

Environmental and Social Impact Assessment

Project No.: 52229-001
April 2018

AFG: Kandahar Solar Power Project

Prepared by GreenTech Construction & Engineering for 77 Construction Contracting and Trading Company and the Asian Development Bank.

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**Environmental and Social Impact Assessment (ESIA) of
15MW ON-GRID POWER PROJECT
KANDAHAR, AFGHANISTAN**

Contractor:



Prepared By:



April 2018

Contents

Introduction	1
1-1 Overview	1
1-2 Objectives for the ESIA	2
1-3 Approach and Methodology	2
1-3-1 Data Collection	4
1-4 Composition	4
Policy, Policy, Legal and Environmental Regulations	5
2-1 Overview	5
2-2 Afghanistan Environmental Laws and Regulations	5
2-2-1 Environment Laws	6
2-2-2 Environmental Impact Assessment (EIA)	6
2-3 World Bank's Environmental and Social Safeguard Policies	10
2-3-1 World Bank's Environmental and Social Safeguard Policies	12
Project Description	1
3-1 Overview	1
3-2 Project Location	1
3-3 Project Layout	1
3-4 Project Objective	1
3-5 Project Components	1
3-6 Characteristics of Solar	1
3-7 Project Activities	1
Description of the Project Environment	2
4-1 General	2
4-2 Physical Environment	2
4-2-1 Climate	2
4-2-2 Geology	6
4-2-2-1 Soil	6
4-2-2-2 Earthquake	8
4-2-2-3 Fault	8
4-4-3 Hydrology	11
4-2-3-1 Tarnak Rod Watershed	11
4-3 Biological Condition	18

4-31 Fauna	18
4-3-2 Flora	19
4-4 Socio-economic	21
4-4-1 General.....	21
4-4-2 Population	21
4-4-3 Ethnic group	23
4-4-4 Social Infrastructure and Services	23
4-5 Historic and Cultural Resources	26
Stockholder Consultant	28
5-1 General.....	28
5-2 Consultation with Government department.....	28
5-3 Consultation with Community Representatives.....	32
Environmental and Social Impacts	35
6-1 General.....	35
6-2 Methodology	35
6-3 Impact Significance.....	35
6-4 Potential Impacts	36
6-5 Potential Environmental Impacts	36
6-5-1 Air Pollution	36
6-5-2 Noise	37
6-5-3 Soil Erosion	37
6-5-4 Solid Waste	38
6-5-5 Surface Water	38
6-5-6 Groundwater.....	38
6-5-7 Ecology.....	38
6-6 Socio-economic Impacts.....	39
6-6-1 Job Opportunities	39
6-6-2 Community Infrastructure	40
6-6-3 Construction Disturbances and Possible Conflicts with Local Population	40
6-6-4 Transport of Materials	41
6-7 Public Health and Safety	41
Mitigation Measures	43
7-1 General.....	43

7-2 Mitigation Measures.....	43
7-2-1 Air Quality.....	43
7-2-2 Noise.....	43
7-2-3 Soil Erosion.....	44
7-2-4 Surface Water.....	44
7-2-5 Groundwater.....	45
7-2-6 Ecology.....	46
7-3 Measures to reduce the adverse socio-economic effects.....	47
7-3-1 Cultural resources.....	47
7-3-2 Population Demography.....	47
7-3-4 Prevention of Social Conflicts and Environmental Degradation.....	48
7-3-5 Sociocultural.....	49
Environmental and Social Management Plan.....	50
8-3 Cost Estimated.....	66
8-4 Monitoring Plan.....	67

Content of Figures

Figure 1. Project Location.	1
Figure 2. Project Site Layout.	1
Figure 3. Soil of project area.	7
Figure 4. Earthquake of Project Area.	9
Figure 5. Location of faults and project.	10
Figure 6. Monitoring of Sound Level.	17
Figure 7. Landover of Study Area.	20
Figure 8. Location of Historical and Cultural Resource in Kandahar Province.	27
Figure 9. Consultant Meeting with Director of NEPA.....	29
Figure 10. Consultant with Director of Information and Culture Department.	30
Figure 11. Consultant Meeting with representative of Agriculture Department.....	30
Figure 12. Consultant Meeting with Director of Rural Rehabilitation and Development Department.	31
Figure 13. Consultant Meeting with Director of Public Health Department.....	31
Figure 14. Interview with local.	33
Figure 15. Public Consulting Meeting in Daman District.....	34

