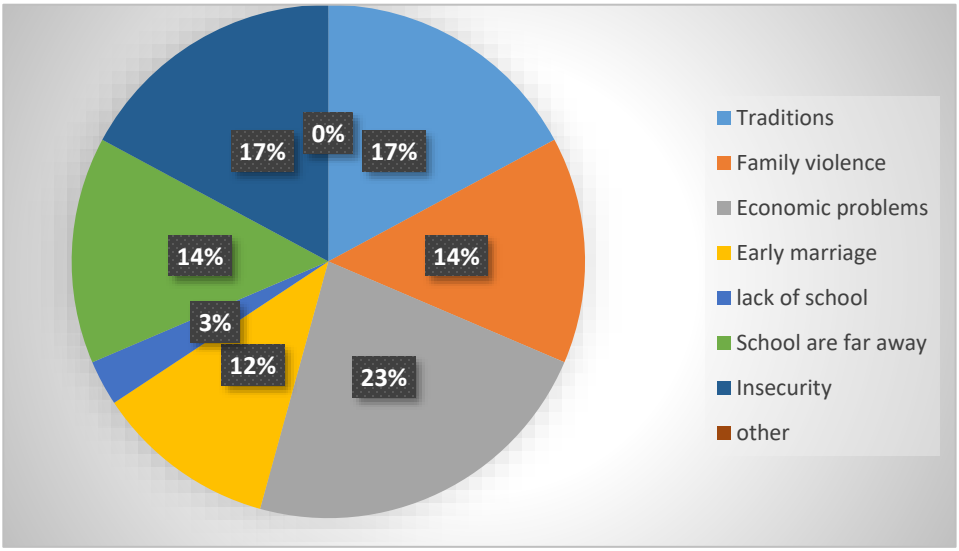
We studied the education level of our sample. Our studies were concentrated on the literacy level of the respondent and then we particularly concentrated on female education in the subject area.

Table 4-29 Education level of respondents

Education Background	Illiterate	Primary School	Baccalaureate	Bachelor's degree
No %	18	9	31	42

Although almost 89 percent of the respondent said that they have no problem with girls attending schools but there are still many factors affecting female education. Below graph shows the basic problems of the women of Sheberghan city and surrounding districts, the bad economic situation is one of the basic problems that deprives women of access to education. The ruling traditions in the community, family violence, early marriage, insecurity, and distance from the schools are the other causes that women in this province cannot access to education.

Figure 4-24 Reasons for not sending girls to schools (ESIA team survey)



4.4.5 Economic Conditions

The main occupation of the inhabitants is agriculture However, a few educated people are engaged in the government sector or private service. Afghan Central Statistic organization data shows that the major employment sector for men is skilled agriculture, hunting, and forestry, while for women the predominant sector is community, social and personal services.

For much of this local population livelihoods consist of sustenance agriculture and livestock raring. The livestock serves as an income source which they sell to meet their needs. The people of the district live a simple life including the standard of their clothing and their diet. Unemployment, lack of potable water, basic health and education facilities, electricity and roads are the major issues for these people. Because the mode of agriculture is irrigation, the land available for cultivation by these communities is limited by water supply, which in turn is determined by access to irrigation infrastructure, resources to access suitable ground water, and/or harvesting precipitation. Because rivers within the northern basins are losing rivers that feed into aquifers, and some shallow aquifers have become to saline for use in irrigation. Roughly half of the Provinces consists of irrigated, cultivated land. Once irrigated, the soil and climate provide good conditions for diverse cereal and vegetable crops and the north has been termed the bread basket of the country.

Family Income. 45 families were sampled randomly in Sheberghan city and villages around the project. As presented in below chart, the income of these 45 families is shown. Most people have an income between 5,000 and 14,000 Afs per month.

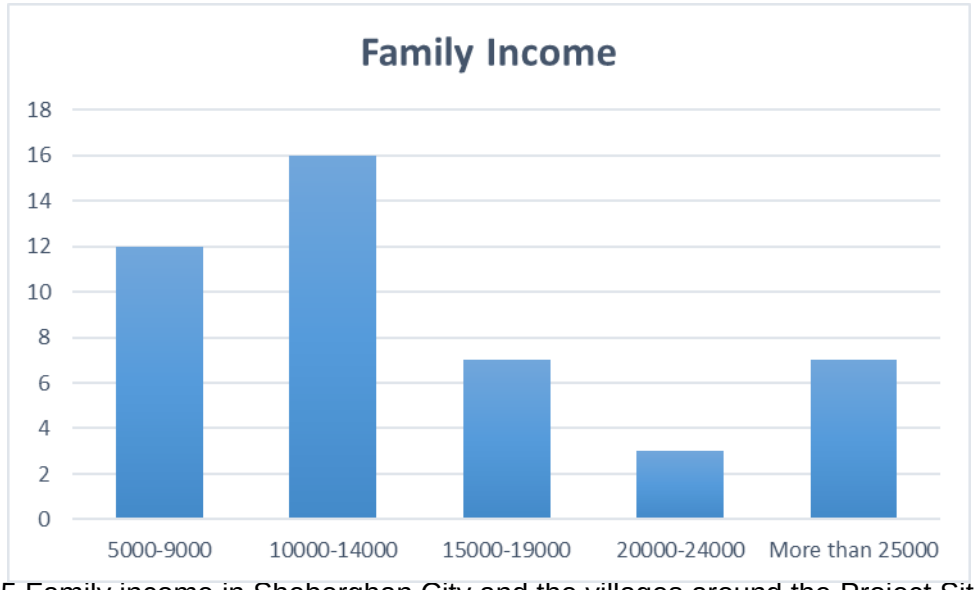


Figure 4-25 Family income in Sheberghan City and the villages around the Project Site (ESIA team survey)

Livestock. The maintenance of domestic animals such as cattle, sheep and goats are common. Farmers raise milking cows, sheep, goats, donkeys, horses, and chickens for production of milk, cheese, yoghurts, meat, eggs, wool and transportation. This practice supports basic family consumption as well as providing easily marketable goods in times of excess.

4.4.6 Social Infrastructure and Services

According to Ministry of Public Health directorate in Sheberghan City, health services are provided by 9 private, four state-run hospitals. They also said that there are approximately 55 health centers operating throughout the Jowzjan province. Two state owned hospitals, with bed capacity of 100 in total, are located in the provincial capital. Meanwhile, there is a 50 bed hospital located in Aghche and one 20 bed in Darzab district. Based on their studies, a few of the common diseases in the regions are breast shaft, diarrhea, measles, metabolic diseases, sugar, blood pressure and Limb ulcers (10 to 15 events per day). They named lack of access to sanitation and poverty as the main cause.

Water. Improved Drinking water sources include piped water into dwelling/yard or compound/neighbor, tube well borehole, protected dug well and protected spring. According to our survey conducted, public access to clean drinking water is one of the main problems in this city. Below graph shows that most people of Sheberghan do not have access to clean water and their main source of drinking water is well. The study shows that 14% of people have access to canal water and some people use spring and sea water for drinking.

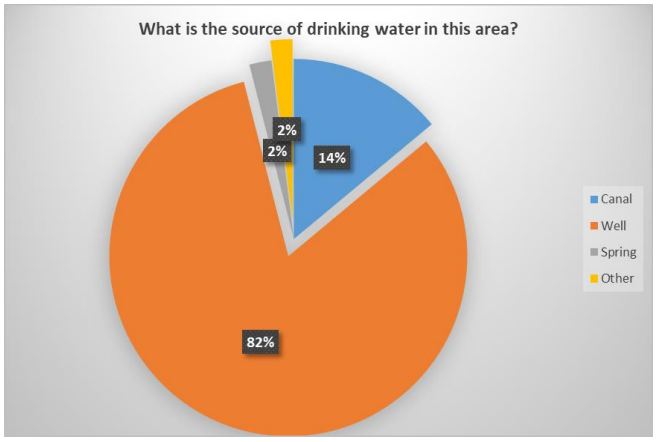
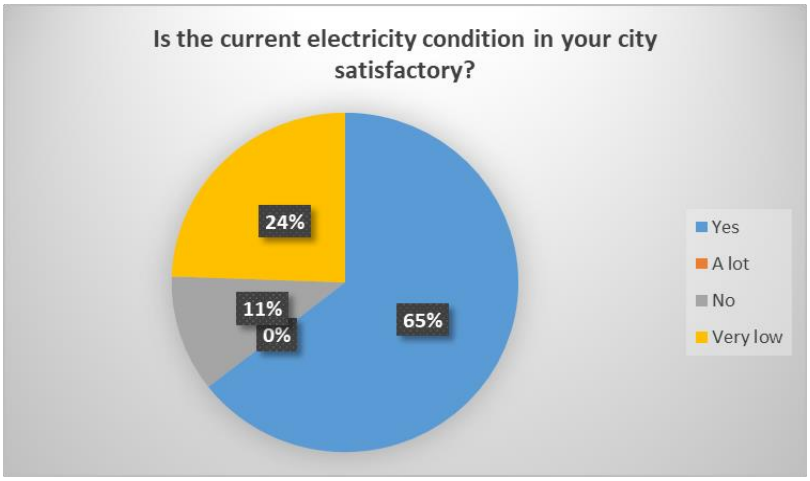


Figure 4-26 Survey Response of Sample population about their source of drinking water (ESIA team survey)

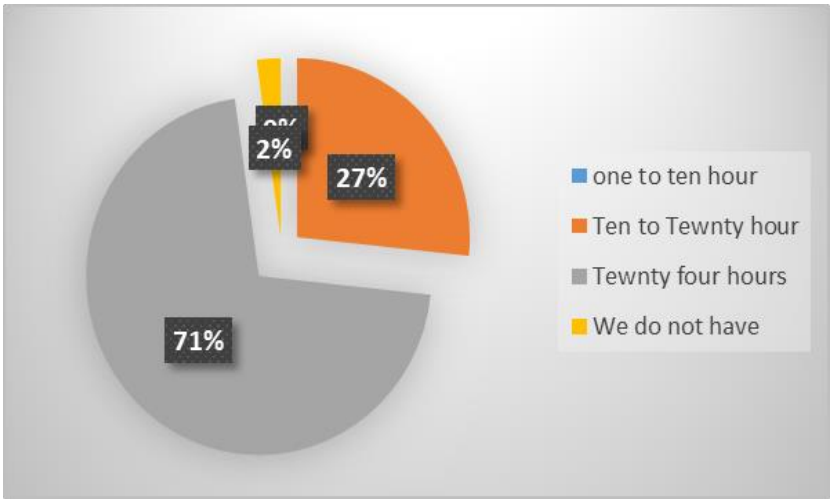
Electricity. Research shows that 65% of the people are satisfied with the current situation of electricity, and still 35% of the population have had the least current electricity and the lowest degree of satisfaction, most of them were saying that current and low power is interrupted which makes them unable to use the electrical tools, and their electrical equipment is often found to be damaged by interruption.

Figure 4.27. Survey Response of Sample population about their electricity condition (Team Survey)



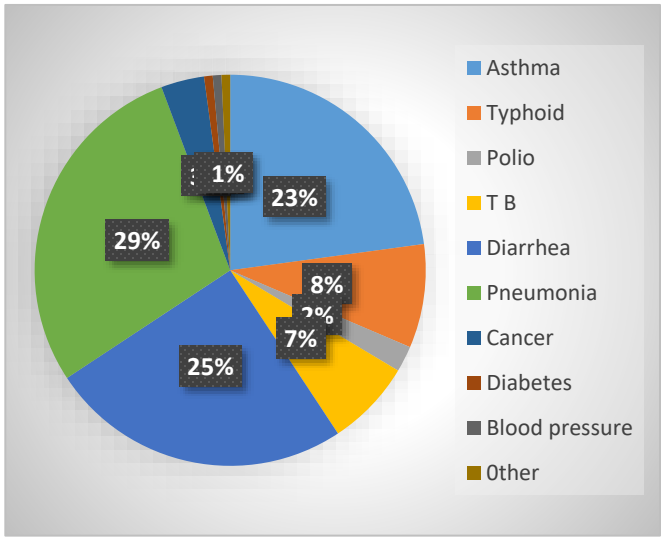
Although our study indicates that most people in Sheberghan city have access to electricity but only %70 of the responded enjoy twenty-four hours of electricity. %27 percent of the responded said that they have only between 10 and 20 hours of electricity in twenty-four hour and two percent of the population have no access to electricity at all.

Figure 4-28 Survey Response of Sample population about their availability of electricity (ESIA Team Survey)



Health. This graph shows that Asthma, Pneumonia, Diarrhea and Typhoid are common diseases in Sheberghan. The lack of clean water is reason of most common diseases in this city. There are other diseases in the Sheberghan that can be considered as the main causes of poverty, poor food and healthy weather.

Figure 2-29 Common Disease in Sheberghan (ESIA team survey)



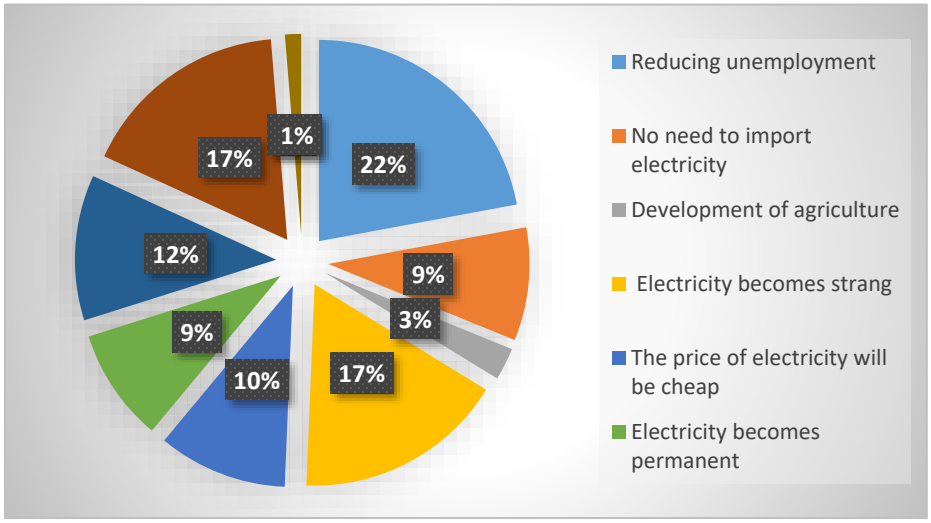
Communication. The Project site has sufficient numbers of telephone but has limited internet connectivity over the region. Most of the services are well functioning. Also, in and around the Project area there are adequate telecommunication services. The services of most of mobile provides are available in the area.

Road Network. There is a chain of national, district and rural roads available in the District. Farms are linked to markets by road network. A baseline study of traffic on the road network that will be used to access the Project site during the construction and operation phases was conducted in the field and the results are presented in the 6.3.3.

4.4.7 General Opinion about Bayat Power Project

In our survey, approximately 69 percent of the respondents were happy with implementation of Bayat Power Project. They considered project as to be valuable in improving the current state of their life particularly electricity, and that with the successful implementation of this project, they expect to see more positive impacts on economy.

Figure 4-30 Anticipated benefits of the project by respondents (ESIA team survey)



At the meantime, 57 percent of interviewees believed that the project would not cause any negative effects on people, and 11 percent believed that the smoke generated from the project could cause air pollution. Almost 9 percent of respondent believed that the activity in the construction and wiring of the project is the possibility of damage to the environment and

only 5 percent of people believed that the smoke generated during the project may increase the respiratory diseases among people.

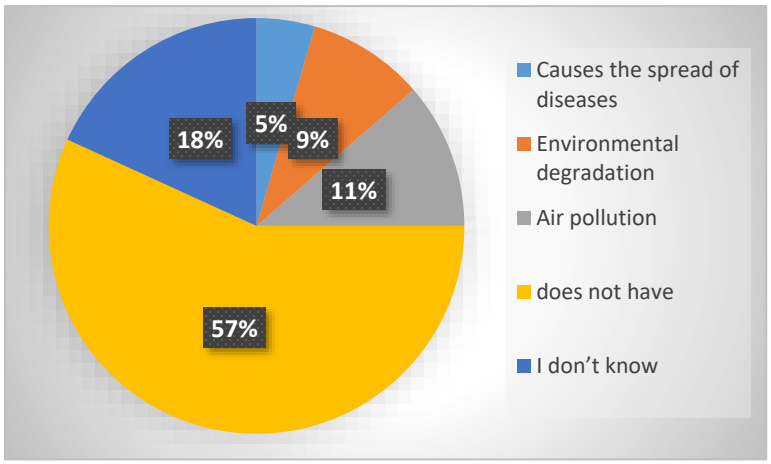


Figure 4-31 Disadvantages of Bayat Power Project from people's point of view (ESIA team survye)

Respondent all were in agreement that the project will provide employment opportunities and more stable electricity with lower rate for local people. They also suggested that the project should start at its appointed schedule and use high quality equipment to reduce the air pollution and experienced personnel. They also raised the security situation as one of the obstacles in the project. For more details refer to Table 9.2 record of the outreach conducted with the local population.

4.4.8 Cultural Heritage

Jowzjan province has more than 6,000 years of history before Islam, which provides rich historic tradition and value. According to Fort Drum Cultural Resources Program funded by Department of Defense legacy Resource management Program, the most famous historical monuments of Jowzjan Province are Altyn 1&10, Aq Chapur 1&2, Dashli Oasis 1&3(East and South), Dilbarjin, fazilabad Tepe, Nimlik, Sheberghan, and Tilya Tepe.[26] No historical, archeological, religious or cultural artifacts, monuments, structures or relics were observed or are suspected to be present on the Project site.

[26] https://www.cemml.colostate.edu/cultural/09476/afgh05b.html

4.5 Sensitive Protected Areas

With regard to protected areas, the USAID Biodiversity Assessment provides the following summary:

- Around 15 protected areas enumerated natural areas whose protection exist in name only, one (Band-eAmir National Part) has been gazetted by GIRoA;
- Two areas (Small Pamir and Waghjir Valley) has been proposed as protected areas by the Wildlife Conservation Society (WCS), but do not appear in the Wold Database of Protected Areas, and are amalgamated in the Wakhan National Partk;
- Shah Foladi, declared in 2015, is the newest protected area

Of the proposed protected areas and sites, only three are located in the northern region;Imam Sahib Wildlife managed Reserve in Kunduz, Nuristan Nature Reserve in southern Badakhshan and the amalgamated areas of the Wakhan national Part in eastern Badakhshan. These areas are all located outside of project site and will not be affected by project activities.

4.6 Vulnerable Groups

According to IFC Performance Standard 1, good ESIA practice requires the identification of individuals and groups that may be directly and differentially or disproportionately affected by the project based on their disadvantaged or vulnerable status. Based on the stakeholder engagement with affected communities conducted as part of the ESIA process. It was identified that these communities include residents from vulnerable groups including youth, elderly, women, disabled, IDPs/returnees and local minorities, however, there is a lack of statistical data on the numbers of disadvantaged or vulnerable individuals and groups within these affected communities.

Vulnerability will depend on how well some groups in the community would handle potential socio-economic and health sensitivities associated with the proposed Project. These sensitivities include having to safeguard traditional livelihoods and income levels, creating opportunities for employment and contracting, access to amenities and housing. There are also sensitivities related to maintaining ethnic balance, degradation of the local

language and culture, and ensuring respect for human rights. Lastly, vulnerability is also impacted by lifestyle and lifestyle choices that can be a result of socioeconomic conditions including social vices, alcohol, drug abuse, and hygiene. In the light of these sensitivities and the potential impacts of the proposed Project, some of the groups deemed vulnerable are the youth, the uneducated and unskilled, the elderly and widows.

The community youth may be exposed to life styles and social vices as they mingle with workers from different backgrounds. The youth group also constitutes a significant proportion of the unemployed and many of them may not be skilled. Therefore, they may have limited access to available employment opportunities on the proposed Project.

The elderly constitutes another vulnerable group. They usually require special attention that includes provision of welfare enhancing programs and health intervention schemes. Given the lack of physical and social amenities the elderly would potentially be most seriously impacted in the event of failure of infrastructural amenities. This increased demand on amenities by workers as a result of the Project may manifest in increased solid waste and indiscriminate dumping of waste. Coupled with lack of potable water, this could lead to hygiene and health problems in households and the community. Safeguarding livelihoods, income, social and infrastructural amenities will require serious consideration upon implementation of the proposed Project.

The Stakeholder Engagement Plan (SEP) developed as part of the ESIA is designed to establish open communication and dialogue with the affected communities and to discern whether any of the potentially vulnerable groups or potential impacts described above are actual risks based on community perception. The ESMP has been created in order to not only evaluate adverse socio-economic impacts for vulnerable groups, but to proactively mitigate the impacts. As part of the SEP, a grievance mechanism has also been established so that community leaders and representatives from the surrounding communities may alert the Project Proponent to unforeseen socio-economic impacts, including for vulnerable groups.

4.7 Security Risk Assessment

Security conditions in Afghanistan are dynamic and complex. However, Bayat Power will have a security team of 25-30 armed security working at the Sheberghan site, including 3 former US Special Forces and 12 former Afghan Commandos. The team will be deployed in three, eight-hour shifts of 8-10 team members per shift. The small team of former US Special Operators will continue to improve on the cam's force protection, provide oversight of all the security and train the entire guard force. Detailed security measures and Procedures can be found in Annex 3.

5 ALTERNATIVES ANALYSIS

5.1 Overview

Alternatives are different means of completing the proposed Project while still meeting the purpose and need for the proposed activity. Furthermore, the alternatives analysis is intended to address other means of completing the proposed Project that could avoid or minimize adverse impacts that would be associated with the proposed Project.

Variety of alternatives were proposed and have been analyzed for the power plant Project development. The technical engineering and economic feasibility, together with the environmental, health and safety concerns, flexibility for loading operations and expansion, regulatory and stakeholder requirements, cost effectiveness and ease of operation and maintenance of the system through its design life are important considerations in the overall assessment of alternatives. Research and development of the natural gas resources of Afghanistan including refurbishment and expansion of the Sheberghan gas fields has been ongoing, and much of this analysis is existing and well documented. For the current analysis, such resources provide value and will be cited in the alternatives analysis where relevant.

5.1.1 Fuel Type Alternatives

In accordance with PS 1, paragraph 11, where the project involves specifically identified physical elements, aspects and facilities that are likely to generate environmental and social impacts, the identification of risks and impacts will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence.

With regard to fuel-type, the alternatives analysis is weighted on the planning studies and decision-making processes that have occurred to date. For example, the Power

Master Sector Plan completed by Fichtner[27] for the GIRoA in 2013 concluded that natural gas derived electricity is the likeliest candidate for large-scale addition of baseload domestic generation in the near term. As a result, several international agencies including USAID[28] and World Bank[29] have conducted feasibility and scoping studies of the northern gas reserves and have evaluated opportunities for gas development projects. Table 5-1 provides a summary of the comparison of natural gas with other potential sources of fuel that could be used to generate electricity in northern Afghanistan.

5.1.2 Site Location Alternatives

With regard to site location alternatives, project economics and land availability are identified as key criteria of importance when assessing land for power plant construction. Adding to this, the availability of suitable development lands in close proximity to the existing gas grid network and electricity transmission network is a key factor in considering and determining a suitable site location for this development. In addition, it is necessary to carefully consider not only the technical issues, but also the impact on the natural environment, local economy and nearby communities.

This analysis of project sitting compares site characteristics to critical issues used in evaluating power plant project locations. Attributes of the site include that it is not located in ecologically critical areas including human settlements, forest sanctuaries, national parks, game reserves, mangroves, forested areas, wetlands, unique wildlife habitats, archaeological sites, ancient monument sites, key biodiversity areas or other ecologically sensitive areas. Furthermore, the preference for power plant projects is to be located on non-productive land and the site is outside existing and proposed agriculture land. Finally,

[27]Islamic Republic of Afghanistan: Power Sector Master Plan (May 2013). Prepared by FICHTNER GmbH & Co. KG, Stuttgart, Germany.

[28]AEAI. Sheberghan Gas Field Development Project (SGFDP). Critical Path for Sheberghan Gas Field Development. February 15, 2011.Prepared for USAID.

AEAI. Sheberghan Gas Field Development Project (SGFDP). Gas/Power and Related Infrastructure Assessment. April 5, 2011.Prepared for USAID.

[29] Hill International. Evaluation of Investment Options for the Development of Oil and Gas Infrastructure in Afghanistan.Final Report. March 28, 2005. Prepared for the International Bank for Reconstruction and Development.

the site is located on an amply large parcel of ground with no directly adjoining developed properties and is therefore eligible for expansion as well as separated by a greater than 15 km buffer zone from human settlements and agricultural land.

5.2 Alternative Sources of Electricity Generation

The suitability of generation technologies has been assessed against the following criteria:

- Readiness/availability;
- Size;
- Reliability;
- Environmental performance; and
- Compliance with local and national policy.

The summary of the key issues identified by the criteria in relation to the power generation options available in Afghanistan is given in Table 5-1 below.

Table 5-1 Summary of Key Issues

Fuel Type	Location	Positive	Negative	Availability
Gas	Afghan Gas Enterprise is currently producing approximately 450,000 cubic meters of natural gas per day. The majority of this natural gas is still transported through a 90-kilometer pipeline (commissioned in 1974) connecting the Khoja Gogerdaq natural gas field near Sheberghan, Jowzjan province, to the Northern Fertilizer and Power Plant in Mazar-e Sharif, Balkh province. The remaining natural gas is distributed through a network of small diameter pipelines to domestic customers in Sheberghan, Khoja Dokho, Aqcha and other villages in Jowzjan.	• Relatively low-cost fuel option when available. • Significant local resource in northern of Afghanistan. • Generators are very compact. • Produces less CO_2 than coal or oil. • Clean and reliable resource.	• Finite resource. • Susceptible to price fluctuation risk. • Extensive and expensive pipeline would be required. • Produces CO_2.	Available in-country.
Coal	Afghanistan is reported to have coal reserves totally 100-400 million tons. These mines are located from Badakhshan and extend up to Herat Province. Afghanistan has more than 11 coal reserves.	• Relatively low-cost fuel option. • Significant resource available in-country. • Generally provides continuous baseload power. • Is not susceptible to weather-related generation fluctuations. • Proven technology. • By-products of burning coal can be reused in other industries.	• Finite resource. • Not sustainable as coal reserves are limited. • Susceptible to price fluctuation risk. • Produces highest CO_2 per kWh (twice as much carbon dioxide when compared with natural gas). • Release higher level of harmful emissions, including a higher ratio of carbon emissions,	Long-term solution

			nitrogen oxides (NOx) and Sulphur dioxide (SO_2) and ash particles. • Requires disposal of significant volumes of ash by-product. • Coal can have significant Sulphur and lesser heavy metals and organic content. • A major cause of acid rain if high Sulphur levels in coal. • Mining of coal results in the destruction of habitat and scenery, and can result in community displacement.	
Geothermal Power	An area of vast untapped potential lies in the heat energy locked inside the earth in the form of magma or dry, hot rocks. Geothermal energy for electricity generation has been used worldwide for nearly 100 years. The technology currently exists to provide low-cost electricity from Afghanistan's geothermal resources, which are located in the main axis areas of the Hindu Kush. These run along the Herat fault system, all the way from Herat to the Wakhan corridor in the North. With efficient use of the natural resources already abundantly available in Afghanistan, alternative energy	• Sustainable. • No significant environmental impacts. • Non-polluting. • Generally, provides continuous baseload power. • Is not susceptible to weather-related generation fluctuations.	• It can only be developed in selected volcanic areas where geothermal systems are present. • Transmission infrastructure and investment required. • Limited geothermal resource site currently known in-country.	Available in-country.

	sources could be directed into industrial use, supply the energy needs of the nation and build economic self-sufficiency.			
Hydropower	Hydroelectric plants in Afghanistan were built between the 1950s and the mid-1970s, which included the Sarbobi hydroelectric power plant in Kabul Province, the Naghlu in the eastern Nangarhar Province, the Kajaki in Helmand Province and a number of others. Other hydroelectric facilities that were operational as of 2002 included plants at Puli Khumri, Darunta in Nangarhar Province, Dahla in Kandahar Province, and one in Mazar-i-Sharif. Also, in operation was the Breshna-Kot Dam in Nangarhar, which had a generating capacity of 11.5 MW. Construction of two more power stations, with a combined capacity of 600 kW, was planned in Charikar City. A number of other dams are being built in different parts of the country, which are mainly for irrigation purposes. Two new dams are under construction in Kunar Province, one of which has the capacity of 1500 MW in Surtak area of the subjected province.	• Renewable resource • Proven technology	• Climate dependent and prone to generation shortfall during droughts • Can be susceptible to climate change. • Major hydropower systems can have significant adverse environmental and social impacts • Potential for flood risk.	Available
Solar Power	In 1991, a new 72-collector solar installation was completed in Kabul at a cost of $364 million. The installation heated 40,000 liters of water to an average temperature of 60ºC around the clock. The use of solar power is becoming widespread in Afghanistan. Solar-powered street lights are seen in several Afghan cities and	• Sustainable. • Proven technology. • Size and location of solar fields is flexible, essentially limited only by demand and transmission infrastructure.	• High energy (and CO_2) intensity manufacturing process. • Efficiency and output are weather dependent.	Long-term solution, but limited capacity due to current technology costs

	towns, including the capital Kabul. Many villagers in rural parts of the country are also buying solar panels and using them.		• Conventional peaking (likely diesel) capacity would be required for low sun conditions. • Daytime production only. • Relatively high cost electricity option that would likely require feed in tariff support to develop significantly.	and lack of feed in tariff support
Wind Power	At least one wind farm was successfully completed in Panjshir Province in 2008, which has the potential to produce 100 kW of energy. United States Agency for International Development has teamed up with the United States National Renewable Energy Laboratory to develop a wind map of Herat province. They have identified approximately 158,000 MW of untapped potential wind energy. Installing wind turbine farms in Herat could provide electricity to much of western Afghanistan. Smaller projects are wind pumps that already have been attached to water wells in several Herat villages, along with reservoirs for storing up to 15 m3 of water.	• Sustainable. • Non-polluting. • It is a proven technology.	• Efficiency and output are weather dependent. • Conventional peaking (likely diesel) capacity is required for low wind conditions. • Locations for application limited on wind speed and ability to interconnect to the grid. • Lack of country policy, legal or regulatory framework.	Medium to long-term solution.

5.3 Alternative Technologies for Natural Gas Power

The core criteria used for considering and choosing between technological/design alternatives for natural gas generation are as follows:

- Overall safety of the personnel working in the proposed project facility and the public living in the vicinity of the project area;
- Environmental impact of the proposed project with respect to its effects on air quality, underground water, soil, geographical terrain, vegetation, wildlife, socioeconomics, noise and other environmental aspects;
- Potential impacts to communities, their health, lifestyle and activities such as businesses, transportation, recreation, etc.;
- Best available/practicable technologies that is not only familiar, but also acceptable within the applicable area in order to ensure effective operation, maintenance and sustainability;
- Feasibility of construction, operation and maintenance in view of satisfactory and cost-effective practices;
- Availability and reliability of fuel supply for the proposed plant operation such as the use and volume of natural gas or diesel requirements;
- Mitigation, management and monitoring requirements that will ensure safe and environmentally sound operations;
- Acceptance by stakeholders with due considerations of technical, environmental, regulatory and cost implications of implementation and maintenance of proposed project; and,
- Other institutional, regulatory, national and international requirements of proposed project.

The technology options assessed consist of the steam turbine, simple cycle combustion turbine, combined cycle combustion turbine and reciprocating internal combustion engine.

5.3.1 Steam Turbine (ST)

The steam turbine has as its advantages that include high overall electrical generating efficiencies of up to 75% when utilized in a combined heat and power

(CHP) application through the reuse of the waste heat. However, there are no potential sources for waste heat so CHP is not an option and typical upper limits of steam turbine efficiencies are around 37%.

Other disadvantages include cost, slow start up times, the risk of corrosion of the pipes and other factors dealing with heat transfer in the steam turbine. The efficiency of a steam turbine is limited by the maximum temperature of the steam produced and is not directly a function of the fuel used. Significant cooling is required for steam condensation and auxiliary stations, which needs either large water quantities (which are not available at the site) or more inefficient air cooling.

Cooling can produce significant waste heat which if not utilized in cogeneration reduces overall efficiencies and can have negative environmental impacts if cooling water is disposed into surface waters, increasing the temperature of the receiving water body. The equipment takes a lot of energy to heat up, therefore increasing start up times, and is usually heavy compared to other engines like gas, diesel, or electric.

5.3.2 Simple Cycle Combustion Turbine (SCCT)

The simple cycle combustion turbine is relatively simple to install, operate and maintain. It is capable of producing large amounts of useful power for a relatively small size and weight. Since motion of all its major components involve pure rotation (i.e. no reciprocating motion as in a piston engine), its mechanical life is long and the corresponding maintenance cost is relatively low. Although the gas turbine must be started by some external means (a small external motor or other source, such as another gas turbine or diesel generator), it can be brought up to full-load (peak output) conditions in minutes as contrasted to a steam turbine plant whose start up time is measured in hours. In addition, the process water demand for this technology is negligible.

5.3.3 Combined Cycle Combustion Turbine (CCCT)

In combined cycle gas turbine power generation the steam produced by the waste heat of the gas turbine rotates an auxiliary steam turbine that also generates electricity resulting in higher operating efficiency and lower fuel consumption than a gas turbine in simple cycle. These gains are countered by high capital costs per kW of electricity

produced and by high process water requirements. Air-cooling as opposed to wet-cooling may be used to reduce process water demand however the technology is not common due to higher costs and lower operating efficiency.

5.3.4 Reciprocating Internal Combustion Engine (RICE)

RICE engines are designed either as spark-ignited (SG) or compression-ignited (CI). The SG uses a spark plug to ignite an air-fuel mixture, whereas with CI air is compressed until the temperature rises to the auto-ignition temperature of the fuel. RICE may utilize a variety of fuels including natural gas and fuel oils, and depending on fuel source, SG and CI will vary in efficiency and emissions characters regarding nitrogen oxides (NOx), sulfur dioxide (SO2), and particulate matter (PM). Engine designs are available that provide CI with more of the lean burning characteristics and low emissions profiles of SG, and dual-fuel engines are available that utilize both liquid and gaseous fuels. Dual-fuel and gas-diesel engine options can utilize highly compressed gas which is injected after liquid pilot fuel is ignited and these engines allow for the use of lower quality gas.

Dual-fuel engines are predominantly fueled by natural gas with a small percentage of diesel oil added however; such engines can be switched to 100 percent diesel operation. Dual-fuel engines provide multi-use options - using cheaper and cleaner burning natural gas when available, while operation on 100 percent diesel allows the engine to act as emergency generators when required. As with the performance of gas turbines, the output and efficiency of reciprocating engine performance decreases as ambient temperature or site elevation increases.

In relative terms, gas fired generators offer low capital cost, high operating efficiency, easy start-up and operation, and proven reliability. There are several types of catalytic exhaust gas treatment processes that are applicable to various types of reciprocating engines for post combustion exhaust gas cleanup. In addition, this technology utilizes air cooling and water demand is negligible.

5.4 Alternatives Analysis Summaries

5.4.1 No-Action Alternative

The no-action alternative would mean that the project does not go ahead. In this case, there would not be any impact associated with the Project (air, noise, flora, fauna and others), however, in this case the no-action alternative would almost certainly mean that domestic energy resources go undeveloped in favor of importation of diesel fuels, and foreign electricity. The current and perseverant negative socio-economic consequences resulting from the no-action alternative are discussed in Section 4-4.

5.4.2 Sources of Electricity

The proposed Project will use natural gas, an existing domestically abundant fuel stream to generate electricity. The use of natural gas offers a number of environmental benefits over other sources of energy, particularly other fossil fuels. For example, coal and oil are composed of much more complex molecules with a higher carbon ratio and higher nitrogen and Sulphur contents. This means that when combusted, coal and oil release higher levels of harmful emissions, including a higher ratio of carbon emissions, NO_x and Sulphur dioxide (SO_2). Combustion of coal and fuel oil also releases particulate matter to atmosphere. The combustion of natural gas, on the other hand, releases negligible quantities of Sulphur and nitrogen oxides (about 60% less than plants that use coal assuming emission reductions measures are not employed), virtually no ash or particulate matter, and lower levels of CO. Regardless of the specific technology selected the proposed power plant will use modern SGT-A45 mobile unit (aeroderivative gas turbine) technology. With up to 44 MW of electrical output, it offers significantly more power and higher efficiency than any other mobile gas turbine.

5.4.3 Technology Alternatives for Natural Gas Power

Ultimately the technology selection for the proposed Project must employ technology that minimizes environmental impacts, is recognized as being the most economically appropriate for power production on the scale proposed and maximizes public and occupational health and safety. The following summary will present this top-down approach, leading with an Environmental Evaluation that is based on central findings of this ESIA, followed by a Technical Evaluation.

Environmental Evaluation

Water demand should be prioritized in the overall comparative analysis. Two technologies, simple cycle combustion turbine (SCCT) and reciprocating internal combustion turbine (RICE) provide for plant operation with negligible process water demand and should be favored. Based on the fact that no detailed hydrogeological study has been conducted, this decision satisfies the precautionary principle, and supports the base-line study data that indicates that the north region has the lowest national per capita water availability and is currently below the water scarcity threshold.[30] In addition, with regard to long-term water availability, the occurrence of successional droughts is real and is coupled with data that indicates a recession of perennial snowcaps and current glacial retreat approaching 30%.[31] There is risk that if this trend continues water yields at the furthest extent of irrigation networks in the northern region may progressively decline. The regional impact of climate change on agriculture is an expected increase of agricultural water demand due to lower soil moisture levels and increased evapotranspiration.

Comparative analysis of SCCT and RICE with regard to water use efficiency reveals that while both require negligible process water in relation to steam and combined cycle turbines. Finally, with regard to emissions, both RICE and SCCT technologies can be installed with selective catalytic reduction (SCR) systems to reduce NO_x and CO to acceptable IFC/World Bank Group standards if utilized effectively.

Social Evaluation

Because the site selection (siting) for the Project has been directed by the GoIRA, and a land lease agreement has been fully executed, there are no sitting alternatives provided for an assessment regarding social impacts. Impacts on the affected communities are relevant to the technology and environmental characteristics of the power plant. Based on the choice of technology, the air emissions, water use and

[30]Centre for Policy and Human Development Kabul University. Afghanistan Human Development Report. 2011.
[31]Eurasia Environmental Associates and Cadmus Group. FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to inform USAID/Afghanistan program design. 2017. Prepared for USAID.

overall safety (employee and public safety) are relevant to a discussion on social impacts.

With regard to air quality impacts, all of the technologies would be designed to meet IFC emissions standards, and air dispersion modelling will be conducted to ascertain relative ground level emissions in the area of influence. With regards to relative emissions, both of the environmentally favorable technologies (RICE and SCCT technologies) can be installed with selective catalytic reduction (SCR) systems to reduce NO_x and CO to acceptable IFC/World Bank Group Standards if utilized effectively.

Finally, based on employee and public safety, all the technologies are considered safe with proper design, installation and operation. Pressurize gas pipelines, gas tanks and combustion or turbine technologies require safe handling of natural gas in design, installation and operation for the complete lifecycle of the power plant.

5.4.4 Preferred Option

In light of these considerations, the preferred option following cost, environmental and technical evaluation is for use of Simple Cycle Combustion Turbine (SCCT). They have light weight and they do not require bulk water. They can be quickly installed at a lower cost than other types of power plants and units require less space, have lower installation and maintenance cost and have simple lubrication and ignition systems. Their performance is also optimized for hot climates. Simple Cycle Combustion Turbine is the most suitable plants that can be installed at selected load centers with fewer auxiliaries. They can be brought on load quickly and surely.

At this time the Project Proponent/Owner has determined to install the SGT-A45 mobile unit (aeroderivative gas turbine). As the world's most powerful mobile gas turbine and outstanding output of up to 44 MW(e), the installation will take less than two weeks. The SGT-A45 mobile gas turbine unit offers a cost-effective, dependable solution to these needs. Based on proven aeroderivative gas turbine technology, the SGT-A455 achieves the highest power density and fuel efficiency of all mobile power plants in the market.

6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

6.1 Overview

The following section assesses the foreseeable potential environmental and social impacts of the Project. Activities will occur in two distinct stages of the Project life cycle, specifically, the construction of the plant (Construction Phase) and the operation and

maintenance of the plant (Operation Phase). While numerous mitigation and management measures are linked to and prescribed for the pre-construction phase, no major adverse environmental or social impacts are anticipated or assessed herein.

Note: Environmental and social impacts during decommissioning of the Plant have not been considered in the impact assessment, as these will depend on the options available at the time of expiry of the Implementation and Power Purchase Agreements between the Afghan Power Plant Company, MoMP/Afghan Gas Enterprise and DABS.

6.2 Evaluation and Assessment of Risk

The potentially significant impacts of the project activities during construction and operation will be evaluated utilizing Good International Industry Practice for environmental and social impact assessment. Implementation of the framework will result in an assignment of impact significance that will be used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact. The significance of an impact is determined by:

- Consequence of the activity,
- Likelihood of occurrence of the activity; and,
- Calculating the product of these two parameters.

Consequence and likelihood of impacts resulting from planned activities are discussed below. Changes in the planned activities for the proposed Project would affect both the impact assessment and also the planned mitigation activities.

Consequence

Table 6-1 presents the consequence assessment criteria for impact assessment. The level of consequence for each identified impact is determined by examining a number of factors relating to the activity. Each category has a number of parameters as follows:

- Perception of the activity,

- Ability of physio-chemical, biological or socio-economic environment to absorb the impact (i.e. adapt to change) based on its natural dynamics and resiliencies; and/or,
- Whether or not the activity results in a breach of legislation, regulation or standards to which the project must comply and/or a breach in operator policy.

It should be noted that in assessing an impact, the assigned level of consequence might be different for different consequence criteria. Where this has been found to be the case for this Project's proposed activities, a rule has been established that the highest-ranking criteria establish the overall consequence ranking for the impact in question.

Table 6-1 Categories and Consequence Levels

Category	Ranking	Definition
Critical	5	▪ Very serious effects with impairment of physio-chemical, biological or socio-economic function. ▪ Long-term, widespread effects on significant environment (e.g. unique habitat, national park) ▪ Restitution time >100 years and requiring extreme substantial intervention.
Major	4	▪ Serious social or environmental effects with some impairment of system function (e.g. displacement of human or animal species). ▪ Relative widespread medium–long term impacts. ▪ Habitat restitution time >10 years and requiring substantial intervention. ▪ Potential for continuous non-compliance with environmental regulations and/or company policy.
Moderate	3	▪ Moderate social or environmental effects but not affecting overall system function. ▪ Moderate short-medium term widespread impacts ▪ Habitat restitution time 1-5 years (possible limited and local areas up to 10years) with potential for full recovery and limited or no intervention required. ▪ Potential for short to medium term noncompliance with environmental regulations and/or company policy.
Minor	2	▪ Minor social or environmental effects. ▪ Minor short-medium term damage to small area of limited significance ▪ Full recovery in < 1 year without intervention required. ▪ Any potential non-compliance with environmental regulations and/or company policy would be minor and short-term.
Low	1	▪ No lasting social or environmental effect. ▪ Low-level impacts on physical or biological environment. ▪ Limited damage to minimal area of low significance ▪ Compliance with environmental regulations and/or company policy at all times.

		▪ Possible beneficial effect or ecosystem improvement.
None	0	▪ No impact or social/environmental damage. ▪ No compliance requirements for environmental regulations and/or company policy. ▪ Possible beneficial effect or ecosystem improvement.
Limited Positive	+	▪ Some beneficial improvement to social or environmental system. ▪ Benefits to specific social, physical or biological components of environment.
Modest Positive	++	▪ Moderate beneficial improvement to social or environmental system. ▪ Medium benefits to specific social, physical or biological components of environment.
Significant Positive	+++	▪ Major beneficial improvement to social or environmental system ▪ Significant benefits to specific social, physical or biological components of environment.

Likelihood

The following Table 6-2 presents criteria for level of likelihood of the occurrence of an activity. The level of likelihood for each identified impact is determined by estimating the probability of the activity occurring.

Table 6-2 Likelihood of Occurrence and Ranking of Impacts

Impact and Likelihood	Ranking	Definition of Impact	Frequency
Almost Certain (80-100%)	5	▪ The activity will occur under normal operating conditions.	▪ Very frequent (high likelihood of ongoing occurrence)
Very Likely (60-80%)	4	▪ The activity is very likely to occur under normal operating conditions.	▪ Frequent (occurs with a regular frequency)
Likely (40-60%)	3	▪ The activity is likely to occur at some time under normal operating conditions.	▪ Occasional (only occasional likelihood of occurrence)
Unlikely (20-40%)	2	▪ The activity is unlikely to, but may occur at some time under normal operating conditions.	▪ Few (unlikely to occur even occasionally)
Very Unlikely (0-20%)	1	▪ The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.	▪ Rare (highly unlikely to ever occur)

Impact Significance

The significance of an impact is then determined by calculating the consequence and likelihood of occurrence of the activity, expressed as follows:

Significance = Consequence × Likelihood

The above two tables illustrate all possible scenarios for the different consequences and likelihood categories. The possible significance rankings are presented in the following Table 6-3.

Table 6-3 Impact Significance Rankings

Ranking (Consequence x Likelihood)	Significance
>16	Critical
9-16	High
6-8	Medium
2-5	Low
<2	Negligible

Risk Matrix

The resulting risk matrix demonstrates the various relationships between consequence, likelihood and significance ranking (Table 6-4).

Table 6-4 Risk Assessment Matrix

Likelihood/Frequency	Consequence/Severity					
		Low	Minor	Moderate	Major	Critical
	Almost certain	Low	High	High	Critical	Critical
	Very likely	Low	Medium	High	High	Critical
	Likely	Low	Medium	High	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Very unlikely	Negligible	Low	Low	Low	Low

6.3 Impact Assessment - Construction Phase

The major activities during the construction phase of the gas fired power plant may be broadly classified into the following: (i) mobilization of equipment, materials and personnel; (ii) site preparation; and (iii) civil construction and electromechanical installation/erection. In this study, the effects of the project activities on the physical-chemical, ecological and socio-economic facets of the environment will be assessed separately. The potential impacts that could occur during the construction phase of the project are summarized in the discussion below.

6.3.1 Physio-Chemical Impacts – Construction Phase

The important physio-chemical environmental parameters that are likely to be affected by the project activities during construction phase include water and soil quality, air quality, and noise level. The potential impacts of the project activities on these physio-chemical environmental parameters are described in this Section.

Water Quality and General Environmental Impacts

Solid waste generated during the construction phase of the project will include but not be limited to spoils, construction debris (metal, wood, rock and plastic), packaging, domestic sanitary wastes, and other solid wastes associated with equipment and machinery. In addition, if temporary, housing is installed for on-site construction work camp use, the domestic solid and liquid wastes generated from the installations will require management through proper infrastructure (waste receptacles and septic tanks) and disposal management plans.

Most of it will be generated toward the end of the construction phase during carrying out of the finishing works, while the site will be cleared of waste materials. The volume of such construction wastes is likely to be significant. Indiscriminate storage and disposal of these construction debris and wastes could create local water logging and ponding by blocking drainage lines and would be aesthetically displeasing. Proper disposal of these wastes, as described in the mitigation measures, is therefore necessary.

Liquid wastes could include impacted stormwater runoff, sanitary wastewater and chemical byproducts and fluids from equipment and machinery. These liquid wastes

could lead to pollution of soil, surface and groundwater and the general environment, if not properly containerized, cleaned-up and ultimately disposed.

Furthermore, improper disposal of solid and liquid waste could adversely affect human health and wellbeing of construction workers and visitors at the construction site by increasing the risk of disease transmission. Proper disposal of wastewater should therefore be managed as recommended in the mitigation measures.

Regarding soil erosion, clearing and grubbing activities within the limits of the project site could result in soil erosion, however, because of the relatively flat topography of the construction site, it is expected that soil losses will be minimal. Temporary drainage will be used during the course of construction to accommodate anticipated rainfall and runoff from the disturbed areas.

Air Quality Impacts

The most significant issues that could potentially impact ambient air quality during construction are combustion gas emissions and nuisance dust. The principal sources of combustion gases would include the operation of a concrete batch plant, diesel powered construction machinery, and vehicle exhaust.

As with any construction site, dust may be generated as a result of surface preparation and earthworks, including earth moving and materials handling.

Heavy-duty diesel trucks would be used to transport raw materials such as sand, aggregate and cement to the project site for concrete production. Diesel exhaust is known to contain several compounds that may be detrimental to human health over the long-term with repeated exposure. Diesel exhaust emissions from construction vehicles and equipment for the project would be generated on an intermittent and short-term basis and would primarily be a risk for on-site workers as opposed to off-site receptors. Because work will be conducted outdoors, in most circumstances gaseous emissions would disperse prior to building up to dangerous levels.

Additionally, approximately 12 Km of the access road is unpaved. The traffic moving on un-surfaced routes/roads within the development site and this road may cause sufficient disturbance of loose surface materials to generate dust, particularly

during the dry season. Since construction of the proposed power plant project would most likely involve significant earthworks, increase in particulate matter in the air from wind-blown dust is also a concern to the project site.

During the construction phase of the proposed power plant project, the important sources of emissions would include those from the operations of construction equipment and machineries, vehicles carrying construction materials to the site and taking construction debris out of the site. If construction equipment, such as stone (aggregate) crushers is used at the site, this may result in significant emission of particulate matter during its operation. Since construction of the proposed power plant project would most likely involve significant earthworks, increase in particulate matter in the air from wind-blown dust is also a concern to the project site. Mitigation measures as outlined in Section 7 should be adopted to minimize the possible adverse impacts of project activities on air quality.

Noise Impacts

The IFC General EHS Guidelines: Environmental for Noise Management recommend that noise levels do not exceed the limits presented in below in Table 6-5.

Table 6-5 IFC Noise Guidelines

IFC Noise Level Guidelines		
Receptor	**1-hour L_{Aeq} (dBA)**	
	Daytime (0700-2200)	**Nighttime (2200-0700)**
Residential, institutional, educational	55	45
Industrial, commercial	70	70

The most significant noise emissions during construction would be associated with the following activities:

- Earthworks and Site Preparation;
- Creation of Hard Standings;
- Construction of Foundations;
- Building Erection; and
- Creation of Roads.

The above construction works are estimated to generate high noise levels in the range 83-87 dB at a distance of 10 m. Therefore, personal hearing protection will be required for all construction workers in the vicinity of these activities.

In addition to noise emissions from major construction work, there may also be some noise emissions from increased traffic movements. Heavy-duty diesel trucks would be used to transport raw materials such as sand, aggregate and cement to the project site for concrete production. These impacts would be short-term and the duration of impacts on the surrounding environment would also be temporal in nature (e.g. passing vehicles). Standard measures for the management of the impact of construction and traffic noise are recommended are presented below. Furthermore, baseline noise monitoring was conducted on-site in order to quantify and monitor the level of noise impacts during construction and operation phases of work.

Landscape and Visual Impacts

In general, a construction site includes visual impacts such as the increase of traffic and the presence cranes, diggers and scaffolding, as well as, the erection of the power plant itself, which will result in negative impacts on the surrounding landscape. Visual impacts due to landscape modification will likely be experienced both by local residents and at settlements further afield. The impact of construction-related visual effects from the project will have limited short-term effects and result ultimately in long-term visual modification of the landscape.

6.3.2 Biological Impacts – Construction Phase

Impacts to Fauna and Flora

Construction of gas fired power plant would have some potential impacts (direct and indirect) on the existing ecological environment. Construction impacts to habitats and species and may arise from:

- Vehicular traffic;
- Construction of hardstanding and structure;
- Lighting of the development (on nocturnal species);
- Clearance of vegetation;
- Presence of people;
- Emissions to the air from machinery and dust;
- Noise and vibration from use of machinery;
- Environmental incidents and accidents (e.g. spillages).
- Disturbance to hydrology (sedimentation, drainage); and
- Ground and excavation works;

The above activates have direct or indirect impacts on the existing ecological environment. During construction phase, small scale impacts could be identified by studying or monitoring the associated flora and fauna. Large scale impact, if any, could be identified after completion of the proposed project through careful long-term study and monitoring. In this study, at first possible general impacts of project activities on 3F (flora, fauna and fish) have been assessed, which has been followed by more specific evaluation of ecological impacts and risk assessment.

Impact on Flora

Construction of power plant has potential impacts (direct and indirect) on the existing aquatic and terrestrial flora. Within the project sites, magnitude/intensity of these impacts may vary from place to place, and some could easily be identified, while others require long-term study/monitoring. However, general impacts on project works on flora are briefly described below.

Aquatic Flora. The proposed Gas Fired Power Plant project site has aquatic habitat which supports few common aquatic floral species. Aquatic floral species are not grown within the proposed project site. Due to proposed project activities, no aquatic flora would be affected.

Terrestrial Flora. The proposed project site has terrestrial habitat which supports diversified terrestrial floral species, and none of them are threatened. During site preparation, some naturally grown floral species (herb and shrub) would have to be cleared; but cutting or clearing of trees would not be required, as there are not “trees” within the project site. Additionally, bushes will have to be removed from the construction area for the new power plant and the associated facilities. Uncontrolled movement of heavy machinery used for setting up batching plant and other project facilities might cause damage to natural vegetation. Such impacts will be primarily confined to the project sites and during initial periods of construction and need to be minimized by adopting appropriate mitigation measures.

Impacts to Fauna

These activities could have some adverse impacts (direct and indirect) on the existing terrestrial fauna due to their reactive behavior in response to disturbance occurring at or near their habitat. Faunal species that are sensitive to direct (human activity and traffic) or indirect disturbance (noise) would be most impacted. Habitat disturbance would reduce habitat availability and effectiveness over a certain period of time for mammals, reptiles, birds and their predators. There are also some possibilities of direct mortality and displacement of reptiles, birds and mammals from the use of vehicles or machinery over terrestrial faunal habitats. Quantification of these losses is difficult; however, the impact is expected to be limited. Based on the baseline review, it is highly unlikely that there are existing plant or animal species that are unique to the project site.