Content of Tables

Table 1. Project Site Coordinates.....	1
Table 2. Kandahar City Temperature.	3
Table 3. Average Precipitation of Kandahar City.....	3
Table 4. Average Wind Speed of Kandahar City.....	4
Table 5. Average sunny days of Kandahar Province.	5
Table 6. Monthly Total and Maximum Discharge of Tarnak Rod.....	12
Table 7. Tarnak Watershed.....	13
Table 8. Surface Water Sampling.	14
Table 9. Groundwater Sampling.....	14
Table 10. Surface water quality.....	15
Table 11. Groundwater quality	16
Table 12. Air quality and sound level of project site.	18
Table 13. Population of Kandahar Province.	22
Table 14. Number of student in Kandahar Province.....	24
Table 15. Environmental and Social Management Plan (ESMP).	51
Table 16. Summary of Implementation Cost of the ESMP.	66
Table 17. Monitoring Plan (MP).....	69

Abbreviation

AC	alternating current
ANDS	Afghan National Development Strategy
CBD	Convention on Biological Diversity
CCD	United Nations Convention to Combat Desertification
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Co.	Company
CRC	community relationship committee
DABS	Da Afghanistan Breshna Sherkat
DC	direct current
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMPs	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management plan
ESMU	Environmental and social Monitoring Plan
GMs	Group Meetings
MP	Monitoring Plan
NEPA	National Environmental Protection Agency
PCR	Physical Cultural Resources
WHC	Convention on Protection of the World Cultural and Natural Heritage

Introduction

1-1 Overview

Due to the limitation of fossil fuels and consequences of environmental pollution and global climate change, Solar Energy producer has been highlighted. Therefore, a project under the title “15 MW ON-GRID SOLAR POWER PROJECT, KANDAHAR, AFGHANISTAN“ which will be implement in Kandahar Province of Afghanistan. The power plant, which will utilize solar technology processes for power production, will generate 15 MW of electricity.

77 Construction Company is responsible to implement this project, which will be dispatched to DABS, the Afghan national utility entity, under a Power Purchase Agreement over 20 years.

This report describes the proposed project, 15MW Kandahar Solar project in Kandahar, and include the following information as relevant: location; general layout; size, capacity, etc. In addition, describe the environmental and social impacts due to the pre-construction, construction and operation phases.

This Environmental and Social Impact Assessment (ESIA) study will ensure that potential adverse environmental and social impacts from the project are identified, and mitigation measures are recommended and implemented to prevent or ameliorate the impacts as much as it is practically possible. This ESIA is carried out in compliance with the Afghanistan Regulation on Evaluation of Environmental and Social Impacts (Official Gazette No. 1276, dated: 9th December, 2017); and in conformance with World Bank environmental assessment requirements.

1-2 Objectives for the ESIA

The scope of the ESIA is to assess the environmental and social impacts of the 15MW ON-GRID POWER PROJECT KANDAHAR, AFGHANISTAN. To the extent possible, this ESIA shall be aligned with the outcomes of the on-going Strategic EIA.

- Describing project components and activities of relevance to the environmental and social impacts assessments Identifying and addressing relevant national and international legal and technical requirements and guidelines pertaining to project-related environmental, social, and occupational health & safety issues;
- Performing stakeholder meetings, scoping sessions, and public consultations to maximize public ownership and stakeholder engagement;
- Describing baseline environmental and social conditions, obtaining key data relevant to the project, and identifying relevant governmental, administrative, and civil society institutions;
- Assessing the potential environmental and social impacts of the project in the project areas; and
- Developing an environmental and social management and monitoring plan for the mitigation of negative impacts and for monitoring compliance with the relevant environmental laws.