Mammal. Few common mammalian species are available at or near the proposed project site and none of them are nationally threatened. Some mammalian species may be disturbed and displaced from portions of the project sites for some hours, days or months due to the project activities. They are likely to return to their habitat soon after the disturbance has ceased. Project activities, e.g., movement of vehicle and people could displace potential prey species for some mammal within the project area. However, the effects are expected to be temporary, incidental and minimal.

Fish. Sar-e-Pul River is approximately 20 kilometers far from the power plant. Therefore, potential impact seems to be restricted only in the proposed project site.

6.3.3 Socio-Economic Impacts – Construction Phase

In many development projects, the most significant loss of income results from loss of land (due to land acquisition) and income. However, for the proposed Project, no land will be acquired as the IPP will be established on undeveloped, non-productive land that is transferred from GIRoA to the Bayat Power Company through a Land Lease Agreement. Through this agreement the Project Proponent is entitled to engineer, design, procure, supply, erect, test, construct, commission, operate, maintain and insure an approximately 40 MW gas-fired power generation plant and all associated facilities required for its facilitation. Therefore, there will be no loss of private land or property and no displacement of population or resettlement requirements.

Additionally, the site is not used for income generation activity and therefore, no direct loss of income will be incurred. The impacts of the project activities during construction phase on important socio-economic parameters are summarized below. Also, there are no indications following research and stakeholder/government engagement that any monument, shrine, archaeological, historical or culture heritage sites are located on/adjacent to the Project area.

Transport Impacts

During construction phase, additional traffic will be generated for bringing in construction material and equipment. This traffic will primarily be coming from the eastern direction. The roads that are expected to be impacted are those where Project site traffic will be concentrated, specifically, the primary access road that connects the Yatimtaq and Khoja Gorger Daq to the secondary road (Figure 6-1).

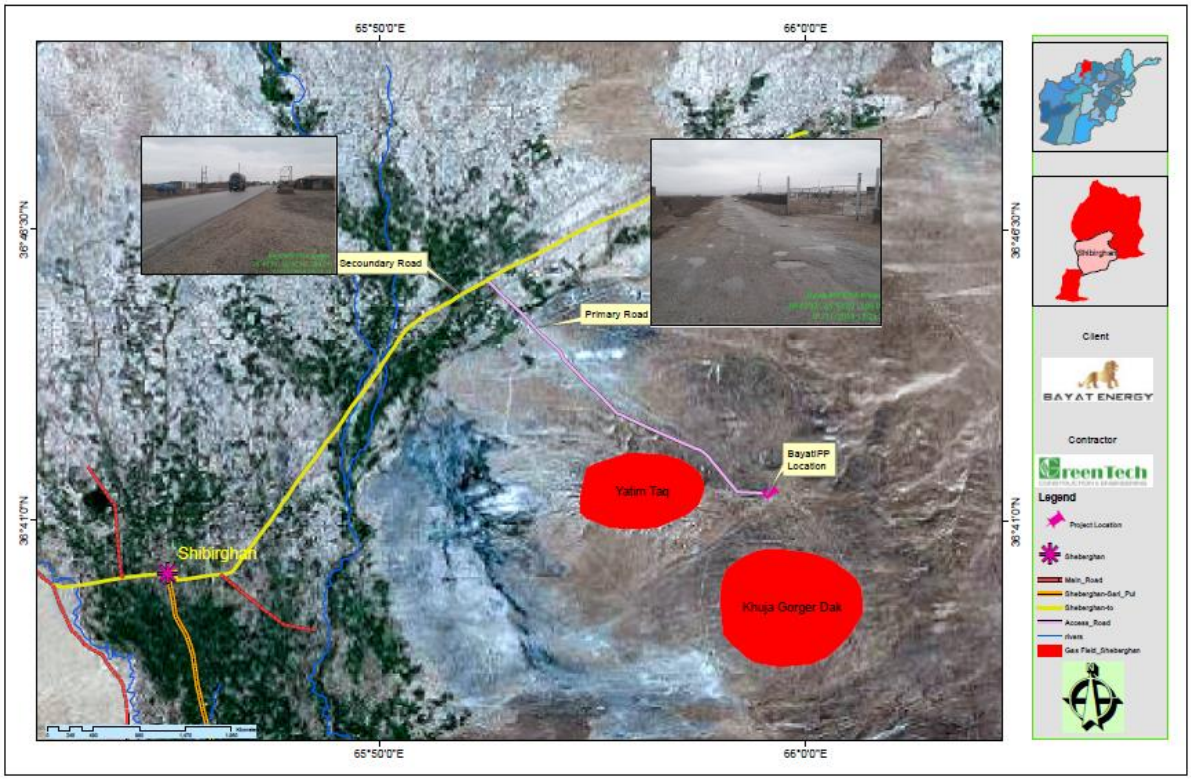


Figure 6-1 Transport and Traffic Pattern Map

Traffic flow to and from the project site during the construction phase will include cars, trucks and heavy load vehicles that will be carrying construction materials, equipment, machinery and personnel. These vehicles will generate noise impacts for on-site workers and the surrounding communities, contribute to exhaust emissions and fugitive dust generation, and pose potential human and animal health risks due to fast speeds and accidents.

During the baseline study, a traffic survey was conducted of the Secondary Highway and the Primary Access Road that will be most impacted by the increase in traffic during construction activities from transport vehicles. The location of the traffic survey points is depicted in figure 6-2. The study involved recording the number of vehicles passing the survey point in either direction over the course of a 30-minute period during separate morning, afternoon, and night events (see Table 6-6 and 6-7).

Based on construction traffic analysis it is expected that traffic increases during the construction phase will vary by activity and can generally be characterized by three main phases of work, namely, Grading/Excavation, Framing/Superstructure and Finishes/Landscaping.

Table 6-6. Traffic count survey of Mazar-e Sharif to Sheberghan Road

Time Period: 09:00 am – 09:29 am				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
A	51	8	6	12
B	33	14	9	17
Time Period: 03:00 pm – 03:29 pm				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
A	55	6	4	9
B	49	8	15	7
Time Period: 09:00 pm – 09:29 pm				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
A	50	5	6	11
B	30	14	9	17

Table 6-7. Traffic count survey of Sheberghan to Bayat IPP Road

Time Period: 09:00 am – 09:29 am				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
a	3	2	5	3
b	2	3	1	5
Time Period: 03:00 pm – 09:29 pm				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
a	2	-	3	2
b	1	1	4	4
Time Period: 09:00 pm – 09:29 pm				
Traffic Volumes	Cars	Light Trucks	Heavy Trucks	Other (Pedestrian, bicycle, motorcycle)
a	5	2	1	1
b	-	-	1	2

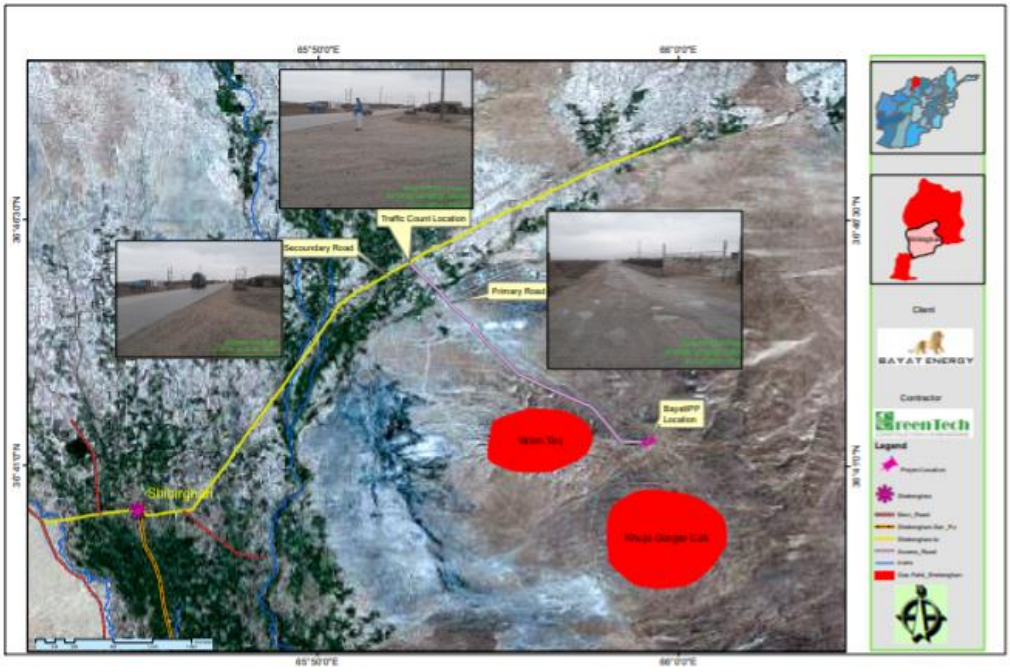


Figure 6-2. Location of the traffic survey points

Based on construction traffic analysis it is expected that traffic increases during the construction phase will vary by activity and can generally be characterized by three main phases of work, namely, Grading/Excavation, Framing/Superstructure and Finishes/Landscaping. Based on conservative estimates,

In relation to the traffic survey results, traffic increases during the busiest construction phase will more than double the baseline traffic load on the Primary Access Road and increase traffic on the Secondary Highway by approximately one-half. However, during the construction period, the delivery trucks would access/egress the project site during non-peak hours and construction workers may be housed on-site or arrive via local shuttles to the project site. Likewise, it is expected that on-site construction activity will fluctuate on a weekly basis, depending largely on the number of workers and construction trucks needed for the activities during each time period.

Because the roads where the majority of traffic will be concentrated are located in a sparsely populated, semi-rural, agricultural area with low population density, traffic is not currently considered heavy or congested. Furthermore, the Yatim Taq and Khoja Gorger Dak located adjacent to the site utilizes the same primary access road and this road network currently accommodates large vehicles and equipment. Construction

traffic impacts will be intermittent throughout the construction period and short-term in nature, however, in order to minimize the public safety and nuisance issues related to the increase in traffic, standard mitigation measures are recommended and presented below.

Public Health and Safety Impacts

Construction activities have the potential to impact human health and well-being due to increased noise pollution and vibration, and local air pollution within and around the project site. Construction activities will generate dust, and noise pollution and vibration will be generated from additional traffic and operation of construction equipment. Because the closest residential and agricultural areas are over 12 km from the site (to the west and north), these impacts are expected to be limited in nature. Furthermore, during much of the year the prevailing winds are northwesterly and the close developed land in the east direction is not located. Other potential adverse public health issues that may arise during the construction phase include improperly managed solid wastes and accidents or releases of hazardous materials. These issues and the recommended management measures to mitigate these impacts are further detailed below.

Employment Impacts

Employment created during construction is considered a beneficial effect of the Project. During project construction and operation phases, employment impacts are considered to be largely positive. The major construction works are expected to be completed within a 12-month period. During plant erection and equipment installation roughly 70 skilled; semi-skilled and daily wage labors are expected to be employed by the Construction Contractor and indirect job opportunities will be generated for drivers, hotels, restaurants, cleaners, etc. Therefore, the project will have a beneficial impact on employment during construction both in the project area of influence, and in the wider geographical region.

If temporary on-site housing is installed for construction work camp operation, the responsible contractor will be required to manage the accommodation of workers and provide basic services to workers in line with the provisions of IFC PS2 and also follow

the guidance note on worker's accommodation published by IFC (Worker's Accommodation: Processes and Standards[32]).

With regard to indirect employment, construction workers and contractors will require numerous vendors, suppliers and service providers to meet the daily operating needs of the project together with the domestic needs of its employees. This could include goods and services such as food vendors, laundry, supply of vehicles and transportation services, security patrols, as well as some construction equipment. In addition, the project will induce secondary/tertiary economic activity due to the influx of migrants from outside the Project's area of influence that will require housing, food, and other types of resources and services. While there is potential that the temporary increase in the local population will impose stress on public service systems such as health clinics and food markets, this impact is limited due to the size and scale of the construction project. Opportunities for utilizing local goods and services for the project and related activities are expected to be positive.

With recommended management measures employment opportunities will be maximized by training of the local workforce and minimizing potential adverse social and health related impacts from an influx of migrant workers. Notwithstanding, there are also potential positive impacts from bringing different groups of people together (residents and migrant or outside workers), which has the potential to encourage development of relationships. It is hoped that interactions will lead to the exchange of knowledge and information, and increased knowledge of other places and people. It is also expected that the project will financially empower some local residents and workers.

Occupational Health and Safety Impacts

The construction phase of the proposed project will involve activities including, but not limited to: excavation, erection of temporary facilities, foundation preparation, and electrical and mechanical work. These activities will expose the workforce to potential

[32] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

hazards. Potential occupational health and safety issues during construction activities include:

- Falls and slips;
- Failures of support systems and/or platforms;
- Collision with mobile plant or vehicles;
- Road safety relating to water trucks;
- Exposure to dust and to hazardous materials;
- Burns;
- Crushing by heavy plant or collapse of structures;
- Falling debris;
- Adverse weather conditions;
- Falls into voids during piling; and
- Contact with concrete.

Hazards cited as of particular concern in IFC Thermal Power Plant Guidelines that were relevant to the study include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards; and,
- Fire and explosion hazards.

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety hazards can be severe since work around heavy equipment and machinery, electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not managed. Therefore, mitigation and management measures (including both technological and institutional) are recommended and presented in Section 7.

6.3.4 Risk Evaluation – Construction Phase

The risk evaluation table below presents the assessment of risk during the construction phase for physio-chemical, biological and socio-economic categories based on the identified potential impacts. The assessment presents the potential issues and the anticipated outcome or receptor that could be affected. The risk matrix elements (consequence, likelihood and significance ranking) are presented, as well as, the adjusted significance ranking once mitigation measures are instituted.

Table 6-8 Summary of Risk Assessment - Construction Phase

Evaluation of Risk – Construction Phase					
Physio-Chemical Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation***
Water Quality and General Environmental Impacts	Solid waste leading to water logging and blockage of drainage lines	Minor	Unlikely	Low	Low
	Liquid waste and contaminated stormwater leading to pollution of soil, surface and groundwater	Minor	Low	Medium	Low
	Solid and liquid waste mismanagement leading to risk of disease transmission	Moderate	Unlikely	Medium	Low
	Clearing and grubbing activities leading to soil erosion	Minor	Unlikely	Low	Low
Air Quality Impacts	Human health impacts from combustion gas emissions and dust	Minor	Likely	Medium	Medium
	Localized ambient air quality degradation	Minor	Likely	Medium	Medium

* Mitigation using standard industry practices considered achievable under site-specific conditions by competent contractors with environmental oversight

	Regional ambient air quality degradation	Minor	Unlikely	Low	Low
Noise Impacts	On-site human health impacts from construction noise	Minor	Likely	Medium	Low
	Off-site (residential, institutional, educational) human health impacts from construction noise	Low	Very Unlikely	Low	Low
	Off-site (industrial, commercial) human health impacts from construction noise	Low	Very Unlikely	Low	Low
	General nuisance (non-health impact) from construction noise	Low	Very Likely	Low	Low
Landscape and Visual Impacts	Short-term quality of life impacts from alteration of existing landscape	Low	Likely	Low	Low
	Long-term quality of life impacts from alteration of existing landscape	Minor	Unlikely	Low	Low
Biological Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Impacts to Flora and Fauna	Short-term destruction of habitats and displacement of fauna	Low	Likely	Low	Low

	Long-term destruction of habitats and displacement of fauna	Low	Likely	Low	Low
	Short-term destruction of flora	Low	Likely	Low	Low
	Long-term destruction of flora	Low	Likely	Low	Low
	Irreversible impacts to ecological systems or functions	Low	Unlikely	Low	Low
Socio-Economic Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Transport Impacts	Public health and safety impacts from vehicles moving at high speeds and accidents	Moderate	Unlikely	Low	Low
	Vehicle noise impacts for surrounding community and on-site workers	Minor	Very Likely	Medium	Low
	Human health impacts from vehicle exhaust and fugitive dust	Minor	Likely	Medium	Low
	Road congestion and nuisance issues for surrounding community	Low	Likely	Low	Low
Public Health and Safety Impacts	Human health impacts from construction noise, vibration and air pollution	Minor	Unlikely	Low	Low

	Human health impacts from improper management of solid and liquid wastes	Minor	Unlikely	Low	Low
	Human health and safety impacts from release or mismanagement of hazardous materials	Low	Unlikely	Medium	Low
Employment Impacts	Health and safety impacts from improper management of labor camps	Moderate	Unlikely	Medium	Low
	Adverse social and health related impacts from influx of outside workers	Minor	Unlikely	Low	Low
	Impacts/stress on local public service systems (health centers, food markets, etc.)	Moderate	Very unlikely	Low	Low
Occupational Health and Safety Impacts	Construction health and safety risks resulting in injury or death	Major	Likely	High	Medium
	Construction health and safety risks resulting in impairment or long-term health issues	Moderate	Unlikely	Medium	Medium

6.4 Impact Assessment - Operation Phase

The following section presents the assessment of the foreseeable significant environmental and social impacts of the Project during the operation and maintenance of the plant (Operation Phase). In this study, the effects of the project activities on physio-chemical, biological and socio-economic parameters have been assessed.

As noted in previous section, the Project site is located on non-agricultural land. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment. Since there will be no thermal discharge (or other forms of discharge from the power plant) into the River, the operation of the power plant is not expected to affect the water quality or quantity in the river, or the aquatic ecosystem of the river.

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial and commercial activities and employment. This section addresses the foreseeable adverse impacts of project activities on environmental and social parameters. The methods of evaluation and risk matrix used for the operations phase assessment is consistent with that used for the construction phase.

6.4.1 Physio-Chemical Impacts – Operation Phase

Wastewater Impacts

Wastewater can pose a number of potential risks if humans consume or are otherwise exposed to pathogenic microorganisms, heavy metals, or harmful organic chemicals such as endocrine-disrupting compounds. Of these, pathogenic microorganisms are generally considered to pose the greatest threat to human health. A wide variety of pathogenic microorganisms may be found in wastewater, including bacteria, viruses, protozoans and parasitic worms. Amongst many others, diseases associated with such pathogens may include typhoid, dysentery, gastroenteritis, diarrhea, vomiting, and malabsorption. The concentration of pathogens in wastewater

is dependent on the source population. The susceptibility to infection by such pathogens can vary between human individuals, for example, children, the elderly and those who are already sick may succumb to infection more easily or experience more serious symptoms.

Wastewater from the project if not properly treated could result in the risk of disease or health effects as described above. A key potential receptor susceptible to the discharge of waste effluent from the site would be a community water supply borehole located down (hydraulic) gradient from the site. If appropriate mitigation measures are not employed, there is the potential for contaminants to infiltrate to groundwater and migrate to the community water supply.

The gas engine component of the power plant does not generate any thermal effluent which needs to be discharged in the environment. A closed cycle cooling system using cooling towers and condensers will dissipate the waste heat into the ambient air rather than a surface water body. Only the intermittent losses of water from the system will be supplemented and there will not be a discharge of water out of the system into a water body.

Wash down water from cleaning the plant and equipment will be conveyed into a stormwater treatment system that will consist of an oil/water separator and sedimentation basin. Sanitary wastewater from the domestic accommodations on-site will be conveyed into a lined septic tank and disposed at the municipally approved disposal site by a certified local waste hauling service provider. Wastewater management practices will be required in order to mitigate impacts to land and water resources.

Solid and Hazardous Waste Impacts

The IFC General EHS Guidelines (Waste Management) contains information about what should be considered in waste management planning. Firstly, the waste should be characterized according to:

- Composition
- Source

- Type of waste
- Generation rate
- Alternatively, according to what local regulations require.

Further to effectively plan and implement waste management strategies the following things should also be done:

- A risk analysis that considers potential EHS risks during the waste cycle and the availability of facilities that can handle waste in an environmentally safe way
- Definition of opportunities for reducing, reusing and recycling waste
- Definition of how waste is safely stored onsite
- Definition of how waste is finally treated and disposed of

Internal combustion gas-fired power plant processes generate very little solid waste relative to other technologies and fuels since the ash content in gas is negligible. Maintenance of the power plant will generate periodic spare part and engine overhaul wastes that are not regularly generated, and therefore careful accounting and planning for waste management is required. The following table provides a comprehensive list of the solid and hazardous wastes that will be generated throughout the operational phase of the power plant.

Table 6-9 Solid and Hazardous Waste Characteristics

Waste source	Waste type	Description / Example waste
Engine spare parts	Metal scrap	By mass the large majority of spare parts are metal, therefore all engine spare parts were considered metal. The rest is mainly plastic and rubber.
Auxiliary system spare parts	Metal scrap	Majority of mass made up by metal.
	Electronic	Majority of mass made up by electronics.
	Hazardous	Majority of mass made up by material considered hazardous.
	Other	Majority of mass made up by material that is not metal, electronic or hazardous. Examples: rubber, plastic, glass fiber, graphite, porcelain, etc.
Non-hazardous waste	Domestic garbage	Food scraps, small articles, plastic bottles, food packaging, etc.
	Paper	Dry and clean printing paper, magazines, newspapers, etc.

	Glass	Bottles, jars, etc.
	Waste to landfilling	Inert waste like car tires, mineral wool, PVC-plastic, etc.
	Metal scrap (excl. spare parts)	Empty containers (that have not contained hazardous material), old tools, etc.
	Used process ventilation filters	Bag filters from process ventilation. (To be handled with caution due to dust content.)
Packaging material	Cardboard	Boxes, etc.
	Plastic	Wrapping plastics, packages, etc.
	Wood	Boxes, pallets, supports, etc.
	Polystyrene	Protective sheets, etc.
	Urea packaging material	Bags and big bags.
Hazardous waste	Contaminated rags	Contaminants: Oil, solvents or other hazardous product.
	Contaminated cans, containers and drums	Contaminants: Oil, solvents, paint, etc.
	Lighting equipment and lamp ballasts	Fluorescent tubes, energy- saving lamps, etc.
	Batteries and accumulators	Nickel-cadmium, lead, etc.
	Gas filters	Gas filters situated on engines, gas modules and pressure reduction stations.
	SCR elements	Catalyst elements from selective catalytic reduction (contain vanadium pentoxide).
	Oxidation catalyst elements	Catalyst elements from the oxidation catalysts.
	Used charge air filters	Depending on filter type the filter elements can be contaminated with oil from the filter.
	Used fuel oil filters	Non-washable fuel oil filter elements from fuel oil filters on 32 engines.

Estimates for hazardous waste accounting for the power plant will vary by engine manufacturer and power plant design however based on the size and scale of the preferred technology the following estimates are provided. With regard to engine spare part waste, based on the size and scale of the engine technology, it is anticipated that between 1-3 kg/MWe of waste (mostly metal) will be generated by 8000 hours of operation (roughly 1 year at full operation).

There are several fractions of waste that are considered hazardous. The average amounts of contaminated rags are 0.0074 kg/MWhe and 0.0313 kg/MWhe for gas and HFO power plants respectively. The average amounts of contaminated containers are 0.0018 kg/MWhe for gas power plants and 0.0110 kg/MWhe for HFO power plants. For lighting equipment, battery and other hazardous waste produced in gas and HFO power plants the average monthly results for gas and HFO power plants respectively are 0.00028 kg/MWhe and 0.00024 kg/MWhe of lighting equipment waste, 0.00010 kg/MWhe and 0.00007 kg/MWhe of battery waste and 0.00016 kg/MWhe and 0.00030 kg/MWhe of other hazardous waste. Finally, with regard to electronic waste the average results for gas and HFO power plants are 0.22 kg/person and 0.075 kg/person respectively. Depending on the selection of emissions control technology (typically Selective Catalytic Reduction (SCR) or oxidation catalysts), additional hazardous wastes require accounting.[33]

Domestic waste is more difficult to estimate quantitatively due to socio-economic, cultural and behavioral variation in trash production and it is likely that due to consumer habits in Afghanistan, domestic waste generation from on-site workers would be less than the global average. However, research suggests that the domestic solid waste stream is characterized by a large organic fraction (approximately 70%) and national solid waste generation rates have been measured in the range of 0.31 and 0.43 kg/capita/day.[34]

[33] Smart, H. (2016). Solid Waste from 4-stroke Medium Speed Engine Power Plant Operation.
[34] https://asu.pure.elsevier.com/en/publications/characterization-of-the-municipal-solid-waste-stream-in-kabul-afg

The scale and severity of solid waste impacts from the operation and maintenance activities is dependent upon the nature of the waste and the medium into which they are disposed. This is also true of accidental release of waste. Mitigation measures for appropriate handling and storage of waste on-site are required and presented below. The ultimate disposition of solid and hazardous wastes from the power plant is expected to be at the municipally approved disposal site.

Water Resource Impacts

The water demand for internal combustion gas engine power plants is significantly less than technologies of similar scale, as described in the Alternatives Analysis section. The source of this public water supply is Sheberghan city groundwater, which is the most common source of industrial and domestic water in the northern region. Groundwater recharge in the Northern River Basin is estimated to be 2.14 km3/year[35]. If a conservative estimate for total site water demand of 50,000 m^3/year is used, this represents 0.0002% of the annual groundwater recharge and is not a significant draw on the groundwater aquifer. While this represents a small impact in relative terms it must be highlighted that excessive use of groundwater for a variety of purposes has significantly depleted water tables and aquifers throughout Afghanistan and, if the trend is not reversed, the country will face a severe shortage of drinking water. The recurrent droughts, low precipitation and poor water management have exacerbated the water crisis. Therefore, regardless of demand, judicious use of water is critical and mitigation measures that maximize water use efficiency and minimize wastage through leakage and misuse must be implemented.

Air Quality Impacts

The proposed 42 MW gas fired power plant is a relatively cleaner technology for electricity production, especially when natural gas with low sulfur content is used as fuel. Natural gas consists of a high percentage of methane (generally above 85 percent) and varying amounts of ethane, propane, butane, and inerts (typically

[35] Favre, A., & Kamal, G. M. (2004). Watershed atlas of Afghanistan.

nitrogen, carbon dioxide, and helium). The average gross heating value of natural gas is approximately 1,020 British thermal units per standard cubic foot (Btu/scf), usually varying from 900 to 1,100 Btu/scf. The natural gas of Yatimtaq will be used at the power plant from, and it was analyzed in March 2018 and the result of these tests are provided in Annex 8.

The primary criteria pollutants from natural gas-fired reciprocating engines are oxides of nitrogen (NOx), carbon monoxide (CO), and volatile organic compounds (VOC). The formation of nitrogen oxides is exponentially related to combustion temperature in the engine cylinder. The other pollutants, CO and VOC species, are primarily the result of incomplete combustion. Particulate matter (PM) emissions include trace amounts of metals, non-combustible inorganic material, and condensable, semi-volatile organics which result from volatized lubricating oil, engine wear, or from products of incomplete combustion. Sulfur oxides are very low since sulfur compounds are removed from natural gas at processing plants. However, trace amounts of sulfur containing odorant are added to natural gas at city gates prior to distribution for the purpose of leak detection.

Based on Guidance Note 3 of PS 3, the potential environmental impacts associated with the emissions of greenhouse gases (GHGs) are considered to be among the most complex to predict and mitigate due to their global nature and therefore clients should consider their potential contribution to climate change when developing and implementing projects and develop a strategy to help reduce it. Various international lender organizations including the IFC give guidance on the scale of a project's GHG emissions based on thresholds of annual emissions that clarify requirements for quantifying, reporting and mitigating project GHG emissions.