1-3 Approach and Methodology

This ESIA follows Environmental Impact Assessment Regulations (Official Gazette No. 1276, dated: 9th December, 2017) requirements regarding scope and detail of assessment and procedure, and gives particular emphasis to public information and stakeholder participation. It will identify and assess significant impacts the proposed project is likely to have on the local population and on human health; on land, soil, water, air and climate; on biodiversity; and on cultural heritage. It will suggest mitigation measures where appropriate.

The ESIA process consists of a defined set of steps with clear activities and outputs. There are two main phases:

- The Scoping Phase: Scoping is a critical, early step in the preparation of an ESIA. The scoping process identifies the issues that are likely to be of most importance during the ESIA and eliminates what is of little concern. A key objective of this phase is to identify available information, to establish gaps that have to be addressed, and to discuss and decide what additional studies or investigation will have to be done to fill these gaps. Consultation with environmental authorities, the affected local population and any other interested parties is an important part of this stage.
- The Impact Assessment Phase: Based on the results of the Scoping Phase, all relevant potential impacts (positive as well as negative) are studied and where possible quantified. The draft ESIA document presents this assessment to affected local communities and stakeholders for comment and discussion. The final draft of the ESIA takes account of any public comments and is subsequently submitted to the authorities for project approval and permitting.

During the Scoping Meeting, the Consultant and representatives of authorities provided information on the project and on the planned impact assessment studies and invited the attendees to comment, raise issues, and suggest where additional studies were needed. A key objective of this meeting was to help the local communities understand the potential environmental and socioeconomic impacts in the different phases of the project (construction phase and operation phase). A second key objective was to obtain, from the developers attending the Scoping Meeting, information on the characteristics and requirements of Projects, both for the construction phase and the operations phase.

During the Impact Assessment Phase, the Consultant assessed the impact of the project on all natural receptors and on the local population. The results of this, and the conclusions and recommendations drawn from these studies, are presented in this ESIA Report.

1-3-1 Data Collection

Primary Data

Primary data collection involves collecting data primarily from different potential stakeholders and project target groups. Special attention was paid to the Project Affected People within the vicinity of Mondi-Hisar village. Vulnerable people were investigated using multilevel of data collection tools. Following is a brief description of data collected:

Qualitative data

The study team utilized additional qualitative research methods which aim to assist the study team in gathering an in-depth understanding of the current socioeconomic and legal conditions, livelihoods dynamics related to the hosting communities and their compensation preferences. The suggested qualitative methods used included:

Group Meetings (GMs) were utilized and used with:

- The potential affected people
- Community people

The main indicators covered through the group meetings were:

- Characteristics of the community people
- Their perception of the project
- Their awareness about the project impacts and the needed mitigation measures, with emphasize on their own livelihood status
- Their perception of mitigation measures
- Community problems
- Community needs

1-4 Composition

Environmental and Social Impact Assessment (ESIA) of 15 MW Solar project in Kandahar province has developed by team of environmental and social experts of Green Tech Construction & Engineering Co.

Policy, Policy, Legal and Environmental Regulations

2-1 Overview

This Chapter provides an overview of the legislative structure and environmental assessment regulations in Afghanistan as well as a list of key environmental legislation applicable to hydropower projects. It also provides an overview of World Bank and other relevant international requirements.

Afghan National Development Strategy (ANDS), considers environment as one an important subject. Goals and priorities about the living environment are described as bellow.

2-2 Afghanistan Environmental Laws and Regulations

Environment is a shared issue and the basis for all of socio-economic development framework in the country. The ultimate goal of Afghan government is to improve the living condition of it citizens by protecting, maintaining and improving the environment. Meanwhile, it makes sure that a sustainable environment is transferred for next generations. NEPA's capacity building should be in government priority so that this agency will manage to coordinate and monitor tasks. It is also important to build the capacity of other ministries in considering environmental programs in their plans. Government may also, as their short-term priority, improve the cross-organizational supervision on environmental impact assessment systems so that the environmental effects of development projects get monitored appropriately.