With regard to greenhouse gas (GHG) emissions, CO2, CH4, and N2O emissions are all produced during natural gas combustion. In properly tuned engines, nearly all of the fuel carbon in natural gas is converted to CO2 during the combustion process. This conversion is relatively independent of engine type. Fuel carbon not converted to CO2 results in CH4, CO, and/or VOC emissions and is due to incomplete combustion. The amount of CH4, CO, and VOC produced is insignificant compared to CO2 levels.

While the amount of CO2 emitted is a function of both fuel carbon content and system efficiency, for estimating emissions, the fuel carbon content of natural gas is the same as that converted to CO2 in the exhaust; 53 kg CO2/MM Btu. Because emissions can vary significantly between different engine models, the engine specifications are required prior to estimating yearly CO2 emissions.

Emission factors provide a means of relating pollutant releases to the atmosphere based on an activity associated with the release of that pollutant. The U.S. Environmental Protection Agency's (U.S. EPA's) Compilation of Air Pollutant Emission Factors (AP- 42)[36] provide emissions factors for 2 and 4-stroke lean burn engines and 4-stroke rich burn engines that report the estimated individual pollutant contributions in pounds per million standard cubic feet (lb/MMscf) of fuel, and these factors may be used to quantify emissions once the number, type and specifications of the engines is determined. It should be emphasized that the actual emissions may vary considerably from the published emission factors due to variations in the engine operating conditions. This variation is due to engines operating at different conditions, including air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors. It is not unusual to test emissions from two identical engines in the same plant, operated by the same personnel, using the same fuel, and have the test results show significantly different emissions.

6.4.2 Biological Impacts – Operation Phase

Impacts to Fauna and Flora

As noted in previous section, the Project site is located on non-agricultural land and is adjacent to two gas field. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment and not expected to increase during the operation phase (outside of

[36] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

duration). Since there will be no thermal discharge (or other forms of discharge from the power plant) into the River, the operation of the power plant is not expected to affect the water quality, or the aquatic ecosystem.

However, thermal emission from the power plant may have some adverse impact on homestead vegetation in the surrounding areas. Operation phase impacts related to thermal emissions and traffic will be mitigated using standard design and operational measures.

6.4.3 Socio-Economic Impacts – Operation Phase

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment.

Employment Impacts

In terms of job creation, it is expected that during operation the permanent employment opportunities will be 30-50 people (excluding security staff) within the proposed facility, and will consist primarily of local staff with expats and contractors to a lesser degree. No major administrative offices or headquarters are planned on-site, and the work force will be primarily trained laborers, technicians and operators. During certain maintenance operations, including engine overhauls or upgrades, the employment level will increase and will be comprised mostly of expats and contractors. Of the local laborers, the Project Proponent will hire from the local region (primarily local residents and citizens of Sheberghan city who will be trained by subject matter experts.

Additionally, a number of indirect jobs will be created in the service industry in the local area to facilitate the development. It is considered that the revenue generated from the additional employment within the region will result in revenue generation and positive impacts on financial security.

labor influx risk assessment

The influx of a large labor may easily lead to social and environmental conflicts with the local population and project site. The list below indicates common categories of social risk associated with labor influx:

- Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources.
- The influx of labor and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community;
- Influx of labor will generate amounts of waste, for which no sufficient local waste management capacities may exist, which would likely lead to improper disposal practices.
- Project-related activities, along with workers' camps, and a lack of appropriate wastewater discharges may pollute nearby water resources. Major health risks can occur if latrine pits spill over into local streams that are used for drinking water by the host community.
- The provision of clean drinking water and water for hygiene purposes can result in increased pressure on freshwater resources in the project or camp site area.
- Also, camps labor can have impacts on the local wildlife. This may include disturbance of species, as well as illegal hunting. In the same context, new access routes for workers' camps may have impacts on natural habitats.

Public Health and Safety Impacts

The predominant impacts to the surrounding community will be mitigated using the measures described herein for management of fugitive dust, solid and hazardous wastes, wastewater and air quality. If implemented and effective, these measures will protect the community from the most common types of impacts resulting from power plant operation. The greatest significant risk to the surrounding community would be in the case of fire or explosion resulting from gas and fuel storage tanks or engines and auxiliary equipment, or from other accidental spills and releases. In order to mitigate these risks, the Project Proponent should generate an Emergency Response Plan (ERP) to direct response actions at the Bayat IPP covering responses to natural

phenomena, fires, medical emergencies, fuel and hazardous material spills/releases, and any other reasonably foreseeable incidents that would affect the health and safety of the plant personnel and/or the general public.

The purpose of the ERP is to establish the responsibility for handling emergency situations promptly, minimizing hazards, and disseminating information to all plant personnel and regulatory authorities (as required). This program will be annually reviewed and updated as appropriate by the plant operator and will include as a prerequisite input from local public safety officials, local first responders, and public security managers. Plant personnel will review this ERP at least annually during routine health and safety training and following an actual emergency or drill, a critique of the emergency response will be conducted to evaluate and improve the plan, as needed. The following relevant hazards will be accounted for in the ERP:

Natural

Earthquake

Landslide, mudslide, subsidence

Meteorological Hazards

Flood, flash flood

Drought

Snow, ice, hail, sleet, arctic freeze

Windstorm, dust storm

Extreme temperatures (heat, cold)

Lightning strikes (wildland fire following)

Biological

Foodborne illnesses

Pandemic/Infectious/communicable disease (Avian flu, H1N1, etc.)

Human-caused events

Accidental

Hazardous material spill or release

Explosion/Fire

Building/structure collapse

Entrapment and or rescue (machinery, confined space, high angle, water)

Transportation Incidents (motor vehicle, railroad, watercraft, aircraft, pipeline)

Intentional

Demonstrations, civil disturbance

Bomb threat, suspicious package

Terrorism

The Facility will be manned 24 hours per day, 7 days per week. The operational labor force will consist of trained employees who will be on-site at all times that will be available to provide initial emergency response support. The perimeter of the facility site will be secured with a chain link fence or perimeter wall, sliding gates and surveillance equipment so as to permit only authorized access to the facility's service drive, structures and operations. One gate would provide access into the Project site, thereby restricting access to this area. The gate would be locked during normal operations with access provided by facility personnel. Normal plant lighting and emergency temporary lighting would be provided throughout the facility. Security will be controlled by the facility's operators in the control room 24 hours per day, 7 days per week, and 365 days per year. All site security personnel will be equipped with communication equipment to maintain contact with construction and operations management personnel and/or the local emergency responders.

The Bayat Power Company will be required to document in the ERP the organizational structure that will implement emergency preparedness and response actions. Individual roles will include:

- Plant Manager: Command and Control for Roles Below
- Communications Officer: Liaison for Government, Police and First Responders
- Health and Safety Manager: Health and Safety Compliance Coordinator
- Spill Operations Manager: Compliance Coordinator for Spill Response
- Community Liaison Officer: Public Information and Grievance Redress Contact

A link to the relevant ERP template generated by the U.S. Department of Homeland Security, Federal Emergency Management Agency that includes the framework and elements for the ERP[37] is provided in the footnote.

Occupational Health and Safety Impacts

The relevant hazards cited as of particular concern in IFC Thermal Power Plant Guidelines include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards; and,
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety (OHS) hazards can be severe since work around power plants and machinery, electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not identified and managed. Bayat's Health and Safety Manual can be reached in Annex 4.

6.4.4 Cumulative Impacts

Based on the environmental and social impact assessment, the effects of cumulative impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive cumulative impacts). The cumulative effects on physio-chemical factors of wastewater, solid waste and hazardous waste and water resources is also likely to be minimal. The primary cumulative impacts will impact air quality and noise, and further discussion as well as recommended mitigation and management measures for these cumulative impacts are presented in Section 7.

[37] https://www.fema.gov/media-library/assets/documents/89518

6.4.5 Risk Evaluation – Operation Phase

The risk evaluation table below presents the assessment of risk during the operation phase for physio-chemical, biological and socio-economic categories based on the identified potential impacts. The assessment presents the potential issues and the anticipated outcome or receptor that could be affected. The risk matrix elements (consequence, likelihood and significance ranking) are presented, as well as, the adjusted significance ranking once mitigation measures are instituted.

Table 6-10 Summary Assessment of Risk - Operation Phase

Evaluation of Risk – Operation Phase					
Physio-Chemical Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation***
Wastewater Impacts	Risk of disease and human health impacts from accidental release of wastewater contaminants	Moderate	Unlikely	Medium	Low
	Natural resource impacts from discharge of impacted stormwater or wash down water	Minor	Likely	Medium	Low
	Natural resource impacts from mismanagement of sanitary wastewater	Low	Very Unlikely	Medium	Low
Solid and Hazardous Waste Impacts	On-site natural resource impacts from mismanagement of solid or hazardous wastes	Moderate	Unlikely	Medium	Low
	Disposal site natural resource impacts from disposition of solid or hazardous wastes	Moderate	Likely	High	Medium

* Mitigation using standard industry practices considered achievable under site-specific conditions by competent contractors with environmental oversight

	Natural resource impacts from accidental release of solid or hazardous wastes	Moderate	Unlikely	Medium	Low
Water Resource Impacts	Water availability impacts from over extraction of municipal supply groundwater resources	Major	Very Unlikely	Low	Low
Air Quality Impacts	Local/regional human health impacts from natural gas emission pollutants	Low	Likely	High	Low
	Human health or environmental impacts from emission of greenhouse gases	Major	Unlikely	Medium	Low
Biological Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Impacts to Flora and Fauna	Impacts to homestead vegetation from thermal emissions	Low	Unlikely	Low	Low
	Impacts to flora and fauna from site traffic	Low	Unlikely	Low	Low
Socio-Economic Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Public Health and Safety Impacts	Human health impacts from fire or explosion on-site	Low	Very Unlikely	Low	Low

	Human health impacts from accidental spills or releases	Low	Very Unlikely	Low	Low
	Human health impacts from natural hazards impacting site	Moderate	Unlikely	Medium	Low
	Human health impacts from biological hazards impacting site	Low	Unlikely	Low	Low
	Human health impacts from accidental hazards impacting site	Moderate	Unlikely	Medium	Low
	Human health impacts from intentional hazards impacting site	Major	Unlikely	Medium	Low
Occupational Health and Safety Impacts	Operation health and safety risks resulting in injury or death	Major	Likely	High	Medium
	Operation health and safety risks resulting in impairment or long-term health issues	Moderate	Unlikely	Medium	Medium
Cumulative Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Cumulative Impacts	Human health impacts resulting from cumulative effect of air emissions	Low	Likely	Low	Low

6.4.6 Environmental and Social Impact Assessment Summary

As presented in the summary tables for construction and operation phases, the significance of environmental and social impacts are ranked as either low or medium. There are a combination of factors that contribute to the majority of risks being ranked as low following the evaluation, the most important including:

- Good project sitting - over 12 km from residential communities and within an industrial land use area;
- Site is not in close proximity to ecological, historical or cultural sensitive areas;
- Limited biodiversity impacts due to characteristics of native flora and fauna;
- Relatively minimal air, liquid and solid waste emissions resulting from preferred technology; and,
- Well understood and achievable mitigation and management measures.

The potential impacts with a significance ranking of medium included:

Construction Phase

Air Quality Impacts

- Human health impacts from combustion gas emissions and dust
- Localized ambient air quality degradation

Occupational Health and Safety Impacts

- Construction site health and safety risks resulting in injury or death
- Construction site health and safety risks resulting in impairment or long-term health impacts

Operation Phase

Solid and Hazardous Waste Impacts

- Natural resource impacts at municipal disposal site from disposition of solid or hazardous wastes

Occupational Health and Safety Impacts

- Operation phase health and safety risks resulting in injury or death
- Operation phase site health and safety risks resulting in impairment or long-term health impacts

The following section presents the recommended mitigation measures.

7 Mitigation and Management Measures

7.1 Mitigation Measures - Construction Phase

7.1.1 Physio-Chemical Impacts – Construction Phase

At large, the Project Owner and Owner's Engineer is responsible for ensuring that design, construction and operation of the structural elements or components of the project are in accordance with good international industry practice, taking into consideration safety risks to third parties or affected communities. Part of this responsibility involves conducting rigorous and continuous oversight of contractors throughout the construction period through implementation of a structured Environmental and Social management System (ESMS), site-specific Environmental and Social Management Plan (ESMP) and monitoring system.

Water Quality and General Environmental Impacts

Project construction activities will result in generation of a considerable amount of inert solid wastes including lumber, excess concrete, metal and glass scrap, and empty containers used for hazardous and non-hazardous substances. Management of these wastes will be the responsibility of the Contractors. Typical management practices include recycling, proper temporary storage of waste and debris, and good housekeeping of work areas. The wastes left after recycling will be transported to the municipal disposal area. Based on common construction practices in Afghanistan, recycling and reuse rates for construction debris are relatively high due to demand for building materials.

The solid wastes of domestic nature generated mainly by the laborers should be collected and stored separately (i.e., without mixing it with construction wastes/debris) in appropriate containers within the construction site. The solid wastes should be disposed of at the municipal disposal area at the responsibility and verification of the Contractor. For assessing quantity of solid waste (of domestic nature) to be generated at the construction site, a generation rate of 0.2 kg per worker per day may be used and calculations based on this rate may be utilized for selection of appropriate waste receptacles and scheduling of disposal services.

In addition, if temporary housing is installed for on-site construction work camp use, the domestic solid and liquid wastes generated from the installations will require

management through proper infrastructure (waste receptacles and septic tanks) and disposal management plans. In Afghanistan the domestic solid waste stream is characterized by a large organic fraction (approximately 70%) and generation rates have been measured in the range of 0.31 and 0.43 kg/capita/day for workers housed on-site.

The human wastes at the construction site should be appropriately disposed of through construction of sanitary latrines connected to appropriately designed septic tank systems (consisting of septic tank and soakage pit). For this purpose, a wastewater generation rate of 50 liters per person per day (lpcd) may be assumed. Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such wastewater may be carried out by ensuring that appropriate conveyance systems are installed that minimize soil erosion and allow for timely infiltration to reduce standing water.

Because of the relatively level topography soil erosion and transport is not likely, however basic construction site erosion measures can be employed as necessary and should include:

- Covering of stockpiled topsoil, installation of wind fences and silt fences, and implementing fugitive dust control or resurfacing of disturbed areas;
- Reseeding and replanting of areas disturbed by construction activities with vegetation similar to that removed; and,
- Final site grade will be designed to facilitate drainage and avoid flooding or pooling.

About management of chemicals and potentially hazardous materials (i.e. waste oil, paint, solvents, degreasers, etc.) mitigation should be conducted to protect against accidental release of chemicals in the soil and groundwater, the following mitigation measures will be employed:

- Workers will be trained in the handling, storing and disposal of hazardous and non-hazardous materials;
- In the event of an accidental release of hazardous materials, emergency procedures and management plans will be in place so that any spills or leaks can be contained immediately;

- Storage of potentially hazardous construction materials will take place on hard surfacing and within appropriate containers. Where necessary, these would be covered and incorporate spill or leak containment measures; and,
- The waste oil, lubricants and containers will be taken from site either by the suppliers or disposed of at the nearest suitable recycling facility.

Finally, in reference to cultural, archeological and religious sites, while there are no indications following research and stakeholder/government engagement that any monument, shrine, archaeological, historical or culture heritage sites are located on/adjacent to the Project area, the Afghanistan Law on the Protection of Historical and Cultural Properties does not allow any actives which endanger Registered Archaeological sites or buildings. Therefore, a Chance Find Procedure will be prepared in the context of Project as specified in the ESMP.

Air Quality Impacts

Localized air quality impacts from construction sites can be mitigated using common and standard mitigation measures and management practices. Because it is unlikely that fugitive dust or combustion emissions would reach off-site receptors over 1 km to the northwest, north and northeast, it is primarily for the health and safety of on-site workers that the air quality mitigation is essential. However, dust and combustion emissions from traffic entering and exiting the site may lead to off-site impacts and will also require mitigation. The following mitigation measures will be implemented to ensure air quality impacts are minimized:

- Construction materials at the site should be properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize visible dust in air (fugitive dust);
- Vehicle movement to and from the site should be properly managed to ensure that it is does not significantly aggravate the traffic problem and local air pollution;
- Minimize idling of vehicles and equipment to reduce duration of combustion emissions;
- Access route should be well compacted with gravel or asphalt or through use of environmental benign additives to minimize dust from transport vehicles; and,

- Utilize washed stone at the entrance point of the site to minimize tracking of soil off-site.

Noise Impacts

The proposed mitigation measures to mitigate construction site noise from the use of equipment and heavy machinery operations for construction works are listed below:

- Normal working hours of the contractor will be between 06:00 and 21:00 hours from Saturday to Thursday;
- Only well-maintained equipment should be operated on-site;
- Machines and construction plant items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods;
- Low noise equipment should be used as far as practicable;
- Noise enclosures should be erected around stationary equipment; and,
- Material stockpiles and other structures should be utilized, where practicable, to screen noise from on-site construction activities.

7.1.2 Biological Impacts – Construction Phase

Impacts to Fauna and Flora

Impacts associated with the loss of vegetation as a result of the proposed project will be minimized through the implementation of the following mitigation measures:

- The limits of clearing will be delineated on appropriate scale site maps and the limits of clearing flagged to clarify to site workers the extents of the vegetation removal required, and thus minimize the loss of natural vegetation;
- Trees and shrubs that are to be retained will be marked with flagging, and compaction of the adjacent soils will (where possible) be avoided;
- Local, native plant species will be used in areas to be landscaped. Native species are best adapted to the local conditions, are more likely to become established, require minimal maintenance, and are less likely to cause problems from the introduction of non-native species (due to competition with native species);

- Salvaged and stockpiled topsoil will be used to the extent possible in re-vegetation efforts, erosion control, and landscaping; and,
- Use temporary fencing to prevent inadvertent damage to habitats adjacent to the construction area.

7.1.3 Socio-Economic Impacts – Construction Phase

Transport Impacts

During construction phase, some additional traffic will be generated for bringing in construction material and equipment. In order to mitigate traffic impacts, the Bayat Power Company is required to generate traffic management plans, as specified in the ESMP. Traffic management plan will include, but not be limited to, the following mitigation measures:

- To the extent feasible haulage routes should be selected away from sensitive establishments such as residential areas, schools and hospitals;
- Where routes pass through sensitive sites it is recommended to install barriers to protect sites from noise and emission;
- Maintenance of engines and exhaust systems are recommended to minimize emission; and,
- In order to prevent noise and air pollution, it is recommended to construct permanent hard surfaces in the roads connecting to the construction site. It is also recommended to inspect the roadway regularly.

Public Health and Safety Impacts

The following mitigation measures are recommended to reduce potential community health and safety effects:

- All project operations vehicles and contractor vehicles will have a speed limit set for travel through settlements and areas where there are no posted speed limits;
- Generate and HR Policy and Code of Conduct including rules on inappropriate conduct and prescribed actions fo conduct violations including prohibition of gender-based violence and any discrimination based on ethnicity, tribe or religion;

- Generate and implement an employee grievance mechanism (GM) for complaints;
- A Worker Policy and Code of Behavior shall be developed in Contractor Health and Safety Plans which includes guidance on inappropriate conduct and prescribed actions for conduct violations;
- Establishment and implementation of a public grievance mechanism for complaints;
- Collaborate with the affected communities, local government agencies, security manager, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations;
- Workers will be trained on emergency response related to traffic accidents and potential releases of chemicals and other hazardous materials.

Employment Impacts

It will be critical that Contractors are monitored to ensure that they promote safe and healthy working conditions and meet all of the IFC PS 2 requirements, including, providing workers with documented information that is clear and understandable regarding their rights under national labor and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur. In addition, safety and security will require ensuring that security staff are deployed to protect the site, staff and property. Although employment impacts are anticipated to be beneficial, the following enhancement measures are proposed to ensure that the employment process is well managed and the community conflicts are minimized.

- Ensure a transparent hiring process is conducted help the community to understand strategic staffing decisions for the project to avoid conflict;
- Establishment and implementation of a worker grievance mechanism for complaints;

- Contractor shall give preference to local community members in the Project Area of Influence, to the extent feasible, with respect to the employment of unskilled labor;
- Provision of local job opportunities should be consulted with local authorities but not be screened by construction contractor chairman (i.e. no gate-keeping); and,
- If temporary on-site housing is installed for construction work camp operation, the responsible contractor will be required to manage the accommodation of workers and provide basic services to workers in line with the provisions of IFC PS2 and also follow the guidance note on worker's accommodation published by IFC (Worker's Accommodation: Processes and Standards[38]).

With recommended management measures employment opportunities will be maximized by training of the local workforce and minimizing potential adverse social and health related impacts from an influx of migrant and expat workers.

Labor Influx Risk Mitigation

In order to contribute to a harmonious relationship with local communities, to reduce behaviors that could lead to social conflict, for this project Labor Influx Management Plan has developed (Annex 13), and to prevent further environmental degradation following mitigation measures are proposed:

- No hunting, poaching or illicit use of local natural resources;
- Careful use of local natural resources and project resources, especially water; transmission line materials, fuel, fuel-wood, and electricity;
- Restrictions related to the consumption of alcohol and drugs;
- Safe driving practices; and
- Respect for the local community and its cultural norms in which laborers are working.

[38] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

- Labor/Personnel shall not engage in any discrimination or harassing behavior, GBV, SEA and WSH.
- Equal Opportunity Policy should develop to promote non-discrimination in accordance with Labor Influx Management Plan (Annex 13).
- The Worker Grievance Redress Committee has established by ESIA Team to solve the grievances regrading GBV, SEA and WSH between workers.

Additional, in HR Policy (Annex 5) which adopted by Bayat Power Company (BPC), has considered the WSH, GBV and SEA risks, and it will be implemented during the life of project to avoid the impacts of labor influxes. Furthermore, with a view to the variety of potential impacts stemming from labor influx on the community, it is recommended that enhanced efforts be made to reach out to men and women separately, as well as to different age groups and vulnerable groups.

Occupational Health and Safety Impacts

The Afghanistan Ministry of Justice generated the Labor Law of that was adopted by GIRoA in February 2007. This law has been enacted by Presidential Decree No. 94, in accordance with Article 48 of the Constitution of Afghanistan to regulate and clarify the obligations, rights, privileges and social security of employees. Based on Chapter 10 of the Labor Law, employers are charged with providing continuous training to employees on work place safety and must provide medical service free of charge to employees injured on the job. Employers are also required to make provisions at no cost to the employee to ensure work place safety and health, as described in Article 112.1 and 2:

- Where the work carried out is under conditions harmful to health or under special temperature or refrigeration or where there is the likelihood of contamination of employees, special clothes and footwear, masks, eye glasses, gloves and other protective devices as well as preventive and curative foods will be put at the disposal of employees free of charge.
- The organization is responsible for supplying, maintenance, cleaning, sterilization, drying and repair of special working clothes and other protective devices.

The Power Energy Company and its Contractors will meet the following requirements that will be documented in their site-specific health & Safety Plan:

- Observe and maintain standards of Health and Safety towards all employees not less than those laid down by the national standards or statutory regulations; and,
- Report to the Engineer promptly and in writing particulars of any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work or not.
- Bayat Energy Company's Health and Safety Plan needs to be in compliance with international standards, such as OHSAS 18001 or similar.
- In case of a fatality or a serious accident, the World Bank will be informed within 24 hours.

7.2 Mitigation Measures - Operation Phase

7.2.1 Physio-Chemical Impacts – Operation Phase

Noise Impacts

Based on the IFC General EHS Guidelines (Noise Management), noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. At the design stage of a project, equipment manufacturers should provide design or construction specifications in the form of "Insertion Loss Performance" for silencers and mufflers, and "Transmission Loss Performance" for acoustic enclosures and upgraded building construction. In general, the noise level limit is represented by the background or ambient noise levels that would be present in the absence of the facility or noise source(s) under investigation.

During the operational phase, high noise levels are expected to be generated within proximity of the engines and generator installations. Prolonged exposure to such high level of noise may cause permanent hearing loss. Therefore, proper

protective measures should be adopted during the operation and inspection of this equipment:

- Restrict access to installations without proper protective gear including ear muffs, and post warning signs alerting workers and visitors of the requirement for personal protective equipment (PPE).

Wastewater Impacts

Potential wastewater impacts identified in the impact assessment included the potential to contaminate future community water supply in the Project site. If appropriate mitigation measures are not employed, there is the potential for contaminants to infiltrate to groundwater and migrate to the community water supply. The following mitigation measures will be used to mitigate this risk:

- Establish a Spill Prevention, Control and Countermeasure Plan (SPCCP) covering all potential hazardous and aqueous compounds stored on-site;
- Ensure all tanks and storage vessels containing such materials are designed with secondary containment to contain 110% of the tank or vessel capacity;
- Train workers on emergency response related to potential releases of chemicals and other hazardous materials and maintain Safety Data Sheets (SDS) for all chemicals stored on-site;
- Ensure that effective septic tanks are included in the design of all sanitary wastewater infrastructure; and,
- Treat stormwater and wash down water effluents prior to release using oil/water separators and grease traps where appropriate.

Solid and Hazardous Waste Impacts

Performance Standard 3 (Resource Efficiency and Pollution Prevention) is the standard which most directly addresses waste. One of the objectives of this standard is to avoid or minimize pollution from project activities which can have negative impact on the environment and human health. Another objective is to address a more sustainable use of resources. Generated waste which is considered hazardous according to international conventions or local legislation, should be treated in facilities that have adopted GIIP. It is the client's responsibility to make sure that third parties taking care of the client's hazardous waste are reputable and legitimate companies

that are licensed by relevant government regulatory agencies. The client should also ensure that he receives documentation that the waste has reached its final destination. If the client finds out that the used contractor's disposal sites are not operated according to accepted standards, he needs to consider other safe disposal options.

The Bayat Power Company is required to generate a stand-along Waster management Plan as well as spill prevention, control and countermeasure plans that are included in the site-specific Health & Safety Plan. Mitigation and management for storage, transport and disposal of solid waste and Small Quantities of Hazardous Waste (as defined in the FC General EHS Guidelines) should be conducted in a manner to prevent or control accidental releases to air, soil, and water resources and therefore the following mitigation measure will be required;

- Workers will be trained in the handling, storing and disposal of hazardous and non-hazardous materials;
- In the event of an accidental release of hazardous materials, emergency procedures and management plans will be in place so that any spills or leaks can be contained immediately;
- Storage of potentially hazardous materials will take place on hard surfacing and within appropriate containers. Where necessary, these would be covered and incorporate spill or leak containment measures; and,
- The waste oil, lubricants and containers will be taken from site and disposed of at the nearest suitable recycling facility.

With regard to off-site disposal of solid and hazard wastes generated during the operation phase, it is expected that municipal disposal site will be utilized. In order to mitigate the impacts to natural resources from waste at this site the following measures should be utilized:

- Properly containerize all hazardous waste planned for transport and disposal at the municipal disposal site, if possible, using leak proof and secure containers or receptacles;
- Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal

site and actively find all reasonable alternatives including recycling and beneficial reuse;

- Conduct verification through monitoring and documentation that staff or third-party subcontractors are following the established waste management and disposal protocols; and,
- Ensure that all on-site and service contract workers handling and transporting hazardous wastes are trained on the Safety Data Sheet, or if not available, on the appropriate response protocols if spills, releases or accidents occur.

Water Resource Impacts

Water will be supplied by the Sheberghan city's ground water and the will establish a contract to purchase water with the local municipality. Judicious use of water is critical and mitigation measures that maximize water use efficiency and minimize wastage through leakage and misuse must be implemented:

- Ensure that piping and plumbing is constructed and maintained in order to eliminate leaks and wastage; and,
- Audit water use and identify and train on-site workers on water conservation and water efficiency practices that can be implemented.

Air Quality Impacts

The IFC General EHS Guidelines (Air Emissions and Ambient Air Quality) specify NO_x limits for Gas Engines from 3-50 MWth at 200 mg/Nm^3 (spark ignition), 400 mg/Nm^3 (dual-fuel), and 1,600 mg/Nm^3 (compression ignition). No guidelines are specified for Particulate Matter (PM) or SO_2. Additional recommended monitoring approaches for engines include annual stack emission testing only for NO_x for gaseous fuel-fired engines. In addition, refer to Good International Industry Practice (GIIP) for stack height design. Based on the gas analysis and the final engine design and operation specifications, it will be estimated whether emissions of NO_x will exceed IFC guidelines and what appropriate air emissions controls will consist of.

IFC EHS Guidelines April 2007:
Small Combustion Facilities Emissions Guidelines, turbines
(15MWth to <50 MWth),
Natural gas fuel (O2@15%)
NOx = 25 ppm/ 51,3 mg/m3
Fuels other than Natural Gas (O2@15%)
NOx = 74 ppm / 152 mg/m3

At this time, it is recommended that the Project Proponent conduct air modeling computations of the 24-hour average ground level concentrations to simulate the effect of emissions from continuous point sources on neighborhood air quality. The description, methods and calculations used in modeling, as well as, the results and summary analysis should be included in a supplemental report to this ESIA. As per design specifications, after commissioning of the plant, the stack emissions are expected to satisfy the IFC emissions standards for NO_x, CO and Particulate Matter (PM).

7.2.2 Biological Impacts – Operation Phase

Impacts to Fauna and Flora

As noted in previous section, the Project site is located on non-agricultural land and is adjacent to two industrial facilities. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment and not expected to increase during the operation phase (outside of duration). The operation of the power plant is not expected to affect the water quality or quantity in the river, or the aquatic ecosystem.

However, thermal emission from the power plant may have some adverse impact on homestead vegetation in the surrounding areas. Operation phase impacts related to thermal emissions and traffic will be mitigated using standard design and operational measures:

- Minimize the thermal emissions from equipment and machinery heat sources through use of barriers, buffers and landscape design features;

- Ensure that site traffic is managed to reduce impacts to non-driveway areas and implement and enforce safe speed limits for all on-site traffic; and,
- Strictly prohibit the hunting, harming or taking for falconry or any other purpose of any bird species found on or around the site.

7.2.3 Socio-Economic Impacts – Operation Phase

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment.

Public Health and Safety Impacts

The predominant impacts to the surrounding community will be mitigated using the measures described above for management of fugitive dust, solid and hazardous wastes, wastewater and air quality. If implemented and effective, these measures will protect the community from the most common types of impacts resulting from power plant operation. The greatest significant risk to the surrounding community would be in the case of fire or explosion resulting from gas and fuel storage tanks or engines and auxiliary equipment, or from other accidental spills and releases. To mitigate these risks, the Project Proponent should generate an Emergency Response Plan (ERP) to direct response actions at the Bayat IPP covering responses to natural, meteorological, biological, accidental and intentional causes. The ERP will serve to establish the responsibility for handling emergency situations promptly, minimizing hazards, and disseminating information to all plant personnel and regulatory authorities (as required). Other recommended measures include:

- Ensure facility will be manned 24 hours per day, 7 days per week and that the perimeter of the facility be secured to permit only authorized access to the facility;
- All site security personnel will be equipped with communication equipment to maintain contact with construction and operations management personnel and/or the local emergency responders;

- Document in the ERP the organizational structure that will implement emergency preparedness and response actions; and,
- Project Proponent's Project Security manager will engage private security contractors as necessary to manage risk associated with security reach or targeting by anti-government groups including training and contingency planning for all on-site personnel

Occupational Health and Safety Impacts

Occupational Health and Safety guidelines to assist in protecting workers during the operation of the plant are as follows:

- Occupational health and safety guidelines presented in Section 2.0 of the General EHS Guidelines published by IFC. The General EHS Guidelines of IFC covers various OHS aspects including General facility design and operation; Communication and training; Physical hazards; Chemical hazards; PPE; Special hazard environments; and OHS Monitoring and record keeping programs;
- Occupational health and safety guidelines presented in Section 1.2 of the EHS Guidelines for Thermal Power Plants published by IFC for the health and safety impacts particular to operation of power plants.

Relevant hazards cited as of particular concern in IFC Thermal Power Plant Guidelines include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards;
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety (OHS) hazards can be severe since work around power plants and machinery,

electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not identified and managed. Therefore, OHS guidance is provided in Annex 4.

7.2.4 Cumulative Impacts

Based on the environmental and social impact assessment, the effects of cumulative impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive cumulative impacts). The cumulative effects on physio-chemical factors from wastewater, solid and hazardous waste and water resources is also likely to be minimal. The primary cumulative impacts will impact air quality and noise, and will be discussed below.

7.2.5 Decommissioning

Environmental and social impacts during decommissioning of the Project infrastructure will depend on the options available at the time of expiry of the power purchase agreement between Bayat Power Company and the MOMP/Afghan Gas Enterprise. If the Power Purchase Agreements, Land Lease Agreement, Gas Supply Agreement and the other relevant agreements cease to be extended or renewed, decommissioning of the plant may be required. Alternatively, if the operational life of the Power Plant expires and retrofits are not economically feasible, the power plant will be decommissioned. Under both scenarios, the Project Owner will be required under national environmental laws to meet the decommissioning and safe repurposing of the site according to the requirements of national authorities.

Most critically, decommissioning of the plant would require coordination with the MoMP/Afghan Gas Enterprise to cease the gas supply to the site and cap or reroute the gas supply according to national gas transmission protocols and requirements at that time. in addition, when electricity production ceases, DABS would be required to de-electrify and disconnect electrical transmission infrastructure at the site in accordance with their electrical generation and transmission protocols.

With regard to on-site infrastructure, it is expected that continued demand for building materials and recyclable metals in Afghanistan would result in all

salvageable materials being repurposed for beneficial reuse (e.g. steel, aluminum and plastics recycling). Based on the new land use plan at that time, the site would likely be razed and or cleared to the existing grade. The recommended decommissioning process will unfold in three key phases as follows:

- Pre-decommissioning activities: includes the detailed planning (development of a Decommissioning Plan, site Closure and Restoration Plan) and identification of permit and approval requirements;
- Decommissioning Activities: removal of all infrastructure (including piping, cables, pylons, footers and erections for the connection to the existing utilities). machinery, steel and dismantled materials will be recycled where possible and disposed of at licensed disposal sites; and any hazardous substances properly contained and managed according to regulatory authority directives; and,
- Post-decommissioning activities: site survey, close out report and field monitoring as necessary.

During decommissioning, the mitigation and monitoring requirement detailed in the Construction ESMP (Section 8) regarding requirements to meet applicable performance standards, engage with stakeholders and implement the GRM will be incorporated in the Decommissioning Plan. A decommissioning Plan will only be developed during the latter stages of the production life of the facility. The assessment of the significance of the environmental and social impact associated with decommissioning will need to be conducted by ESMP Management unit one the Decommissioning Plan is finalized. In general, the level of impacts and risk posed by decommissioning activities will be commensurate with those during the construction phase and the standard mitigation measures outlined in section 8 will be applicable in their management.

8 Environmental and Social Management System (ESMS)

8.1 Introduction

The Bayat Power Company (BPC) is a newly formed organization out of Bayat Group of Companies. The BPC will be organized in a manner that ensures it will meet the compliance, legal and regulatory requirements of the Government of Islamic Republic of Afghanistan and the IFC PSs. In accordance with IFC PS1, the BPC has established an Environmental and Social Management System (ESMS) that includes policies, procedures and personnel responsible for implementing the system. This section describes the ESMS and its component parts including the Environmental and Social Management Plan (ESMP) that has been generated for the Bayat IPP Project.

8.2 Environmental and Social Management Policy

The BPC has established an Environmental and Social Management Policy (E&SM Policy) which is included in Annex 2. This policy defines the environmental and social objectives and principles for achieving sound environmental and social performances. Through the policy, the BPC accept the responsibility to comply with all environmental regulations and global best practices (including but not limited to IFC Performance Standards, EHS Guidelines, ESI/ESMP, local laws and regulations). In addition, BPC accepts responsibility for ensuring that any contractor providing services of any kind duly follows these requirements throughout the duration of the contract, including any activity or services perfumed by subcontractors or third parties undertaking a contract from the contractor.

8.3 Organizational Structure

The organizational structure that will be allocated to take responsibility and ensure conformance and implementation of the ESMS and ESMP is provided below in Figure 8-1.

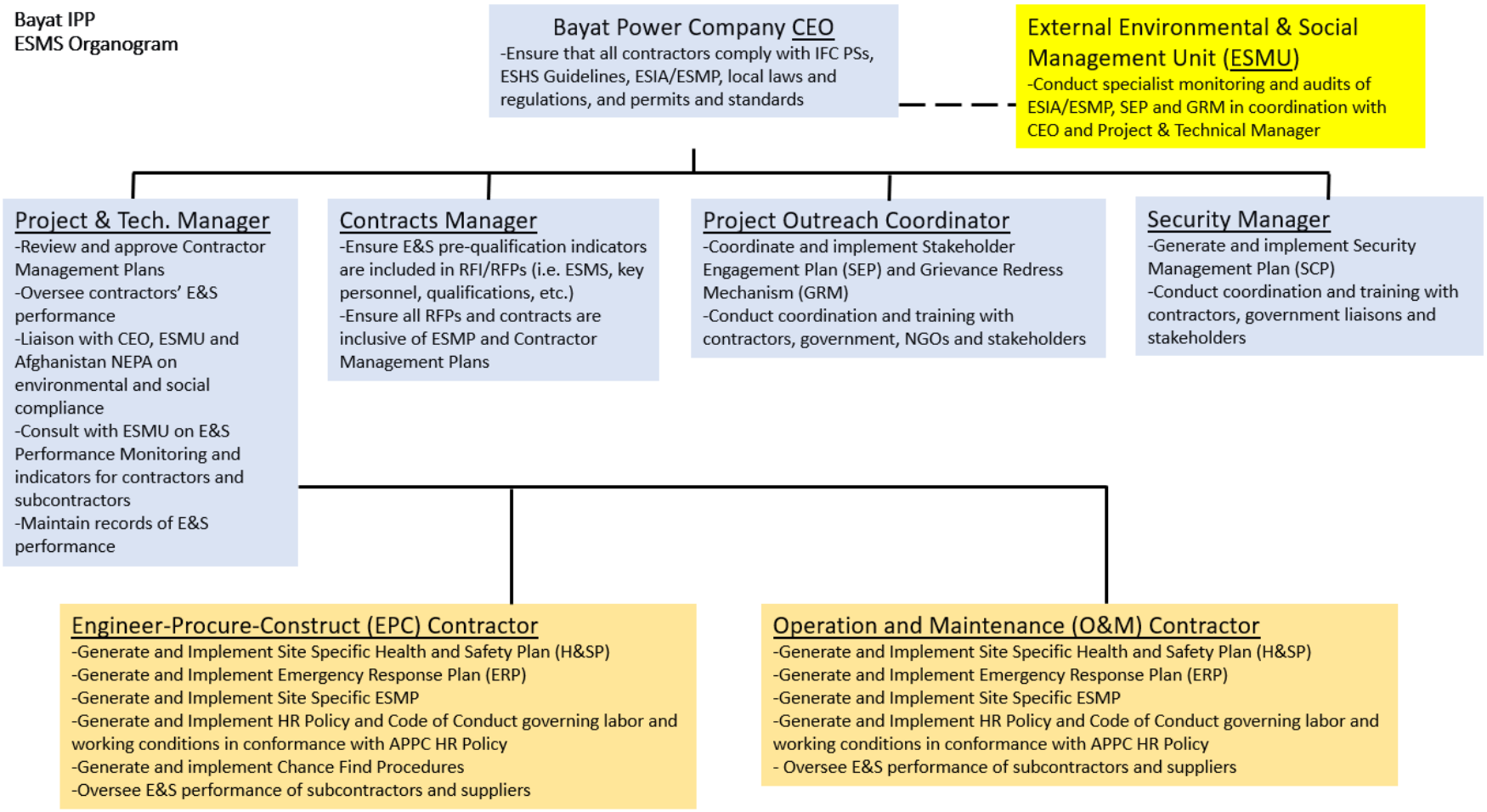


Figure 8-1 ESMS Organogram

As depicted above, the high-level managers of the BPC will all have clearly identified roles and responsibilities in the management of environmental and social risks. While the BPC Project & Technical manager will have direct authority over the contractors, it is expected that an Environmental and Social Management Unit (ESMU) consisting of E&S professionals will be contracted separately to provide training, support services, guidance and monitoring throughout the project. IN addition, contractors will be required to maintain full-time on-site health, safety and environmental compliance oversight personnel as part of their contractual obligations, and this will be documented in the associated Contractor Management Plans that will be reviewed by the BPC prior to implementation.

Through coordination with BPC managers, the ESMU is expected to play a key role in effective implementation of the ESMP, and through the authority of the CEO, clear lines of control between the ESMU and BPC managers will be established. Table 8-1 provides more detail on the roles and requirements of the ESMU.

Table 8-1 Environmental and Social Management Unit Description

Creation of ESMU by Project Proponent/Owner
The Project proponent/Owner (Bayat Power Company) will create a management unit consisting of the Owner's Engineer and/or Environmental Consultant to ensure that the ESMP is implemented over the life of the project. The unit may include the Engineer's field manager(s) and/or the Consultant's field technician(s) who collect samples, conduct monitoring and engage in communications, however, these staff would be directed by the responsible individuals named in the Management Unit. The Owner's Engineer or Environmental Consultant should be a qualified and certified Health & safety Specialist, preferably OHSAS 180001:2007, NEBOSCH or similar certified.
ESMU Roles
The ESMU will be responsible for high level monitoring and quality assurance with regard to E&S performance. This will entail ensuring that the actions and measures described in the ESMP are incorporated into the contracts and plans of all on-site contractors, and that the ESMP is fully implemented throughout the life of the project. The ESMU will assist the BPC Project & Technical Managers to review, comment and ultimately approve the plans developed by contractors and subcontractors to assure compliance with the ESMP. The contractors/subcontractors will be responsible for surveillance during their involvement in the project and are responsible for implementation of their approved plans, while the ESMU will assess their performance and fulfill the role of overall environmental monitoring throughout the life of the project. The ESMU will also be responsible for

monitoring that community relations, public outreach, grievance mechanisms and communication with local authorities are conducted as planned. The ESMU will report directly to the BPC CEO.
ESMU Responsibility
The ESMU will maintain records related to ESMP performance during the course of the construction and operational phase of the Project and provide reports containing the results of monitoring. these will include dates of incidents or accidents; spills, releases or other environmental damage; public complaints or grievances; compliance with code of conduct, camp management plan and influx management plan and, any revisions to the ESMP including changes or additions to specific measures outlined in the ESMP that are modified to improve performance in response to site conditions or circumstances. if necessary, the ESMU, as well as, the BPC Project & Technical Manager have the authority to issue corrective action orders, work improvement notices, or to temporarily suspend work being conducted by contractors or subcontractors (even if this results in project delays.)
External Auditors
Environmental, Social, health and Safety Audits conducted by Project Company are expected to be carried quarterly during construction phase and annually during operations. ESMU will support these audits by responding to information requests and assisting in coordination and scheduling of the site visits, if tasked to do so.

In summary, the ESMU, contracted by the Project Proponent/Owner will have a key role in ensuring that the ESMP is implemented by the BPC and its contractors/operators through a process of thorough supervision and training, as well as, engaging with BPC managers and supervisors.

8.4 Construction Phase ESMS

The Construction Phase ESMS will form the framework for managing social and environmental issues throughout construction, prior to the operation of the Bayat IPP Project facilities and will be consistent with, but not necessarily certified to, ISO 14001.

The Construction Phase ESMS will be used to deliver the Bayat IPP ESIA commitments and coordinate and review the environmental and social performance of the Project at the construction stage. Special consideration will be given to the following:

- Practical training and raising the environmental and social awareness of personnel;
- Supervision and monitoring of environmental and social issues in the field; and
- Continuous improvement of environmental and social performance throughout the Project.

Below figure presents an overview of the elements of the Construction Phase ESMS.

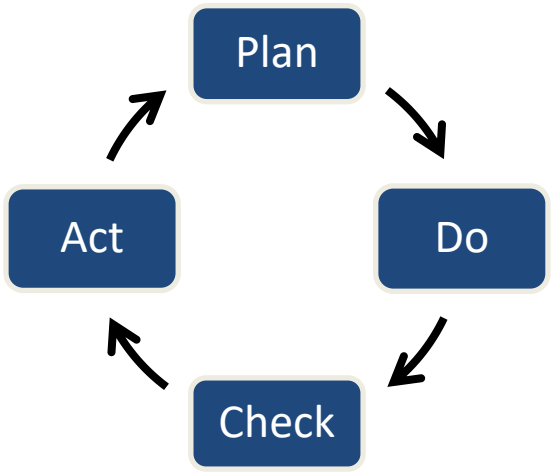


Figure 8-2 Construction Phase ESMS Elements

Plan. The 'plan' stage of the cycle seeks to identify hazards and risks to the Project, and also involves the identification of legal and other requirements, such as the development of aims and target setting using Key Performance Indicators.

Do. The 'Do' stage of the cycle reflects the implementation of the Construction Phase ESMS and its key components:

- Strategy and framework documents;
- Environmental and Social Management Plan and Monitoring Plan;
- Management plans; and
- Contractor procedures.

Check. The Construction Phase ESMS will identify key indicators that will be used to measure environmental and social performance. The main construction and installation contractor's procedures and plans will be used to collect and regularly report monitoring data to Bayat IPP, including the following:

- Data (e.g. waste volumes, types and disposal, complaints received and resolved);
- Activities carried out (e.g. surveys, meetings with communities, site inspections and findings);
- Status of non-conformances identified during inspections;
- Environmental, social and cultural heritage issues arising in the course of the works (e.g. contaminated land discovered, archaeological finds and ecological issues); and
- Site observations and reports, from inspections and incidents such as spill events.

The construction and installation contractors will conduct audits to track progress and performance in implementing the Construction Phase ESMSs and the effectiveness of the mitigation measures implemented in avoiding environmental and social impacts. The schedule of these audits will be determined after the contract has been awarded, but the aim will be to audit all elements of the Construction Phase ESMSs. The frequency of auditing for individual commitments will be reviewed regularly and adjusted as necessary to take account of audit findings. Bayat/Contractor will also carry out spot check audits of any issues that are of environmental and social concern.

Act. The inspection and audit processes will be documented with nonconformance reports (NCRs) and corrective action requests (CARs). The construction and installation contractors will develop and maintain action-tracking systems to monitor the effectiveness of actions taken in response to NCRs and CARs. Contractor will track the implementation of corrective actions and will update the Project Manager and the Environmental and Social Manager daily on non-conformances that require follow-up actions. The contractors will be responsible for the management of their staff (to the extent that reflects staffing at the site).

8.5 Operations Phase ESMS

Contractor will operate the facilities using an Operations Phase ESMS that is certified to ISO14001 Environmental Management System (EMS) and will be based

on the 'plan, do, check, and act' cycle. The Operations Phase ESMS will be developed prior to commencement of operations and transition plans will be developed to assist with the movement from the construction to the Operations Phase ESMS.

Similar to the Construction Phase ESMS, the primary functions of the Operations Phase ESMS will be to operate Project facilities in accordance with the ESIA and applicable legal and regulatory standards. Through a management system that mirrors the ISO 14001 EMS, the Operations Phase EMS will:

- Regularly assess the environmental and social aspects and impacts of its activities;
- Develop objectives and targets to address any significant aspects;
- Appropriately resource and train staff; and
- Monitor and audit the success of its actions in addressing the significant impacts.

This system will be implemented with the aim of ensuring continual improvement in performance. Key components of the Operations Phase ESMS, consistent with ISO14001 requirements, are provided below:

- EMS General Requirements
- Environmental Policy
- Environmental Aspects
- Legal and other requirements
- Objectives and Targets
- Environmental Management Programmes
- Structure and Responsibility
- Training and Awareness
- Communication
- EMS Documentation
- Document Control
- Operational Control
- Emergency Preparedness and Response
- Monitoring and Measurement

- Non-Conformance and Corrective Action
- Records
- Environmental Management System Audit
- Management Review

The operations commitments included within this ESIA will be implemented through the operations phase environmental of environmental management system. The following existing plans will be updated to incorporate Project or new plans developed as required:

- Emissions management;
- Waste management; and
- Ecological management and monitoring.

In addition, the existing Emergency Response Plan (ERP) will be reviewed and amended to reflect the location of new Bayat IPP Project facilities.

8.6 Environmental and Social Management Plan (ESMP)

The primary objective of the environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the mitigation measures identified earlier to reduce adverse impacts and enhance positive impacts from specific project activities. It is also meant to address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project. The ESMP enforces the IFC Performance Standards (PS) and is compatible with the World Bank Operational Policy 4.03. The primary Performance Standards that apply to project activities are identified as:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety and Security

- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

The ESMP is separated into a construction phase plan (CESMP) and an operation phase plan (OESMP), which are presented in the table 8-2 and 8-3 respectively. CESMPs and OESMPs need to be approved by the World Bank and will need to be disclosed in-country and on the World Bank website. Amendments to ESMP shall be submitted to the World Bank. At the meantime,

8.6.1 Construction ESMP

Table 8-2 Construction Environmental and Social Management Plan (CESMP)

Environmental Issue	Impact Source	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsibility for Mitigation Implementation	Responsibility for Supervision of Mitigation Implementation
Air Quality	• Operation of heavy machinery and transport vehicles • Overall construction activities	Air Quality Impacts	• Cover stockpiles and loads to avoid fugitive dust emissions • Minimize idling of vehicles and operation of combustion • machinery and equipment to greatest extent possible • Hard pack or spray access roads and driveway areas to reduce dust generation • Place washed stone at site exit to minimize off-site tracking of soil and debris	EPC Contractor	Site Management Team & Project Management Team
Noise	Overall construction activities	Noise Impacts	• Set and enforce standard daytime working hours, recommended to be 06:00 to 21:00 • Maintain equipment and use low noise equipment and methods where feasible • Enclose or fix barriers around noise-generating stationary equipment	EPC Contractor	Site Management Team & Project Management Team
Soil and Groundwater Quality	• Wastewater Discharges • Fueling of heavy machinery and transport vehicles • Storage, handling and disposal of solid waste	Water Quality and General Environmental Impacts	• Recycle waste to the maximum extent, provide for the proper temporary staging and storage of waste and debris on-site and implement good housekeeping in work areas • Transport, or oversee the subcontract for transport, of non-recyclable waste to the municipally approved disposal site and periodically verify delivery	EPC Contractor	Site Management Team & Project Management Team

	• Storage, handling and disposal of hazardous waste		• Segregate domestic waste in appropriate receptacles and dispose at municipally approved disposal site and manage sanitary waste systems in a manner protective of human and environmental health • Protect against accidental releases of hazardous materials through training, spill prevention measures, recycling and if appropriate, timely cleanup and disposal • Enforce Chance Find Procedures and cease work if • historic/archeological finds are encountered • Design, construct, operate, and decommission the structural • Elements or components of the project in accordance with good international industry practice, taking into consideration safety risks to third parties or affected communities.		
Biological Environment	• Land clearance • Construction activities	Impacts to Flora and Fauna	• Minimize removal of vegetation and replant disturbed areas using native plant species • Use fencing, flagging and site boundary controls during construction to minimize disturbance of off-site habitats	EPC Contractor	Site Management Team
Traffic	Transportation of construction equipment to Project site	Transport Impacts	• Manage haulage routes to avoid sensitive establishments and use barriers as appropriate • Maintain vehicles in good working condition	Design Contractor	Site Management Team
Land Use	Lands used by locals close to Project activities and access roads.	Damage on crops or lands near the Project site or along the transportation road.	Stakeholder engagement Plan is in place	EPC Contractor	Site Management Team

Local Employment	Employment of Afghan nationals during construction phase		• Follow a transparent hiring process to help the community understand strategic staffing decisions and avoid conflict over hiring with the local communities. • Develop a training and skills program to impart best practice in the skilling of local people for construction and operational jobs. • Encourage contractors to provide apprenticeship opportunities to local people, and encourage supply chain partners to recruit local people. • Establish a local job readiness program and encourage the construction supply chain to continue to invest in workers. • Establish a local employment brokerage that will publicize job vacancies and put in place initiatives to ensure employment opportunities for hard to reach groups. • Bayat Power Company (BPC) has stablished a HR Management Policy and Procedure (Annex 5), and it has three parts which are Human Resource Polices, Human Resource System, and Employee Performance Management, for employees to promote ethics, honesty and professionalism within the company and among its employees. In the third part, the "Code of Behavior" has descripted, and BPC will develop and implement it to meet the PS2 Occupational Health and Safety Standard.	Human Resources of the Project Subcontractor	Site Management Team
Labor and Working Conditions	Employment of multinational groups	Employment Impacts	• Consult with local authorities on hiring local workers and enforce a transparent "no-gatekeeping" policy • Manage construction work camps (if used) according to IFC PS2 guidelines, processes and standards	EPC Contractor	Site management Team & Site HSE Officer

			• Provide workers with clear understandable documentation explaining worker's rights and refrain from harassment, intimidation and exploitation. Enforce Human Resource policies specifically outlawing underage workers and forced labor • Implement employee grievance for on-site workers as part of worker's rights program • Ensure proper security protocols and staff are in place throughout construction to provide security and safeguard property • A code-of-conduct (CoC) shall be prepared by EPC contractor and after approve by Bayat power Co. should signed by each worker prior to begin work		
Labor Influx	• Employment of International Workers for the Project • Goods and services received from the locals	• Projects involving major civil works often require a labor force and associated goods and services which may increase risks of GBV • Labor influx for construction works can lead to a variety of adverse social	• Bayat Power Company has developed GBV Policy to promoting gender equality, both in and outside the workplace. In addition, BPC recognized that certain types of violence have a disproportionate effect on women; therefore, the Gender Based Violence GBV Policy has developed to deal with perpetrators of GBV (Please See Annex 5, Bayat HR Policy). • Bayat Power Company has also developed the SEA policy to ensure effective action is taken to prevent sexual harassment, exploitation and abuse. BPC will not tolerate its employees, contractors, consultants or any other collaborators from sexual harassment, sexual exploitation or sexual abuse. Furthermore, BPC committed to achieving full, ongoing implementation of the Six Core Principles relating to	EPC Contractor	Site Management Team & HR Manager

		and environmental risk and impacts • Gender equality	Sexual Exploitation and Abuse by the Inter-Agency Standing Committee working group on Prevention and response to sexual exploitation and Abuse (Please See Annex 5, Bayat HR Policy).		
Occupational Health and Safety	• Construction activities • Labour and working conditions • Monitoring and review of accidents/ incidents due to construction activities • Construction activities, transportation of construction material	Public Health and Safety Impacts	• Set and enforce speed limits to avoid public health impacts to surrounding communities • Institute and enforce Code of Behavior Policy • Implement public grievance mechanism and conduct public outreach and notification as appropriate • Collaborate with the affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations	• Project Owner • ESMP Management Unit and • Contractor	Site management Team & Site HSE Officer
Cultural Heritage	Construction activities	Impacts / disturbance to unforeseen cultural heritage through project activities.	Procedures shall be developed in the event that cultural heritage is subsequently discovered during the project construction.	EPC Contractor	Site Management team and Project Management Team
		If cultural resources are found during construction	Follow the cultural heritage law of Afghanistan	EPC Contractor	Site management Team for Operation
Landscape	Construction activities	Visual amenity	Landscaping of the site upon completion of construction works. This will both mitigate visual impact and reduce erosion from surface waters during heavy rains and flood periods. Soils excavated during construction may be used for landscaping if suitable.	EPC Contractor	Site management Team for Operation