The environment law published in January 2007 is the main source of law in Afghanistan. Environmental Impact Assessment Regulation, Official Gazette No. 1276, dated: 9th December, 2017. Subsequently, water law, air pollution control regulations, procedures regarding protected areas, etc. were published for protecting the environment. Worth mentioning, compensation as result of land acquisition, governmental and private lands, shall be addressed in accordance with related mentioned laws in bellow.

2-2-1 Environment Laws

Afghanistan Environment law is the basic principles of environmental protection and its structure is as follows:

- Chapter one: General provisions
- Chapter two: Responsibilities and authorities
- Chapter three: Management of activities affecting the environment
- Chapter four: Integrated pollution control
- Chapter five: Environmental considerations relating to water resource conservation
- Chapter six: Biodiversity and natural resource conservation
- Chapter seven: Environmental information, education, research and training
- Chapter eight: Compliance and enforcement
- Chapter nine: Miscellaneous provisions

The Chapter three describes essential issues related to environmental impact assessment and consists of provisions about public participation.

2-2-2 Environmental Impact Assessment (EIA)

Three documents have been provided regarding environmental impact assessment:

Environmental Impact Assessment Regulations (Official Gazette No. 1276, dated: 9th December, 2017)

Environmental Impact Assessment Regulations. Official Gazette No. 939 (Mar 2008). Schedule I that list project types likely to have significant impacts (Category 1) or potentially adverse impacts (Category 2); and the industries likely to give rise to pollution. Schedule II provides the clearance certificate application form.

National Environmental Impact Assessment Policy, 2007

National Environmental Impact Assessment Policy (2007) follows on from the Environment Law and sets forth a policy vision, principles, strategy, and process for environmental assessment in Afghanistan. The emphasis is on ensuring that projects with potentially significant impacts are identified to the national environmental regulator, the National Environmental Protection

Agency (NEPA), and follow adequate due diligence procedures. The document provides a range of additional useful information on NEPA and environmental assessment in the Afghanistan context.

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

These guidelines were prepared as a companion to the 2008 Regulations, to guide proponents on interacting with the National Environmental Protection Agency, on public consultation, and roles and responsibilities of stakeholders.

Official Guide for Providing Environmental Impact Assessment

These documents state requirements, regulations and other specifications of environmental impact assessment. This report is provided based on the above mentioned rules and regulations. Following steps should be taken after preparation of the report:

1. Contractor shall present the screening report, as a first stage, when accepting responsibility of a project. This report shall contain header, subject, main environmental effects, brief description of mitigation measures and etc. Screening report shall be based on manuals and check lists provided by National Environmental Protection Agency (NEPA);
2. This is the responsibility of NEPA to decide if a project needs an EIA or not. Generally, after studying of project based on EIA regulations, EIA committee issue its final verdict on the project;
3. EIA report is required for projects in category No.1 and these projects have adverse environmental impacts.

Considering Afghanistan's history, active administration system and education related to environment is a new subject. However, according to NEPA's performance particularly in environmental impact assessment & sustainable development department, it is promising to witness a more organized system for supervision of projects in near future.

Land Acquisition Laws

Land acquisition laws, published in 2000, describe procedures, conditions and compensation of lands. Article 13 speaks about land compensation. For this project, ownership of the land required for project execution belongs to the client, hence no land acquisition is likely to take place. This phase of the project shall be implemented in the area of current hydropower land, which belongs to the government.

Regulation on Reduction and Prevention of Air Pollution

This regulation approved by the council of Afghanistan ministers that contains 6 chapters and 47 articles. It is published in the number 18 on 29/04/138.

Article (5) Prohibition of air pollution and determination of the permissible level:

- I. Emission of any air contaminants, exceeding the limits, is prohibited
- II. National Environmental Protection Agency (NEPA) will determine the permissible limit of pollution and broadcast it through public media.

Presidential Decree Regarding Protection of Agricultural lands, Gardens, Amusement Parks and Other Green Areas (no. 4252, dated 19/7/1389)

To protect agricultural lands, gardens, parks, green areas, construction of buildings or allocation of agricultural lands, gardens and parks for construction of cities, industries, residential areas or any other purpose that will damage and destroy lands and result in environmental pollution were prohibited.