8.6.2 Operation ESMP

Table 8-3 Operation Environmental and Social Management Plan (OESMP)

Environmental issue	Impact Source	Potential Impacts	Action/Mitigation Measure	Responsibility for Mitigation Implementation	Responsibility for Supervision of Mitigation Implementation
Air quality	Stack emissions	Impact on ambient air quality	• Conduct air modeling computations of the ground level concentrations to simulate the effect of emissions from continuous point sources on neighborhood air quality and include in a supplemental report to this ESIA • As per design specifications, after commissioning of the plant, the stack emissions are expected to satisfy the IFC emissions standards for NOx, CO and Particulate Matter (PM).	Design Engineer	NEPA / ESMU
Greenhouse Gases	GHG emissions from plant operation	Impact on ambient air quality	• Include the results of air modeling along with other design considerations including engine quantity and specification, gas characteristics and IFC emissions (priority pollutant and GHG) standards when determining the appropriate emissions control technology.	Project Owner, Design Engineer	NEPA / ESMU
Noise	Operation of the Power Plant	Noise Impacts	• Implement noise controls measures at the source through design elements including, but not limited to, silencers, mufflers, acoustic enclosures, upgraded building design and landscape features (mounds, trees, etc.) • Restrict access to installations without proper provision of personal protective equipment (i.e.	Operator	NEPA / ESMU

			ear muffs) and post noise warning signs at perimeter of noise exposure area		
Water Quality	• Wastewater Discharges • Water intake • Accidental Spills and Leaks • Storage, handling and disposal of solid waste • Storage, handling and disposal of hazardous waste	Impacts to Water and Soil	• Maximize water use efficiency and minimize wastage through leakage and misuse by ensuring that piping and plumbing is constructed and maintained in order to eliminate leaks and wastage • Audit water use and identify and train on-site workers on water conservation and water efficiency practices that can be implemented • Conduct **verification through monitoring and documentation that staff or third-party subcontractors are following the established waste management and disposal protocols**	Operator	NEPA / ESMU
Solid and Hazardous Waste	Operation activities	Solid and Hazardous Waste Impacts	• Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal site and actively find all reasonable alternatives including recycling and beneficial reuse • Properly containerize all hazardous waste planned for transport and disposal at the municipal disposal site, if possible, using leak proof and secure containers or receptacles • Avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project through modifying, substituting, or eliminating their use, and recycle all hazardous materials to the extent feasible	O&M Contractor	Site management team for operation

			• Establish a Spill Prevention, Control and Countermeasure Plan (SPCCP) covering all potential hazardous and aqueous compounds stored on-site • Provide worker training on the handling, storing and disposal of hazardous and non-hazardous materials		
Biological Environment	• Operation activities • Operation activities • Protected fish species	Impacts to Flora and Fauna	• Minimize the thermal emissions from equipment and machinery heat sources through use of barriers, buffers and landscape design features • Ensure that site traffic is managed to reduce impacts to non-driveway areas and implement and enforce safe speed limits for all on-site traffic	Project Owner and O&M Contractor	Site ESMU
Local Employment	Employment of locals	Decline in the high unemployment rate of the area of influence (Aol).	• Follow a transparent hiring process to help the community understand strategic staffing decisions and avoid conflict over hiring with the local communities. • Develop a training and skills program to impart best practice in the skilling of local people for construction and operational jobs. • Encourage contractors to provide apprenticeship opportunities to local people, and encourage supply chain partners to recruit local people. • Establish a local job readiness program and encourage the construction supply chain to continue to invest in workers. • Establish a local employment brokerage that will publicize job vacancies and put in place initiatives	Project Owner and Operator	Site management Team for Operation

			to ensure employment opportunities for hard to reach groups		
Labor Influx	Employment of international workers for the Project; Goods and services received from the locals	• GBV risk will increase • Labor influx for Operation works can lead to a variety of adverse social and environmental risks and impacts. • Gender equality	• Bayat Power Company has developed GBV Policy (Annex 5), it will be implemented. • Bayat Power Company has also developed the SEA policy to ensure effective action is taken to prevent sexual harassment, exploitation and abuse. (Please See Annex 5, Bayat HR Policy).	O&P Contractor	Site Management team for operation, HSE Officer & HR Manager
Public Health and Safety		Public Health and Safety Impact	• Institute a public grievance and redress mechanism to respond to community issues and concerns and take appropriate actions to remedy and compensate for social impacts • Institute and maintain proper security protocols throughout operation to provide security and safeguard property by ensuring facility will be manned 24 hours per day, 7 days per week and that the perimeter of the facility be secured to permit only authorized access to the site • Collaborate with the affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations • Generate an Emergency Response Plan (ERP) to direct response actions at the Bayat IPP covering	Project Owner and Operator	Site management Team for Operation & HSE Officer

			responses to natural, meteorological, biological, accidental and intentional causes		
Occupational Health and Safety	Operation activities Plant operations	Occupational Health and Safety Impacts	• Generated a comprehensive Health and Safety Plan and submit to ESMP Management Unit for approval prior to conducting work • Report all accidents and injuries to ESMP Management Unit within 24 hours of incident	ESMP Management Unit and Operator	Site management Team for Operation & HSE Officer

8.6.3 Action Plans and Contractor Management Plans

Action Plans will be used to describe the documents or processes that the BPC will take the lead roles and responsibilities in generating and/or overseeing. These will include the BPC Contracts Manager ensuring that E&S Performance Management requirements are included in RFI, RFQ, bid documents and contracts so that Contractors are properly vetted and committed to providing the level of competency required to undertake the measures described in ESMP. The BPC Project Outreach Coordinator will be responsible for managing and enacting the Stakeholder Engagement Plan and the Community Grievance Redress Mechanism (see Section 9). Finally, the BPC Security Manager will be required to generate and fulfill the necessary security functions for all personnel on-site. This will include training BPC staff and contractors/subcontractors, engaging with local emergency response and military organizations, and working with the BPC Project Outreach Coordinator to ensure that affected communities are involved in and educated on the necessary security details.

As referenced in the ESMPs, the contractors will be required to generate Contractor Management Plans. These will be discussed herein. With reference to Occupational Health and Safety (OHS), the mitigation measures that will be required are dependent upon the stage and phase of work, the nature of the activity and the outcomes of site-specific activity hazard analyses. Therefore, the ESMPs do not provide specific measures, outside of the requirement that the contractors and in some cases subcontractors will generate comprehensive Health and Safety Plans (H&SP) These H&SP will explicitly contain detail and direction on Emergency Response Plans (ERP), spill prevention, Control and Countermeasure Plans (SPCCP), and Traffic Management Plans (TMP) on and around the site.

About Waste Management, each Contractor will inherently be dealing with different types, volumes and quantities of solid and liquid wastes. The management of these waste streams, both on-site and off-site, will require careful planning and consideration, as well as, training and directives for employees. The Waste Management Plans generated by the Contractors will contain this detail and will

include provisions for supervising and monitoring that waste is managed and disposed according to their BPC-approved Waster Management Plans.

In addition to H&SPs and Waste Management Plans, the contractors will be responsible for providing Human Resource Policies (HR Policies) outlining their commitments to maintaining GIIP regarding labor and working conditions that are commensurate with the FC PS 2 and Bayat and BPC Human Resources Policy (See Annex 5). the HR Policies will be required to include the Contractor's Employee and Third-Party Grievance Mechanism (as well as the provision of staff and training to manage the GM) and a specific code of conduct relevant to local working conditions and the surrounding communities.

Finally, the contractor will also be required generate a Chance Find Procedure highlighting the precautions and procedures that will be enacted to protect cultural and historical heritage. while no historically or culturally significant sites or artifacts are expected to be encountered at the site, ti is imperative that the contractor has specific procedures in place in case of a chance find - including stoppage of work, reporting to the relevant local/national authorities, and taking prescribed measures to protect and appropriately preserve other potential significant artifacts or sites in the vicinity of the chance find.

Contractors will submit their management plans to the responsible BPC manager for approval according to the schedule provided in Table 8-4 below. It is expected that BPC managers will involve the ESMU in the review, comment and approval process for all Contractor Management Plans.

As indicated in the ESMP, the following documents, action plans and contractor management plans are official required deliverables based on the ESIA/ESMP. The responsible parties, plan name, approver and schedule are included in Table 8-4.

Table 8-4 Action and Management Plan Responsibilities

Responsible Party	Action or Management Plan	Approval /Oversight	Schedule
BPC Contracts Manager	Contracts - Ensure that E&S Performance Management Requirements are included in RFI, RFQ, bid documents and contracts	ESMU	Prior to issuing contracts
BPC Project Outreach Coordinator	Stakeholder Engagement Plan (SEP) and Grievance Redress Mechanism (GRM)	ESMU	As indicted in SEP and GRM
BPC Security Manager	Security Management Plan (SMP)	BPC CEO	Prior to Project Implementation
Contractor	Waste Management Plan	BPC Project & Technical Manager and ESMU	Prior to Project Implementation
Contractor	Chance Find Procedure	BPC Project & Technical Manager and ESMU	Prior to Project Implementation
Contractor	Human Resources Policy including Employee Grievance Mechanism and code of Conduct	BPC Project & Technical Manager and ESMU	Prior to Issuing Contract
Contractor	Health & Safety Plan (HSP)including provisions for Emergency Response, Spill Prevention and Control, and Traffic Management	BPC Project & Technical Manager and ESMU	Prior to Project Implementation

8.7 Monitoring and Management

Monitoring will be a multi-faceted component of the ESMP. Monitoring is required to ensure that the actions specified in the ESMP to mitigate environmental and social impacts are effective. Monitoring must be undertaken on a specified schedule depending on the nature, scale and extent of the impacts and mitigation measures being monitored (e.g. hourly, daily, weekly, monthly, etc.). As noted in Section 8-2, the Contractors/Subcontractors/Operators will be responsible for surveillance during their involvement in the project and are responsible for implementation of their approved plans, while the ESMP Management Unit will assess their performance and fulfill the role of overall environmental monitoring throughout the life of the project. The specific monitoring role of the ESMP Management Unit will include:

- Identifying monitoring plans and schedules per Contractor based on the nature and duration of activities being undertaken;
- Establishment of an Environmental Management Procedure (EMP) to ensure the implementation of the necessary CESMP and OESMP actions to achieve these objectives;
- Cooperation and coordination with outside environmental auditors based on directives from the Project Owner and International Finance Institution to assess the performance of the EMP;
- Conducting OHS leadership and training when multi-employer worksite scenarios are encountered to ensure effective coordination and management and reinforce the shared responsibilities for environmental and social protection; and,
- Preparing reports of monitoring observations and records for submittal to the Project Owner, regulators and to the International Financing Institutions (IFI) when specified.

In addition to monitoring, it may be required to establish additional detailed management plans for an activity or specific phase of work on-site that is currently unforeseen or requires special attention following the commencement of work activities. The need for these additional plans will be determined by the BPC Project & Technical Manager and the ESMU. The costs associated with implementation of any additional plans will be negotiated or incorporated into new bid documents and

contracts as needed. The BPC and ESMU will review and approve these plans prior to the contractor starting work on the activities involved.

Finally, it should be noted that the ESMP is a working document and will be updated in line with any changes to Project requirements or as a result of actions required by internal/external audits. The Contractors/Operators are responsible for ensuring that changes are incorporated into the relevant procedures and plans and the BPC and ESMU is responsible for directing such changes.

As the Project progresses and detailed design is concluded, a greater level of certainty will be available regarding the project's likely impacts and understanding of the environmental and social aspects requiring management during all phases of work. Where any additional issues are identified, these will be assessed and included as necessary through an update to the ESIA and subsequent amendments of this ESMP and associated detailed contractor management plans. Any amendments to the ESIA/ESMP will be re-submitted to the NEPA and made available to the public.

8.7.1 Monitoring Methods and Parameters

In general terms, the ESIA predicts the impacts of the proposed project on the basis of information available at the time of conducting the assessment and the natural processes that link various environmental and social parameters. Based on this prediction, mitigation measures are introduced such that the predicted residual effects do not exceed acceptable levels. However, there can be an element of uncertainty in such predictions, for example, due to an insufficient grasp of the processes, limitations in prediction techniques, or inadequate data on the environment. This is true for the physio-chemical, biological, as well as socio-economic environment. Consequently, it is possible that even if the mitigation measures are implemented fully, the negative impacts of the project could exceed predicted levels or acceptable limits. In order to address the above concerns, monitoring will include technical evaluation of environmental and social risks and uncertainties. Broadly, effects monitoring has the following objectives:

- To verify that the impacts of the proposed project are within acceptable limits, thus establishing credibility (public assurance);
- To immediately warn the Project proponents (and the regulatory agencies, if appropriate) of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures;
- To provide information to plan and control the timing, location, and level of certain project activities so that the effects are minimized; and
- To facilitate research and development by documenting the effects of the proposed project that can be used to validate impact-prediction techniques and provide a basis for more accurate predictions of future projects.

Monitoring and evaluation methodologies will be developed during the detailed design phase of the Project when the specific information on field activities will be known. The effects monitoring will be comprised of the following as needed:

- Attitude and Community Perception;
- Transportation Systems;
- Soil Erosion and Drainage;
- Land Contamination;
- Water Quality;
- Air Quality;
- Fauna & Flora;
- Wastewater;
- Archaeological Resources and Cultural Heritage;
- Public Health and Safety; and,
- Occupational Health and Safety.

Table 8-5 provides a framework monitoring plan that may be used by the BPC Project & Technical Manager and ESMU in developing their EMP. This framework is a guideline that should be used to assist in creating separate construction and operation phase monitoring plans throughout the life of the Project. The plans should

be used in conjunction with other inspection checklists and reporting forms that will be required for monitoring different contractors during different activity stages and phases of work. A consolidated and comprehensive operation phase monitoring plan should be developed as part of the EMS based on site specific conditions and operational aspects identified following the construction phase.

Table 8-5 Framework Monitoring Plan

Monitoring parameter	Monitoring Locations	Monitoring Objectives	Methodology/ Resource Requirement	Frequency	Role	Documentation
Attitude and Community Perception	All communities that will be affected by power plant construction activities.	To ensure that grievances are resolved and do not escalate into conflict.	Quarterly review of grievance registers to identify outstanding issues not resolved. Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of project activities.	Quarterly review during preconstruction, extending into the construction stage as required.	ESMP MU	Complete records and reports of findings
Transportation	Secondary highway, primary access road and ROW around the associated facilities.	To document disturbances to local villagers due to transportation if they occur. To avoid traffic accidents. To mitigate nuisance of increased traffic due to increased noise level.	Visual observation of construction areas and surrounding road networks with particular attention to road areas in need of repair or where resurfacing has recently occurred. Particular attention to road segments in proximity to any sensitive receptors or human use areas.	Biweekly during construction extending to quarterly during initial operational phase	ESMP MU	Record all of accidents, noise level, and problems regarding transportation.
Soil Erosion and Drainage	Construction site disturbance areas, temporary lay down areas, waste staging areas, loading zones and site perimeter.	To assess the effectiveness of environmental protection measures aimed to minimize erosion, maximize sediment retention and minimize suspended solid loads off-site.	Erosion effects will be monitored by visual observation of landforms, storm water turbidity and photographic documentation; Identification of areas of potential soil instability, soil erosion, and standing water.	Weekly throughout construction activities involving land disturbance, grading, landscaping or other land surface impacts; quarterly during operation phase	ESMP MU	Complete record Record of visual observation/ photographs
Land Contamination	Visual soil contamination monitoring should occur at all areas near fuel and chemical storage areas and maintenance activities.	To assess the effectiveness of environmental protection measures aimed to prevent pollution and protect environmental resources and community health and safety	Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for contamination. Verification of disposal practices through field visits and inspections.	Visual observations of soil contamination should be ongoing, on a weekly basis during construction and monthly during operation phase.	ESMP MU	Reports, photographs and records of any sampling and analysis
Water Quality	At wells and surface water bodies near construction site and labor campsite.	Turbidity, pH, DO, TSS, Total Dissolved Solids, oil & grease, total coliform, heavy metals	Laboratory analysis/sampling bottles	Pre-construction baseline, followed by monthly tests during construction and biyearly during operations	ESMP MU	Record of sampling location and analysis, corrective actions required

	Selected local wells in nearby communities. Selected locations at nearby surface water bodies.					
Air Quality	• Upwind area • Within construction area • Downwind direction at site perimeter • Adjacent to nearest residential areas	To measure concentrations of dust and gaseous emissions at selected locations surrounding the project area, so that the results can be assessed in relation to air quality standards	Site inspection Air quality sampling parameters will include hourly and 24-hour readings of total suspended particulates (TSP) and particulate matter less than 10µm (PM10) for gravimetric determination. NOx and CO during operation phase	Determined by construction activity (weekly to monthly depending on current activities). Monthly extending to biyearly during operation.	ESMP MU	Record of visual observations, analytic results and photographs
Noise Level	Identified locations within the construction area based on activities and nearby noise generating sources	To ensure that noise levels produced by operation of machinery and equipment do not exceed standards and to ensure that adopted air pollution and noise controls and management are effective.	Site inspection The measurement of noise levels will be conducted using an integrated sound meter. Since operation will be continuous over 24 hours, representative measurements will be made during all working shifts on the day of sampling. The grievance register will be monitored for reports by local residents for vibration causing human irritation or damage to property.	Monthly during construction extending to quarterly during operation.	ESMP MU	Complete record of noise measurements with documentation of sample locations
Fauna & Flora	Construction area, at site perimeter and in immediately adjacent land areas.	• To document terrestrial flora and fauna prior to land clearing. • To monitor the extent of land clearing and of rehabilitated areas following completion of land preparation activities. • To document rehabilitation success.	Site surveys and photographic records of land clearance, and subsequent rehabilitation. Rehabilitation progress will be recorded by measuring stem density and projected foliage cover.	Daily, Weekly or Monthly depending on construction activities. During operation phase extending to quarterly. Vegetation monitoring on rehabilitated sites will be carried out at six-monthly intervals, over two years after planting of vegetation.	ESMP MU	Complete records and reports of findings
Wastewater	All generation areas, conveyance systems and holding/storage infrastructure used for wastewater from construction, operation and sanitary sources.	Identify whether wastewater management practices are protective of the environment and human health and take corrective actions if needed.	Site inspection Soil and water testing if needed Verification of waste disposal practices.	During construction weekly and extending to monthly during operation phase.	ESMP MU	Record of visual Inspection, photographs and documentation of sample analysis

Archaeological Resources and Cultural Heritage	Construction Site	Ensure that chance find policy is implemented and effective	Visual Inspections and interviews with staff	Weekly or Monthly based on construction activities occurring. Immediately after and continuously following a chance find.	ESMP MU	Record of visual Inspections and interviews and photographs
Public Health and Safety	Site and surrounding area including nearby villages	To support government and local communities to prevent and to combat diseases. To ensure that the opportunity for the spread of disease between the non-local workforce and local residents is kept to a minimum. Avoid any deterioration in public health and environmental sanitation as a result of the project. To determine whether the presence of the construction workforce is negatively impacting the provision of local health services. To determine whether the treatment of ailments as a direct result of construction activities is placing pressure on local health services.	Records of accidents and safety hazard incidents. Medical surveillance of workforce. Collect and analyze relevant primary and secondary data from the company medical clinic and public medical centers. Quarterly consultation with local health service providers. Consultation with local government to determine sanitation as part of community development needs assessment.	Monthly during construction extending to quarterly during operation phase.	ESMP MU	Complete records and reports of findings
Occupational Health and Safety	Project site	To monitor the effectiveness of Contractor/Operator Health and Safety Plan implementation.	Conduct complete safety and health inspections including review of management practices, labor practices, equipment and machinery, personal protective equipment (PPE) use and enforcement, safety incidents and policies. Conduct interviews with managers and staff.	Monitoring will commence at the start of the preconstruction stage and continue through construction and operation stages daily on site.	ESMP MU	Complete records and reports of findings.
Community/CDC Engagement and Grievance Mechanism	• Within local communities or CDC; and Grievance log in site office	• Develop / disclose compliant plan to local communities; • Appoint Community Liaison Officer (CLO); • Implement plan during construction. • Grievance mechanism in SEP • Signage providing grievance contact details Grievance logging	• Develop stakeholder engagement plan; Record the compliant of communities and CDCs.	• Prior to construction; • Monthly; and Update prior to operations and on an ongoing basis as new stakeholders are identified	ESMP MU	• SEP; • CLO employment contract and job description; • Minutes and photographs of meetings; and Grievance logs and investigation reports

9 STAKEHOLDER ENGAGEMENT

9.1 Introduction

This section presents the Stakeholder Engagement Plan (SEP) for the Bayat IPP Project. Participation is a process, through which stakeholders influence and share control over development initiatives as well as the decisions and the resources that affect them. The Bayat IPP Project is not expected to have potentially significant adverse impacts on any affected communities. However, regardless of the lack of direct impacts on Affected Communities, the Company has already initiated informed consultation and participation with the nearest villages, and established a grievance mechanism for these nearby communities as one part of the ongoing external communication program.

The pre-project stakeholder engagement and consultation was initiated by the ESIA team in order to establish communications with stakeholders as well as the greater community and social network that surrounds the proposed Project. This stakeholder outreach and involvement would increase the probability of successful implementation of the ESMP and provide the affected community with a clear and achievable means of voicing concerns and grievances throughout the life of the project. The objectives of the stakeholder engagement include the following:

- Provide a preliminary identification and mapping of key stakeholders of the project, including vulnerable groups (if any), to be updated as the Project evolves.
- Provide a practical framework for the dialogue with stakeholders through the life of the aforementioned Project that is technically and culturally adapted to the local context.
- Ensure that the SEP is underpinned with sufficient resources, supportive institutional structure and adequate processes.

The SEP is a key supporting document to the Project Environmental and Social Impact Assessment (ESIA) that has been developed by Green Tech on behalf of the

Project Proponent/Owner and was conducted during October and November 2018. The dialogue approach detailed in this SEP has been prepared in line with national legislation and country norms as well as IFC/World Bank standards. The SEP is a "living" document that will be updated as the project evolves and the stakeholder landscape is further understood.

The project description as well as the social context and characteristics of the affected communities are detailed in ESIA section of this report. This information and context have been used in, 1) providing best available Project information to stakeholders, and, 2) identifying and mapping the social groups and communities that have been incorporated into the SEP.

9.2 Stakeholder Groups

For the purposes of this SEP, stakeholders are defined as:

- Parties which are or can be influenced by the Project (positively and/or negatively).
- Parties showing their interest in the Project.
- Parties which are able to influence the Project.
- Explicit inclusion of women representatives and women's groups

The list of stakeholders and the plan of engagement with various groups will be issued and revised on a regular basis to ensure that the Project Proponent/Owner is aware of those who are interested and/or concerned with the Project and, consequently, should be involved in the engagement process. In an effort to ensure inclusion of gender equality and women's participation in the project, specific women's groups and representatives were disaggregated in the SEP for decision making input and input into the grievance redress mechanism. While preparing this SEP, the main groups of stakeholders that were identified are presented in Table 9.1. Due to the nature and scale of the Project and the stakeholder groups identified, a ranking system indicating the degree of interest in and influence over the Project was not deemed useful and all stakeholders were treated as highly interested and influential.

Individual interviews were conducted with all government directories and both national and international NGOs. In addition, 10 Focus groups discussions (FGD) were conducted with different groups of society which were identified by quota sampling. At the meantime, 45 people were randomly selected in the city and individual interviews were conducted. Two public awareness consultations were held between women and men representing the villagers, and one Grievance Redressal Committee (GRC) set up at each meeting.

Another GRC was established among the relevant directorates including; Mines and Petroleum Directorate, DABS Directorate, Energy and Water Directorate, Provincial Governor, Municipality and Provincial Council.

Table 9-1 Stakeholder Groups

Stakeholder Group	Stakeholder Group	Impact/Experience
Local population (Potentially Direct Stakeholders)	Residents of the surrounding villages	The local residents of the communities nearest to the site have the greatest interest in the Project and are likely to be the most indirectly impacted by the positive and potential negative impacts of the Project
Women's Groups (Potentially Direct Stakeholders)	Female residents	Women will be impacted indirectly by the outcome of the Bayat IPP and are critical part of the SEP in achieving representative public engagement
Non-Government Organizations (Indirect Stakeholders)	Both national and international organization.	Prominent NGOs that are well informed of social and environmental conditions and act as public advocates regarding sustainable development are key stakeholders for knowledge transfer
Local Government Officials (Indirect Stakeholders)	Refer to Table 9.2	Officials have a key role in local authorizations during all Project phases (design, construction, operation) and act as public representatives and liaisons.

9.3 SEP Schedule

Stakeholder engagement will be carried out throughout the Project in stages at key phases in order to disseminate new information on Project details and update stakeholders of timelines and upcoming activities. This initial outreach conducted during preparation of this ESIA is considered Pre-Project/Preliminary and the planned subsequent stages for outreach to all of the identified stakeholder groups are as follows:

- Stage 1: Pre-Project/Preliminary
- Stage 2: Project Approval/Pre-Construction
- Stage 3: Construction Phase
- Stage 4: Pre-Start Up Operation
- Stage 5: Operation Phase

The exact dates for external communications prior to each new phase of the Project have not been determined. Therefore, the SEP schedule is considered a SEP Framework even thou this SEP Plan has been initiated.

The remainder of this section presents the details of the activities and dialogue documented during Stage 1: Pre-Project/Preliminary and establishes the framework of stakeholders and meeting locations for the implementation of the ongoing SEP. the BPC Project Outreach Coordinator will, as primary duty, enact and document each subsequent stage to explain the rationale and timing for the engagement, the information disseminated, the record of dialogue and/or grievances and resolution/response actions provided.

The BPC will develop a community engagement plan. The plan will outline how employees and workers will be identified and hired. Workers must be selected from local and vulnerable people like affected people, women headed households, people below the poverty line, single household heads with dependents, the landless or households without security of tenure and elderly households with no means of support.

9.4 Pre-Project/Preliminary Stakeholder Engagement

The following Table 9.2 provides a record of the outreach conducted with the local population, specifically the communities immediately surrounding the site to the northwest, north and northeast in closest proximity to the Project. The location of these villages in relation to the site is depicted in Figure 9.1. Public notices were posted prior to conducting the meetings and arrangements were made with local leaders (i.e.

Imams, school administrators and teachers) in advance in order to maximize attendance and interest. The community consultation meetings were designed specifically to provide project information to the public. These sessions were informal to encourage a friendly social environment in which participants were comfortable in raising questions, expressing their opinion and voicing concerns about the project. The lists of attendees contact information and photographs of meetings are provided in Annex 10.

The following table 9.2 provides detail for the local government ministries/agencies that were part of the Pre-Project/Preliminary SEP activities. Meetings with institutional stakeholders including government departments were organized to discuss project interventions and their potential impacts on the local communities and environment. In these meetings, stakeholders were informed about the available details of the Project and location. Institutional stakeholders showed their concerns and gave suggestions/recommendations for the implementation of the project.

The following Table provides detail of the local populations, NGOs and local government ministries/agencies that were part of the Pre-Project/Preliminary SEP activities. Meetings with institutional stakeholders including government departments were organized to discuss project interventions and their potential impacts on the local communities and environment. In these meetings, stakeholders were informed about the available details of the project and location. Institutional stakeholders showed their concerns and gave suggestions/recommendations for the implementation of the project. A summary of the salient topics discussed are listed below:

- Government should fulfill the regulatory requirements of conducting ESIA of proposed project;
- Project shall be done with high quality work and materials;
- Possible damage to flora and fauna particularly at proposed site for power house should be addressed;
- Take good security measures during the implementation of the project;

- Construction related issues like excavated material, soil erosion and hazards for local communities and labor force should be appropriately addressed during the construction activities;
- Recruit expert and professional staff;
- Health and safety measures for labor force; and;
- Rights of employment in Bayat IPP Project for local community.

Figure 9-1 Location of Surrounding villages in relation to the Project site

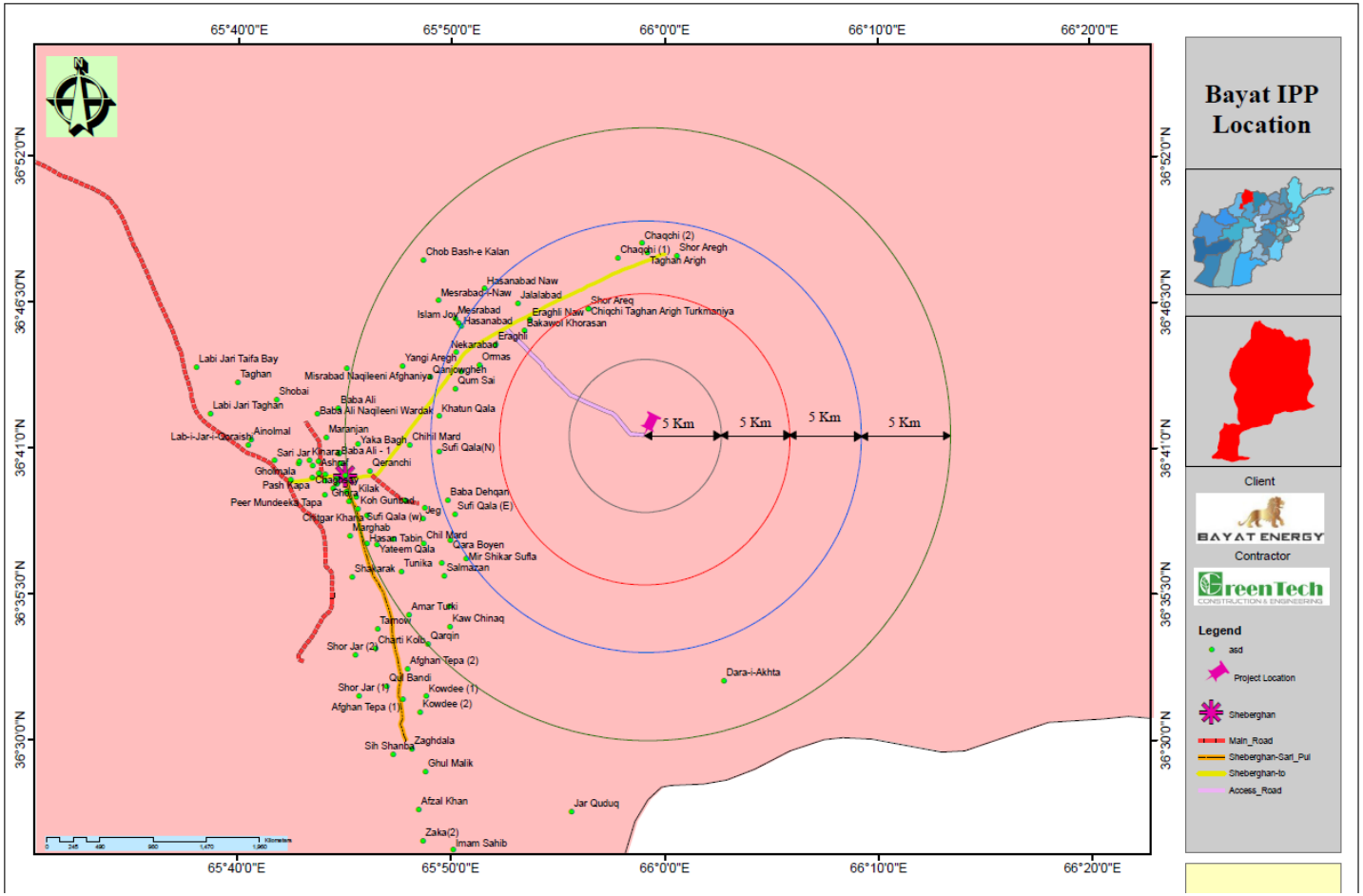


Table 9.2 record of the outreach conducted with the local population	**Local Population**	

Date	**Stakeholders**	**Main Points Shared**	**Suggestions**	**Importance of the Stakeholder**
October 25, 2018	Religious Scholars	In their opinion, this project has many advantages such as; • The government moves toward electricity independency, • More revenue generated for the government, • Job creation in the region and country, and • Hopefully provide cheaper electricity for the public **Challenge:** Security of the Project site is and will be a big challenge for the BEC.	• Take good security measures in the project site. • Expert people should be hired • Trees to be planted around the project site.	The most influential people in the Afghan local societies are mullahs. They are involved in almost all the big decisions in the community levels.
October 26, 2018	Refugees and Repatriations	After complaining the current status of the electricity in the region especially during the cold season, they fully supported the project. In their views, some of the benefits of the project would be: • The economy grows, • The electricity would be available to the public at cheaper price. • The power supply voltage would high. • One more step will be taken for independency in electricity • More job opportunities • Satisfaction of people from the government and the company is large. • Both the government and the nation benefit from this project. **Disadvantage:** We believe that the only disadvantage of this project could be the smoke generated during the operation. **Challenges:** we believe that the security will be a big challenge in the job site. We hope the Bayat Power Company hires competent professional and management team to implement the project.	• Recruit professional, technical and experienced staff • Local people should be given priority when electricity is generated.	These people have been forced to leave because of poverty, lack of security, illiteracy and unemployment. By starting power generation and increase the employment and economic growth, the economic situation of repatriations may improve.
October 31, 2018	University's Students	They said that they are not happy with the current situation of unstable electricity especially during the warm and cold seasons.	They state that the professional staff should be hired to implement this	As the educated population, they are entitled to be consulted about the details of the project

		Advantage: In their opinion, the first advantage of this project would be to produces inexpensive electricity and promote job opportunities for people. They believe, eventually, the economy would grow. This project would increase revenue for the central government and that we don't need to pay millions of Dollars to Turkestan to purchase electricity. **Disadvantage:** Operation of this facility will produce smoke and carbon dioxide. These smoke, if not proper managed, would causes acid rain, environmental degradation, and mental illness. Special care should be taken in these regards. **Challenge:** They referred insecurity as the biggest challenge of the project. Lack of expert people and interference of the people with power could be other challenges for the project.	project. At the meantime, the government is responsible to provide security for the project. They also requested the all-time availability of the project owner(s) to the local residence.	and hear their concerns/recommendation to successfully implement the project.
October 26, 2018	Landowners & Farmers	They said that they heard through the media and other people that a gas-fired power plant will be built by Bayat Power Company. They strongly support the implementation of this project at the soonest possible. **Advantage:** They believe that this project can make a huge contribution to the lives of poor people, and they can also access the power-enabled technologies like the other big cities. They also said that many of their current problems will be solved by the project. They were very pleased with the implementation of the project, saying that even in their agriculture, the project would be beneficial. **Disadvantage:** According to these people, the smoke generated, as a result of the operation, could be harmful to the people and the surrounding environment, causing illnesses if not properly managed. **Challenges:** In their opinion, the lack of proper management in the future could challenge this project. Meanwhile, security is also another major challenge for them in the future.	• This project should be managed properly to avoid harm to people and the environment. • This project should be implemented as soon as possible	The drought in Jowzjan province in the last ten years has made landowners vulnerable.

October 30, 2018	Chiefs, Elders and Village Representatives	**Advantage**: In their views, this project would increase the employment rate in the region and ultimately grow the economy. They also believe that as a result of this project, roads will be built. As a result, no longer people need to migrate to foreign counties. **Disadvantage**: In their views, this project doesn't pose any problem to people. **Challenge**: They named the insecurity as the biggest challenge.	• The project should hire local people from Sufi Qala village because these people are close to thee project • Power lines should be under the ground to prevent potential environmental hazard. • Use high quality equipment with the best technology available in this project	This group is well respected among people of local communities. They play a big rule in successfully implementation of the project through their advice.
October 24, 2018	University professors	According to them, this project, if managed properly, will reduce all the problems of the people in the region. they also said that this project is in the interest of all people in the province of Jowzjan and neighboring provinces, in their views, this project has many benefits such as: • In general, economy grows; • More employment opportunities for people; • In agriculture sector, it can provide benefits to farmers; • This project can reduce the cost of electricity and • Carpet washing plants can also be activated in this province.	• Logically, the price of electricity generated should be cheaper than imported electricity. • Corruption should not exist in this project. • State of the art technology should be provided to minimize and mitigate the environmental contamination. • Provision of the security will be a big challenge. • Professional staff in management should be hired. • Local staff should also be hired from Jowzjan province.	As the educated population, they are entitled to be consulted about the details of the project and hear their concerns/recommendation to successfully implement the project.
October 31, 2018	Public Meeting	Advantage: • The quality of electricity will be good. • Electricity will be generated from internal resources and will benefit the public and the government.	• Hiring experienced staff in the project • Use of quality devices	This group includes all type of the community members of which the implementation of this project may have different effects on them.

		• It will create jobs for the people of the region. • Promote agriculture in the region. Disadvantage: • If the project is properly managed, it will not be harmful for the environment and people. • Challenge: • Insecurity and Taliban presence in the project area • Foreign interference in project activities • Intervention of powerful people • Lack of proper and practical management	• In the distribution of electricity, justice should be considered. • Electricity should be supplied at low prices. • Project security will be taken seriously. • The government should monitor the activities of the project. • Project management team should always be in contact with local people specially elders.	
Women's Groups				
Date	**Stakeholders**	**Main Points/Comments**	**Recommendations**	**Importance of the Stakeholder**
October 24, 2018	Employed Women	After raising their concerns about the current situation of the electricity, they stated that the problem gets worst in cold and warm seasons. **Advantage:** They believe that this project can solve many of their problems. They also outlined a few benefits of this project for themselves such as: • We can use electrical appliances for ease, • Electricity becomes strong and we no longer need to use solar power and generator, • Electricity would get cheaper, hopefully, • More employment opportunities for our youth, • The economy of Jowzjan's people grow and rises, • Students can also make the most of this project, • People who run small businesses will benefit from this project. **Disadvantage:** According to them, smoke from this device can be harmful to the environment and people who live near the project. In	• The trees should be planted around the project in minimize damage to the environment, • Special attention should be given to the security of the area, • professional/experienced staff, • The smoke/pollution generated from the equipment should be taken care of.	Since this group is involved with both inside and outside affairs of their houses, their ideas and inputs are paramount important note.

		general, they believed that the project would not harm the region and the people if properly managed. **Challenges:** • Security as the biggest challenge • Lack of professional/experienced staff to run the equipment.		
October 23, 2018	Housewives	**Advantage:** In their opinion, if the electricity to be generated will be powerful, permanent and inexpensive, this will definitely help both the job creation in the region and also grow economy in the larger extent. **Disadvantage:** They said, "one of the disadvantages of this project could be the smoke generated as a result of operation that could cause illness." **Challenges:** Security threats are real. Because the project site is located out of the city in Yatimtaq area, serious security measures should be taken.	In their opinions, it is very important for the Company to oversee the smoke and pollution released as a result of the operation of the facility not to harm surrounding environments and people.	Housewives, since they spend most of their times in homes, they need electricity for cleaning and washing clothes, ironing and etc.
Non-Government Organizations				
Date	**Stakeholders**	**Main Points/Comments**	**Recommendations**	**Importance of the Stakeholder**
October 13, 2108	World Hunger Help (WHH)	Current International NGOs: • (W.H.H) • Save the children • ZOA • Action aid • Bark This specific NGO did not know about the construction of the project by Bayat Power Company. This NGO has been operating in Afghanistan for over a decade and is operating in Jowzjan. Their goal is to eliminate poverty in the region, and they are working to achieve this goal through help and job creation for the people.	• All the required studies/analysis should be conducted at the initial phase. • Recruit professional/experienced staff. • Take the advantage to hire the local people in the region for the operation	NGOs and Civil societies are the voice of the people and could have good ideas/comments on the subject matter

		Advantages: They believe that, by implementing this project, we can carry out poverty programs quickly and easily. **Challenges:** They also mentioned security in the region as the biggest challenge for the new project.		
October 13, 2108	Women Association	Current National NGOs: • Unity • Family • Helping children • Pack • Y.H.U. **Advantages:** By the start of this project, we believe that many of our problems regarding electricity will be solved.	• Use the experience of other companies in the same sector to take the use of their experiences. • Recruit professional staff, • The project must start at the scheduled time.	NGOs and Civil societies are the voice of the people and could have good ideas/comments on the subject matter
October 13, 2108	Civil Society: • Bakhtar Agency • Radio Armaghan • PAFCO Program • National TV • Civil Society Institutions • University Students • University professors • Civilian activists • Government staff	They did not seem much pleased with the current electricity situation, stating that during the cold and hot season, power problems would increase. **Advantage:** According to them, this project would be beneficial for employment for the people of Jowzjan. When people have electricity, they believe that, people and the government will benefit most from the project because the electricity is offered at a cheaper price to the public. **Disadvantage: They said that** each project is both beneficial and harmful, and the disadvantage of this project is related to environmental degradation and health problems.	• Insecurity as the biggest challenge, • Presence of mafia groups, and • Poor management because the lack of professional/experience staff.	Civil societies, as one the most active groups in a society, are able to inform people of their rights and continue to litigate against the authorities.
Governmental Organizations				

Date	Stakeholders	Main Points/Comments	Recommendations	Importance of the Stakeholder
October 27, 2018	Information & Culture Directorate	**Historic sites and ancient relics:** Historic places in Jowzjan province dates back to centuries ago in Tela Tapa with approximately more than 22,000 pieces of historical at both national and international museums.	To better implement this project, they need to pay closer attention to the security of the project. Bayat Power Company must also hire professional people specializing in the implementation of such kind projects.	Bayat project can have indirect benefit effect on tourism and handcraft in Jowzjan province.
October 29, 2018	Education Directorate	Currently, there are 406 schools in total in Jowzjan province. The total number of students reaches to 194,000 which females constitute approximately %42 of the entire student population. Life of many people especially students will improve as a result of sustainable source of power.	Low-cost electricity should be provided to the public, as the main beneficiaries.	Improvement of education quality, implementation of the national strategy and excellent management in the educational system has related to this project.
October 20, 2018	Urban Development and Land Directorate	According to this office, Jowzjan can become an industrial city in the country. With the implementation of this project, all the factories and master plans of the city can come one step closer to this goal.	• The government should constantly monitor the operation of this project.	A Government office affected as a result of the project.
October 26, 2018	Refugees and Repatriations Directorate	Many people tend to immigrate to foreign countries with unemployment being as the main cause. The destination of these immigrants are mainly Turkey and/or European countries. Their statistics show that immigration from other provinces is also high in this province. For example, immigrants from Faryab, Kunduz and Sar- e-Pul provinces have migrated to this province, and the statistics show that over the past two years there are approximately 15,000 displaced in this province. According to the directorate, this project can reduce the process of foreign migration in the province, this project will also increase the scope of employment in this province.	• Use the state-of-the-art technology for the implementation of this project. • Government to monitor the operation of this project regularly.	Some of the reasons for immigration are unemployment, illiteracy and insecurity. Therefore, this project will have a direct impact on reducing the migration of people to other provinces and foreign countries.

October 29, 2018	Municipality of Sheberghan	According to them, this project will have a positive impact on the lives of people and can solve any urban related issues. They also said that the current electricity is not enough and problem gets worse in middle of summer and winter. They mentioned below potential impacts on urban services as a result of this project: • With this project, city lights will be installed, • Private sectors shall be encouraged to invest, • This electricity has a positive impact on the people's economy, • Companies and offices will enjoy permanent electricity, • The factories will resume their operation, and • City services will be modernized in this province.	• The project must be started at the scheduled timing • Local residence to be given priority for hiring	A Government office affected as a result of the project.
October 29, 2018	Statistics Organization Directorate	They expressed their full cooperation with the project owner to start the project at the scheduled timing.	• Local employees should be given priority • Project to start its operation as soon as possible.	A government office affected as a result of the project.
October 28, 2018	DABS	They said that were fully informed about the operation of this project and that they are working closely with Bayat Power Company. By the successful implementation of this project, Sheberghan city and neighboring districts will have sustainable electricity. They also mentioned the current challenge of the city of Sheberghan as the old electricity distribution system. Recently, many towns have been built but network distribution wires have not changed, which is a major challenge to the lack of sufficient voltage for these towns.	No comments	DABS is one of the main stakeholders of the project. Based on the Power Purchase Agreement, as stipulated in the previous sections, they will purchase the generated power.
October 29, 2018	Environment Protection Directorate	The directorate believes that the protected area has not been registered in Jowzjan province, where there are certain species of animals, birds, trees, herbivores or green areas. There is also no specific areas in the vicinity of the Project where the lives of animals, plants, trees, lakes, wetlands, or particular locations are threatened by the implementation of this project.	• Consider the potential environmental effect of the project and take the necessary steps to mitigate them.	Protection of environment is one of main tasks of this directorate and it is one of agencies that should be involved in all phases of the project and it should be ensured that the environment will not be harmed during the operation of the project.

		According to the directorate, each project has its positive and negative effects, and the Bayat Project is no exception to this rule. They also say that if the project is not managed properly and that environmental are not be good into country, it will have bad effects on the environment.		
November 04, 2018	Public Health Directorate	It is believed that the electricity is a vital necessity for a society. That's why this project can have positive health effects for the people of Jowzjan province. And on the other hand, in the opinion of the directorate, since the field of work is being built in a non-residential area away from the city, it may not have health issues for people.	• The project must be started as soon as possible • Providing electricity to health centers should be given priority in the distribution.	High quality medical services need a source of electricity.
October 30, 2018	Commerce and Industry Directorate	According to the directorate, all the factories in this province face electricity shortages. The directorate had a positive attitude toward this project and said that the people of this province will move along the path of self-sufficiency again. According to the Directorate, if this project is implemented, all the factories that are powered by electricity will be re-activated in the province. For instances, the carpenters will no longer need to send their carpets to either Kabul or Mazar Sharif.	• Use the state of the art technology to minimize the pollution.	The project will have a direct impact on the economic development, expansion in domestic production and the growth of industry and trade.
December 11, 2018	Mine and Petroleum Directorate	According to them, the biggest challenge in the field of gas and electricity production is chemicals, which pollutes the surrounding environment, if not properly managed. According to this directorate, the extraction of mines in Jowzjan province would change the life of the people.	No Comments	Since the main fuel of the power plant is gas, it is one of the most important stockholders of this project.
October 30, 2018	Disaster Management Directorate	They said that they initially heard the news from the media that Bayat Energy Company plans to build a gas to power plant in the area. They also stated that this project is crucial in Jowzjan province.	• The capacity of this project must be improved. • Distribute electricity to the people who have no electricity.	Coordination and regulation of natural disaster prevention activities and preventing and mitigating the adverse effects need permanent electricity. Jowzjan province is one of the

				most vulnerable and incidental provinces in Afghanistan, and this project can minimize the damage of these events.
December 04, 2018	Rural Rehabilitation and Development Directorate	According to Seyyed Enayatullah Nasir, he believes that by implementation of this project, his directorate would be able to take more measures to solve the irrigation problems in the villages.	According to the head of Rural Rehabilitation and Development Directorate, the 42 megawatts of electricity for the northern part of the country was not enough and that the second and third phases of this project should begin as soon as possible.	In order to achieve the goals of poverty reduction, economic and social development of villages, social welfare, reconstruction and basic needs of Jowzjan's villages, this project has direct impacts on the goals of this directorate.
October 29, 2018	Public Works Directorate	According to public works directorate, this project has many benefits for this directorate in particular and the society as a general. Specifically, supply of electricity would make it happen to them to make use of modern devices in their sector.	No Comments	A government office affected as a result of the project.
October 29, 2018	Provincial Council	The council believes that this project will be a great service for the people of Jowzjan province. They also expressed their full support for the Bayat Energy Company. The council also believes that this project can have a positive impact on the people of this province and will provide employment opportunities for the people, which will affect the people's economy in the province.	The council believes that there is no problem with the project, and that the project has to start at its appointed time.	Provincial Council influences structural policies, participation and involvement of people and civil society in cooperation with the government. Representation of the people and bringing the problems to the attention of the authorities is one of the main tasks of the council and this project can increase the credibility of the government and provide participation of people in cooperation with the government.

October 30, 2018	Women Affair's Directorate	They said that they were informed about the project through an official letter from the provincial government. Regarding the current situation of women in the province, the women's economic situation in the province, as a whole, is not satisfactory. According to this directorate, the project will have a positive impact on the women of this province. The electricity generated will be utilized in offices and homes. Undoubtedly, this will improve the lives of many in the region.	• Females to be hired in the project, • Women in the field with expertise should be given priority.	A Government office affected indirectly as a result of the project.
October 29, 2018	Agriculture, Irrigation and Livestock Directorate	According to the them, almost 80 to 90 percent of the people in the Jowzjan province live in agricultural land. Livestock has declined over the past 10 years in this province due to drought. Regarding this project, since there is no building in radius of 5 km around there would be no direct harm to the people.	• Local employees should be given priority.	It is one of the direct government offices regarding the project.
October 31, 2018	Directorate of Ministry of Labour Social Affairs Martyrs and Disabled	This project can play a very important role for employment and job creation in Jowzjan province. It is of great importance in the long-term and short-term employment of the people of Jowzjan.	• Hire local labor for the implementation of the project, • Start the project sooner to generate electricity.	It is one of the direct government offices regarding the project.
October 29, 2018	Directorate of Land Registration and Coordination - (ARAZI)	After acknowledging about the aforementioned project, they said that the project can undoubtedly benefit the unused land. The project can help to develop factories, industrial towns, cities, factories and agriculture in the province.	No Comments	It is one of the main and direct government offices regarding the project.

The FGDs Summary

Social studies in Jawzjan province have been conducted on Bayat Power project with a questionnaire, interviews with government departments, interviews with national and international NGOs and public interviews (FGD) and it shows that the implementation of this project in the Jawzjan province has made people hope that the province could become an industrial city and investment center. This study shows that most people in Jawzjan province were unaware of the implementation of Bayat Power Project, and some people were aware about the project by the meetings, elders and the media. They hoped that this project will start to work as soon as possible.

A large number of people surveyed were satisfied with the current situation of electricity, and a number of people said that current electricity was not enough for the needs of Jawzjan province. This electricity will also be cut off for a long time in two seasons (summer and winter) which is much needed for electricity, or so weak that it cannot be used.

Studies in the province indicate that electricity distribution in the province is not the same, some areas are twenty-four hours of powerful electricity and some areas do not have access to twenty-four-hour electricity. In addition to the old system of electricity lines in the province's electricity system is considered one of the main challenges.

Advantage

- The study shows that most people in Jawzjan province believe that the result of implementation of the project for the province of employment, economic growth, urban development, reduction of migration, poverty reduction, modernization of agriculture and access to life facilities and the start of activities of factories, which will have a significant impact on the growth of the economy of Jawzjan province and the national economy.
- The studies show that most people are affected by the Bayat project in Jawzjan province, the study people believing that the project could provide high quality

electricity to the all people of the province. And this project could be the beginning of the self-sufficiency of the Afghan government for imported electricity.

- Study people believe with the launch of the Bayat Power project, the province of Jawzjan would find talent for attracting national and international investment. As this province will become an important industrial area at the national level by having gas fields and electricity, in their view, Jawzjan province has the potential to become an industrial province.
- The study also shows that the Bayat Power project will increase the quality of education in the province, because most universities and schools have access to electricity and they can do Practical the theoretical lessons, students' access to technology and communication with the world of science is useful and valuable.
- The modernization of agriculture, access to the amenities of life, the modern city also plays a major role in these studies, and most people believe that this project can be found in all the major constituencies.
- In general, this project has been defined by the people of Jawzjan province, and they believe that the project can prevent air and environmental pollution. They also said that the implementation of this project would also have an impact on the diagnosis and treatment of patients, since most laboratory and medical equipment needed electricity.

Disadvantage

- These studies show that a large number of the study people believing that the project could generate respiratory diseases and environmental degradation during the activity with smoke and dust that it produces. A large number of study people also believed that the Bayat project would not be harmful to humans and the environment, because the gas field Yatemtaq gas activities already going on, and the area is located far from the city.
- Some people also believed that until the project started, its harm to humans and the environment would not be known now.

- There was almost no such thing among them, if this project was managed properly, it would not be harmful to the environment or humans.

Challenges

- In these studies, an important part of the study is dedicated to the challenges that may affect the project in the future. According to most interviewees, insecurity can challenge this project, because the Yatemtaq area is far from the city and armed opponents can easily stop the activities of this project.
- Improper management of the project, use of counterfeit electronic devices, lack of experienced people, local power intervention for personal interests, government intervention, flood, storm, earthquake, unequal distribution of electricity, they did not comply with the environmental laws and the supply of electricity at high prices could be another challenge that will threaten the future of this project.

Suggestions

- The opinion of all those who were studied was recorded by the interviewees. They believed that in order to better implement this project, this project should be properly managed to prevent harm to the people and the environment. The government should also cooperate in securing of the Bayat Power Project.
- These studies show that all people were thinking of cheap electricity. People said that they should be provided employment for local people and prevent the intervention of the mafia and misuse of government power.
- Also, a number of people said the Jawzjan province has the capacity to develop Bayat Power Plant because gas fields are near to project and after increasing the power generation capacity, they can distribute electricity to many Northern provinces.