National Environmental Protection Agency shall monitor and supervise the execution of the decree and will provide biannual report for the Presidential Office.

International Laws and Conventions

In addition to biding to national laws, Islamic Republic of Afghanistan has international commitments and obligations as well. Following is a brief description of such conventions:

Convention on Protection of the World Cultural and Natural Heritage (WHC)

This convention requires its members to undertake a general policy for protection of cultural and natural heritage. In this regard, scientific and technical studies should be done. In addition, proper actions in terms of law, scientific, technical and administrative decisions for training and education in this area are needed. This convention was signed in 1972 and Afghanistan joined it in 1979.

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

Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 34,000 species of animals and plants. Eighty countries signed this convention in Washington City in 1973 and Afghanistan joined in 1985.

United Nations Convention to Combat Desertification (CCD)

Purpose of this Convention is to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. In 1994, this convention was signed by 115 countries in Paris and Afghanistan joined in 1995.

Convention on Biological Diversity (CBD)

Known informally as the Biodiversity Convention, is an international legally binding treaty. The Convention has three main goals:

1. conservation of biological diversity (or biodiversity);
2. sustainable use of its components; and
3. Fair and equitable sharing of benefits arising from genetic resources.

In other words, its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development. This convention was

signed by 150 countries in Rio De Janeiro in 1992 and was enacted in Afghanistan in 2002.

2-3 World Bank's Environmental and Social Safeguard Policies

The World Bank's environmental and social safeguard policies are a cornerstone of its support for program aimed at sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for lenders (including banks) and borrower staff in the identification, preparation, and implementation of program and projects. Safeguard policies have often provided a platform for the participation of stakeholders in the project design, and have been an important instrument for building a sense of project "ownership" among local populations. There are a total of ten environmental, social and legal Safeguard Policies of the World Bank, of which the seven most relevant are listed in below.

World Bank Safeguard Policies and Guidelines:

- World Bank OP 4.01 for Environmental Assessment;
- World Bank OP 4.04 for Natural Habitats;
- World Bank OD 4.10 for Indigenous People;
- World Bank OPN 4.11 for Physical Cultural Resources;
- World Bank EA Sourcebook Update No 4: Sectoral EA (October 1993);
- World Bank EA Sourcebook Update No 25: EMPs (January 1999).

The following policies are likely to be triggered by the utility-scale PV-based solar power plant project activities:

OP 4.01 – Environmental Assessment is used in the World Bank to identify, avoid and mitigate the potential negative environmental impacts associated with the Bank’s lending and guarantee operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making in order to ensure that project options under consideration are sound and sustainable and that potentially affected people have been properly consulted.

OP 4.01 – Environmental Assessment contains guidance on the World Bank requirements on various aspects of the EIA process. These include guidance on the categorization of projects during Project screening, provisions for sector investing and financial intermediaries, exemptions for emergency situations, requirements for institutional capacity and requirements for public consultation and disclosure. According to the World Bank **OP 4.01**, the proposed project is likely to be classified as a Category A project. Projects under this Category are likely to have significant adverse environmental impacts that are considered sensitive, diverse, or unprecedented and which may affect an area beyond the site or facilities. An EIA for a Category A project is required to identify and assess potential negative and positive environmental and social impacts, compare these with those of feasible alternatives (including the no project alternative), and recommend mitigation measures to reduce negative impacts and enhance benefits. The EIA process and this EIA report have been conducted and prepared in line with **OP 4.01**.

OP 4.12 – Physical Cultural Resources

The World Bank recognizes physical cultural resources (PCR) as valuable scientific and historical assets and an integral part of a people’s cultural identity and practices. Thus development projects that are likely to have an impact on PCR must work to avoid or mitigate adverse impacts. In the event that PCR are impacted by project activities the developer is required to adhere to Afghanistan legislation and, World Bank or any other international obligations. The following steps, which are integrated into the ESIA process, will take account of the PCR in the area of interest:

- screening, developing a terms of reference (TOR),
- collecting baseline data,
- impact assessment and
- Formulating mitigating measures and a management plan.