10 Grievance Redress Mechanism

The aim of the Grievance Redress Mechanism (GRM) procedure is to receive grievances and ensure adequate response to all complaints and appeals by stakeholders including the local population affected by the Project. During the Pre-Project/Preliminary SEP stage, the dialogue included establishing a Grievance Redress Committee (GRC) for each stakeholder group. On an ongoing basis, the ESMP Management Unit of the Project shall have the duty for managing and handling complaints and responses. The Management Unit will also be in contact with the responsible committees in order to make sure it receives any complaints in a timely fashion. They will receive, register and communicate with the competent GRC and supervise Project responses on complaints and resorts of the interested parties. Grievance Redress Mechanism for Bayat Power IPP under Environmental and Social Management Unit is to:

- Provide a mechanism to PAPs to address the concerns arising as a result of project activities and grievances linked to the associated facilities, such as the proposed Transmission-line to be constructed by DABS.
- Record the grievance of PAPs, to enable tracking and facilitate the process of reviewing, categorizing and prioritizing grievances,
- Determine and implement the mitigation actions to address grievances,
- Monitor and analyze grievances as well as track response time,
- Inform communities within the project area of influence to utilize GRM services.

10.1 Structure of Grievance Redress Mechanism

An effective Grievance Redress Mechanism has established to address complaints, concerns, and grievances that may arise due to the implementation of the Bayat Power project. The Grievance Redress Mechanism is designed user interface and as per the requirements of the Project site. Structure of Grievance Redress Committees for Bayat

Power Project encompasses Grievance Redress Committees at two different levels as follows:

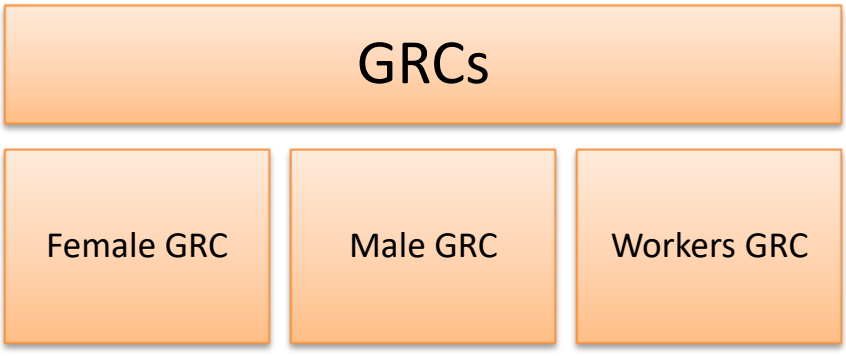
- **Local Grievance Redress Committees (Local GRCs)**

To address grievances, complaints and concerns from public and to ensure their accessibility to grievance redresses committees, local level Grievance Redress Committees are established. Two female and male grievance redress committees are established in area of influence. The committees include representative of all villages in 15 KM radius of Bayat IPP's project site.

As communities are more conservative with regard to gender issues, it sometimes may result in women voices and complaints not be heard and redressed properly, or women, due to sensitivity to male GRC members, may not refer to committees and may not voice their opinions and concerns. Therefore, Bayat Power has established both female and male grievance redress committees at local level. The female Grievance Redress Committees, whose members are all female, are responsible to address grievances from women. furthermore, one GRC is established for project workers.

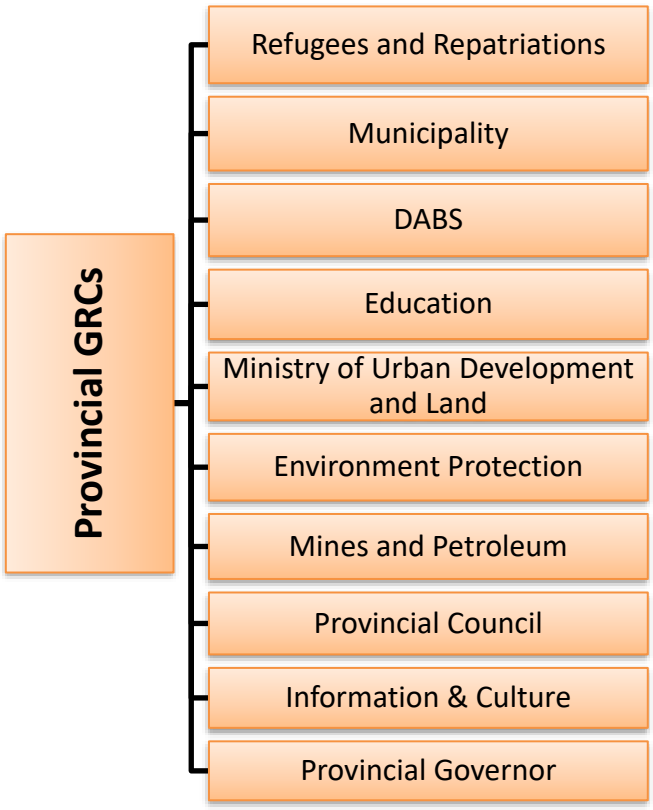
If the complaint is not addressed in the project level GRC, the complaint will be transferred to the second stage (Provincial GRC).

Figure 10-1: Local Grievance Redress Committees



- **Provincial Level Grievance Redress Committee (Provincial GRC)**

One provincial level grievance redress committee is established to reach out complaints at Jawzjan province. Grievances/ complaints that are not solved at local level shall be referred to Provincial Grievance Redress Committees, which is more powerful as it includes provincial government authorities. The provincial committee includes 10 departments:



10.2 Grievance Handling Procedure

The following table provides steps with responsibilities of grievances relating to the project activities. The key purpose of this exercise is to present GRM process in an effective & user-friendly manner.

Figure 10-2: GRM Procedures

Steps	Complainants	GRC Function	Timeframe
(1) Local level GRC The AP (or his/her representative) may submit his/her complaint in several ways e.g. by written letter, phone, SMS messages and email to the GRC or, alternatively, raise his/her voice in a public or individual meeting with project staff.			
1	Submission of complaint to the project level GRC	• Conduct public information sessions among the affected communities to use grievance service. • Registering a grievance in the project logbook and or central excel-sheet or grievance database. • Segregate/sort and process • Acknowledge and follow up of grievance. • Verify investigate, and act • Provide written response to the complainant	7- 14 days
(2) Provincial Level GRC If resolution at sub-project level is unsuccessful, the Affected Person (AP) can take his or her complaint to a Provincial level GRC			
2	Submission of grievance to the provincial level GRC through one of the channels	1. Conduct coordinating meetings among complainants/ public and relevant administrations 2. Take legal action against juridical complaints at provincial level. Provide written response to the complainant. 3. Provide written response to the complainant	10 days

Appeals and legal recourse-Issues not resolved at local GRC level will be escalated at the Provincial level, if considers necessary will attempt a hearing on the matter in order to resolve it. In case of no resolution, such issues will be referred to the court of law.

10.3 Principles of Grievance Redress Mechanism

10.3.1 Functions of Grievance Redress Mechanism

- Ensure that handling of grievances is in accordance with Afghan law and World Bank procedures.
- Ensure that follow-up actions in response to grievances are taken within an agreed time-frame.
- Maintain record of all registered grievances in a database, along with details on the nature of the issues raised the case history, and actions taken.
- Coordinate with community representatives on the efficiency and usefulness of grievance redress procedures and recommend changes if any required.
- Assign member(s) to undertake site visits to assess issues raised as and when needed.

10.3.2 Grievance Redress Mechanism Operators

The main operator of Grievance Redress Mechanism is ESM Unit of Bayat Power IPP. ESM Unit is responsible for handling, tracking and reporting grievances, complaints and concerns within the Bayat Power IPP.

Experts in Environmental and Social Management Unit do not see Grievance Redress Mechanism as “Complaints Department.” If those working in a GRM see their function only—or primarily—as addressing complaints, then they will likely assume that every interaction will be unpleasant, and they should expect to be on the defensive in almost every conversation with an affected person. Experts working in ESM Units of Bayat Power IPP view their own role as having to face unhappy or angry people, trying to manage emotionally charged expectations, defending the organization or project as best they can from criticism, and trying not to make concessions or raise expectations. Meanwhile, the substantive complaints in the process will be seen only as unwelcome or unpleasant problems that someone will (or might) need to address— creating delays and additional work. Simply by framing the GRM with an emphasis on “grievances,” everyone involved will be likely to approach the process with negative perceptions, diminishing the

enthusiasm with which they will approach their work, while maximizing the stress it creates.

Contradictorily, ESM Unit view GRM as an integral part of effective project management, through which the project implementation and management teams seek feedback not from “affected persons” (a term that emphasizes the negative consequences), but from “customers” or “beneficiaries,” who are also meant to be receiving the benefits of the project, then they will be far more likely to approach their work positively. If they actively seek all types of substantive feedback from their “customers,” then they will consider the information they receive to be of value, rather than simply as unpleasant complaints, and they can use that feedback to improve their approach to a project or to learn for the purpose of improving future projects. Second, ESM Unit experts at Bayat Power IPP seek not just complaints, but also positive feedback from those who are affected by the project (in order to paint a more accurate picture of the value of the project, and to put any complaints into proper perspective). A positive approach to GRMs will also be much more likely to yield positive responses from Project Affected People, rather than they’re simply expecting to complain. If people are asked not only what they do not like about the project, but also what they do like, then their responses are more likely to be moderate about any negative impacts in most cases. In approaching the work of a GRM this way, people within the mechanism can also feel better about the work they are doing and approach it with more enthusiasm. Their experience in conversations with APs will be more mixed, rather than completely negative.

Generally speaking, the more people within a mechanism know about what they are doing, the better. Specifically, however, three types of knowledge are especially important to those operating within a GRM:

- THE PROJECT CONTEXT—understanding of background issues, politics, sensitivities, precedents, local history, language, and culture;

- THE FACTS—having detailed information and a survey of relevant perceptions (as well as facts) related to the project and to any cases associated with it; this includes specifics on the impacts and benefits of the project, who is affected, and knowledge of relevant criteria (e.g., laws, costs, valuations); and
- THE SYSTEM —experience in dealing with people, organizations, procedures, and cases; one should be familiar with the purpose and objectives of GRMs, the guiding principles governing treatment of Project Affected People, relevant legislation, ESM Unit role in the process, and the limits of GRMs.

10.3.2.1 GRM Effective Operation

The skills required to deal effectively with grievances and to have productive conversations with complainants are not the same as those normally required to implement a project effectively. As officers who have dealt with Affected People know, addressing grievances has both technical and nontechnical aspects, and staff are seldom trained in the latter. In order to effectively manage and redress grievances, experts at Environmental and Social Management Unit should have a specific set of skills as follows:

- **Negotiation, Influence, and Conflict Management**: Every interaction with an Affected People who has a grievance is a negotiation—a conversation in which parties are attempting to influence each other. Most grievances are also disputing or potential disputes between complainants and those responsible for a project. One of the most difficult, yet common, challenges in negotiating grievances or disputes is managing the “friction” that is generated in relationships while trying to work out substantive answers or solutions to problems. Skills in the art and science of negotiation, influence, and conflict management are essential to dealing with grievances effectively, in particular the art of negotiating substantive or technical issues in ways that
    - allow decisions to be based on appropriate, legitimate criteria;
    - preserve manageable relationships even while there might be disagreement over issues; and

- explore options and alternatives in order to reach mutual agreements where possible.

- **Choice Analysis**: Many specific tools can help negotiators to be more effective at preparing for conversations with those who disagree, and there are lessons to be learned about how best to design strategies to influence counterparts to accept certain proposals or decisions. Understanding how people see (from their own perspective) the choices they are being given is essential to understanding why they might behave in certain ways. Project officers working within GRMs will benefit from an empathetic (though not necessarily sympathetic) understanding of what APs are experiencing. Specific tools are available to help negotiators better understand how choices look to others, for the purpose of influencing them more effectively.
- **Brainstorming and Joint Problem Solving**: While some issues affecting APs are often emotional, there are also technical, non-emotional matters that ESM Unit Experts deal with in GRM. These include determining responsibility, assessing the validity of claims, determining how policies apply in a case, and valuation. In order to turn conversations about grievances into productive problem solving, it is useful to have the capacity to engage Project Affected People in brainstorming about constructive ideas and to design and manage processes for joint problem solving (engaging both project staff and complainants—and possibly other resource people).

- **Communication**: In order to deal with grievance effectively some sets of communication skills are required, these include the following:
    - Inquiry and Active Listening: The most basic, and essential, communication skills for anyone dealing with grievances are the skills of inquiry (asking good questions) and active listening (listening to people with the intent of understanding what they mean, as well as hearing what they say). Most Complainants want to be listened to, in addition to having their substantive complaint addressed. Not listening adequately to Affected People is

probably one of the most common sources of frustration, which only adds to any existing problems in dealing with substantive issues.

- Understanding Perceptions: Much like the importance of having an empathetic understanding of the choices people face, it is also essential for project staff to be aware that different people, for very logical reasons, will often have very different perceptions of an event, a policy, or other people. When most people try to talk about an issue on which they disagree, they engage in forms of communication that are not helpful (e.g., debate, arguments, accusations, or threats). It is often vital to turn the type of communication being used into something more constructive, particularly dialogue—a conversation where people are making the effort to understand each other, even if they might strongly disagree. The key to turning arguments into dialogue is to reframe people's assertions into perceptions, leaving room for more than one, rather than trying too quickly to determine "who is right, and who is wrong" and to assign blame. There are practical tools available to help people do this systematically.
- Difficult Conversations: Nearly every interaction within a GRM is either a difficult conversation or potentially so. A "difficult conversation" is any conversation that people find challenging, but particularly one that is important and about which they feel strongly. It will be helpful for any officer working within a GRM to realize that every difficult conversation (especially those with APs) is actually three conversations. First, there is the "factual" conversation: the technical details of what happened, is happening, or will happen. However, there is also an "emotional" conversation, which is the conversation about how people feel about what is happening. And third, there is the "identity" conversation, which is the impact that the conversation (or dispute) has on their sense of "who they are" and how they are being treated.

- Feedback: Grievances are fundamentally a form of feedback given about the project by those affected by activities of Bayat Power IPP, and they should be treated as such. Much has been learned about how feedback is both given and received. And particular skills have been identified to give and receive (and to help others give) feedback effectively and in ways that maximize how helpful that feedback can be. To emphasize the "customer service" approach to managing GRMs, understanding how feedback works and developing the capacity to manage the feedback process well are extremely important.

- **Facilitation**: Many project-related grievances will be common to many PAFs (Project Affected Families) and will involve multiple stakeholders. In fact, few attempts to redress grievances will be purely bilateral. ESM Unit officers insist on facilitation skills so that they can better manage the communication, the collection of information, any option generation, the exploration of alternatives, and/or the making of any commitments consistently and effectively in group settings. These skills include how to design group processes, run meetings effectively, manage multiple interests, facilitate group brainstorming, and manage the production of documents (e.g., draft agreements) by groups.
- **Risk Management**: ESM Unit Officers are aware of risks inherent in trying to address concerns. These risks include legal liabilities, reputational damage to the organizations or projects they represent, physical harm to people and/or property, raising expectations, undermining colleagues or previous decisions, and setting precedents that might be used later. Thus, skills and tools of risk management is essential for avoiding specific kinds of trouble and for aligning the work done in each case with work done in the past or to be done in the future (i.e., avoiding inconsistency, which will undermine credibility).

- **Strategic Communication:** Strategic Communication is a part of skills that ESM Unit staff have during addressing grievances. These skills help to:

- manage perceptions (and minimize negative perceptions) about a project and the organizations behind it,
- disseminate accurate information about the Bayat Power IPP and its impacts (particularly useful in countering rumors and/or addressing fears based on uncertainty),
- inform Affected Persons about the existence of the mechanisms and resources that are available to them
- address (professionally and strategically) any criticism or questions raised in public about a project or its impacts, and
- manage good public relations as part of good corporate social responsibility.

10.4 Grievance Redress Committees (GRCs)

A multi-stage Grievance Redress Mechanism is adopted. Grievances may differ in nature and complexity. Some grievances are easy to be resolved at local level, while others are complex and require governmental authorities as mediators and intermediaries. However, some cases are very complex and may be forwarded to the Capital Government in Kabul.

GRCs is established at the division levels to assure accessibility for Project Affected People and other complainants. The GRCs are mandated to deal with any other types of grievances arising at the community level as a result of direct/ indirect project activities. GRC meetings are held at the respective divisions, which are described in this document.

The GRCs has the right to request the project technical staff, and officers from relevant departments to attend the meetings and provide information. A complainant has the right to appear in person, to be accompanied by a family member, and/or to request to be represented by a village elder. Two level committees at two different divisions are established. The committees are established at various levels as follows:

- Local Grievance Redress Committees
- Provincial Grievance Redress Committees

Local Level Grievance Redress Committees are established at local level. Further, at the local level, gender segregated committees are established. Women grievance redress committees are established to ensure better accessibility of women to redressal committees. Provincial Grievance Redress Committees, whose members are authorities of provincial government is established at provincial level.

10.4.1 Local Level Grievance Redress Committees

The first and primary grievance redress committees are established at the local level during initial site survey. GRC members are selected based on free and transparent election among public consultation meeting members that include people from all villages.

At the local level, both male and female Grievance Redress Committees are established separately. Female Grievance Redress Committees, whose members are all female members of the community, are established to register, receive and resolve/report grievances from women during the project. However, women can submit their grievances to local male committees as well, local female grievance redress committees are established to ease their accessibility to those grievance redressal committees. Also, Bayat Power stablished GRC for workers who work in Bayat Power IPP. If the workers' complaint was not addressed in the first level, the complaint will be transferred to the second level (Provincial GRC).

In all levels (Local and Provincial Levels) ESM officer of Bayat Power IPP should register and handle the grievances. He/she should register all complaints in complaint form and database.

Men Grievance Redress Committees

A public awareness session was conducted for men around the plant. Because of security issues the consultation was conducted in Sheberghan city and the transportation expenses payed to them. (Sheberghan police headquarter had told to regional staff that the police cannot make the public consultations safe and it is better to avoid make

consultations around the site). Abdul Ghafar Kuyak, representative of Bayat IPP, is also one of the members of the men grievance redress committee.

Table 10-1 Men Grievance Redress Committee

No.	Name	F/ name	Position	Phone Number
1	Mohammad Alem	Abdul Karim	President	0787501536
2	Saleh	Buman Ali	Vice president	0747011720
3	Haji Lal Mohammad	Abdul Khalil	GRC member	0787923571
4	Mohammadullah	Eshaq	GRC member	0767056470
5	Abdul Ghafar Kuyak	Abdul Khaleq	GRC member	0702935333

Figure 10-2 Men Public Consultation and Grievance Redress Committee

Women Grievance Redress Committees

During the consultation the women were informed about Grievance Redress Mechanism and its procedures. Women expressed their gladness about the procedure for registering, receiving and resolving complaints. At the end of the meeting, Committee

was established and the members of Grievance Redress Committee were selected in transparent election.

Table 10-2 Women Grievance Redress Committee

No.	Name	F/ name	Position	Phone Number
1	Andira	Mehrabuddin	President	0787862480
2	Zia jan	Dad Mohammad	Vice president	0731742261
3	Zarmina	Abdulrahim	GRC member	0731770768

Figure 10-3: Women Public Consultation and Grievance Redress Committee

Worker Grievance Redress Committee

During the consultation, workers were informed about Grievance Redress Mechanism and its procedures. Workers also expressed their willingness about the procedure for registering, receiving and resolving complaints. At the end of the meeting, Committee was

established, and the members of Grievance Redress Committee were selected in transparent election.

Table 10-3 Worker Grievance Redress Committee

No.	Name	F/ name	Position	Phone Number
1	Mohammad	Ramazan	President	0702935303
2	Hussain	Mohammad Ibrahim	Vice president	0702935449
3	Sulaiman	Sharifi	GRC member	0702935306
4	Shafiqudin	Khodaidad	GRC member	0702935334
5	Abdul Satar	Ajmal	GRC member	0702435343

Figure 10-4 Worker Grievance Redress Committee

10.4.2 Provincial Grievance Redress Committee

In case a complaint cannot be solved at local level, it will be directed to the provincial level or if a complainer does not satisfy with the decision taken at the local level, complaint shall be directed to the provincial grievance redress committee. In case that provincial

level is unable to solve the issue, it shall be directed to the Provincial Governor and Jawzjan Supreme Court.

When the Committee members were made aware of their appointment as the members of Provincial Grievance Redress Committee, they expressed their satisfaction and commitment to carry on their responsibilities in a timely and professional manner.

Table 10-4: Provincial Grievance Redress Committee

No.	Name	Position	Designation	Phone Number
1	Sayed Aref Baqeri	Representative of Refugees and Repatriations	Head of GRC	0744228718
2	Mohammad Yousuf	Representative of Municipality	GRC member	0784509486
3	Sayed Jamaluddin	Representative of DABS	GRC member	0729003177
4	Sayed Milad Sajadi	Representative of Education	GRC member	0790422006
5	Borhanuddin	Representative of Urban Development and Land	GRC member	0794341274
6	Mohammad Rafie	Representative of Environment Protection	GRC member	0782182938
7	Abdul Ghafar Ahmadi	Representative of Provincial Governor	GRC member	0788146610
8	Akhtar Mohammad Fayzi	Representative of Information & Culture	GRC member	0799011966
9	Hafizullha Qudrat	Representative of Provincial Council	GRC member	0788869080
10	Eng. Jawid	Representative of Mines and Petroleum	GRC member	0781310033
11	Abdul Ghafar Kuyak	Bayat Power	GRC member	0702935333

10.5 Grievance Redressal Procedures

10.5.1 Grievance uptake

ESM Unit staff has the primary role in resolving complaints as part of their day to day activities as they interact with community members. Complaints can be submitted via:

Complaint Box:	One in Bayat Power site and one in Municipality
Email:	m.simus@bayatpower.com
Phone:	+1.702.809.6772
Written/ Letter:	Bayat Power Offices in Sheberghan
Verbally:	Any project staff/ GRC Member

Staff members who receive complaints verbally must put them in writing for them to be considered. Anonymous complaints will be accepted by phone. Each complaint received will be assigned a tracking number that will help the complainant track progress. Complainant will receive update on the grievance he/she registers on Bayat Power IPP via phone call. When a final decision has been taken by any of the redressal committees, complainant will be informed of the decision and will have the right to whether satisfy or appeal and refer the case to the next level grievance redressal committee. In case that grievance is not redressed at all three project GRCs, it would be directed to the court for final decision.

10.5.2 Review and Resolution of Grievances:

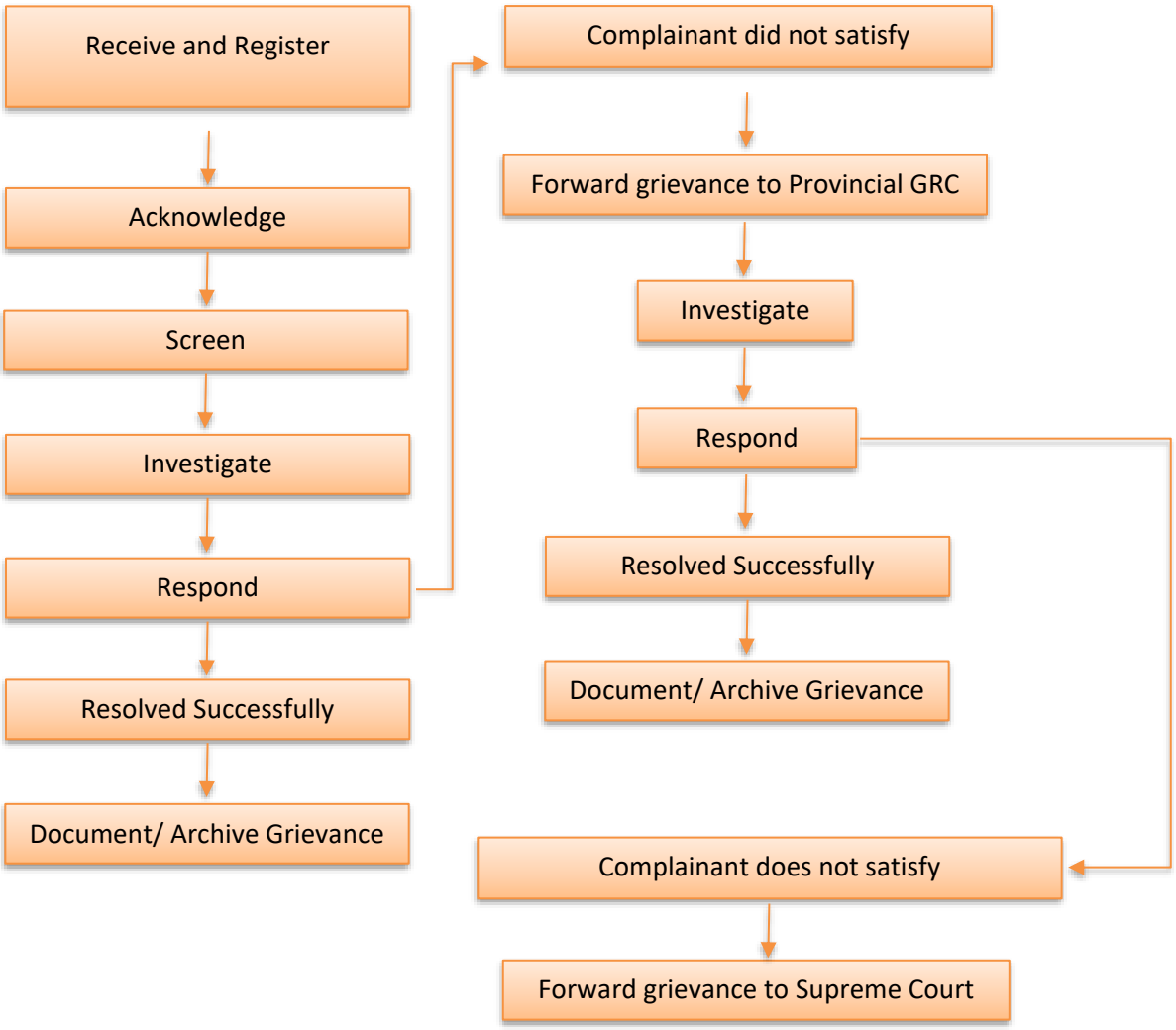
The GRC will meet to try and resolve the matter at the individual or community level and make a response of acknowledgement within 7-10 working days from receipt of complaint. Mitigation and/or rectification will be accomplished within no later than 20 days of the complaint. If an extension is required to conduct mitigation and/or rectification due to the nature or scale of the issue, a response from the GRC will be issued to the AI or community with explanation of the activities that will be conducted in response to the complaint and an expected time frame for completion.

10.5.3 Information Management

All submitted complaints and grievances will be added to a database/project file that will be updated and kept current by the Project Outreach Coordinator. The status of grievances submitted, and grievance redress will be reported through the monthly status reports. The ongoing record of the GRM will include the following information:

- Issue and date received
- GRC response date and record of mitigation/rectification dates and actions
- Feedback (acceptance/Non-acceptance) response
- Closing date on the issue

Finally, the ESMU will conduct a secondary layer of monitoring over the GRM.


Receive and Register
Acknowledge
Screen
Investigate
Respond
Resolved Successfully
Document/ Archive Grievance
Complainant did not satisfy
Forward grievance to Provincial GRC
Investigate
Respond
Resolved Successfully
Document/ Archive Grievance
Complainant does not satisfy
Forward grievance to Supreme Court