If the Project is identified to have adverse impacts on PCR, the proponent must identify appropriate measures for avoiding or mitigating these impacts as part of the EIA. These measures may range from full site protection to selective mitigation, including salvage and documentation, in cases where a portion or all of the physical cultural resources may be lost. The proponent is also required to develop a PCR management plan. In addition, **OP4.12** requires the proponent to engage with project-affected groups, concerned government authorities, and relevant non-governmental organizations to document the presence and significance of PCR, assess potential impacts, and explore avoidance and mitigation options. The findings of the physical cultural resources component of the EIA are disclosed as part of, and in the same manner as, the EIA report.

2-3-1 World Bank's Environmental and Social Safeguard Policies

The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The key objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These are achieved through:

- supporting the integration of environmental and social aspects of projects into the decision making process;
- providing mechanism for addressing environmental and social issues in program and project design, implementation and operation;
- identifying and managing impacts and risks;
- providing framework for consultation and disclosure; and

- supporting development effectiveness – increase results on the ground both short and long term.

The World Bank Safeguard policies are mechanisms for integration of environmental and social issues into decision-making. They:

- provide a set of specialized tools to support development processes;
- support participatory approaches and transparency; and
- apply to all investments financed by the World Bank.

There are eleven (11) safeguard policies and they are:

- Environmental Assessment;
- Natural Habitats;
- Forestry;
- Pest Management;
- Physical Cultural Resources;
- Indigenous Peoples;
- Involuntary Resettlement;
- Safety of Dams;
- International Waterways;
- Disputed Areas; and
- Disclosure Policy.

3

Project Description

3-1 Overview

This is a 15 MW PPP on-gird project and signed a contract with DABS for 20 years, located in Kandahar province, beside Kandahar ANA. 77 Construction Company is supplying the material, do the installation and operation & maintenance, according the contract with government of Afghanistan. We are selling the energy/KWH to Kandahar DABS for 20 years. All official agreements and documentation is signed and provided with Afghanistan government side.

This chapter describes in details, the proposed project facilities to be installed and operated. The proposed project activities will generally involve site clearing, construction works, installation, operation and maintenance phases.

3-2 Project Location

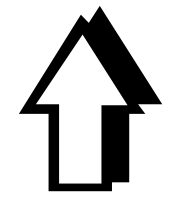
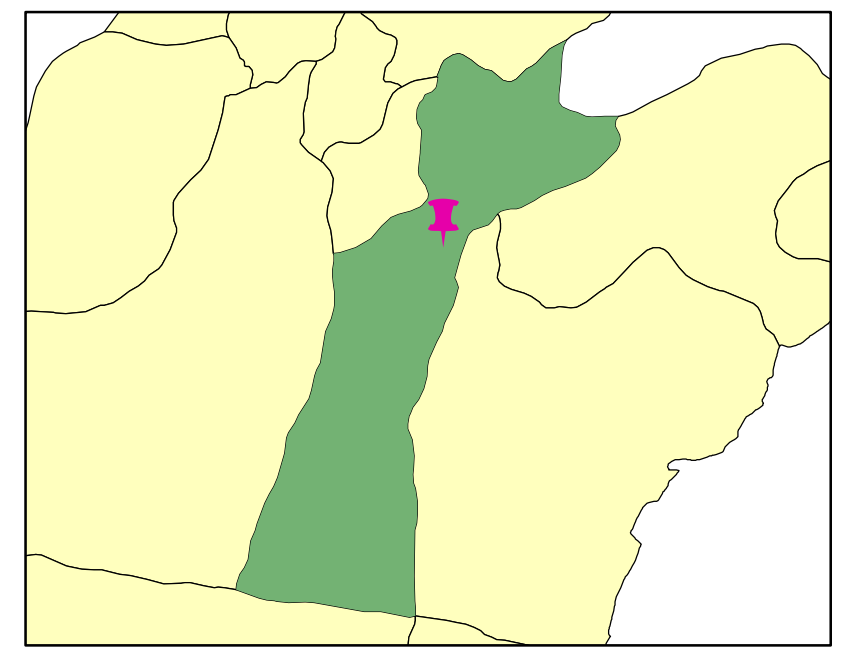
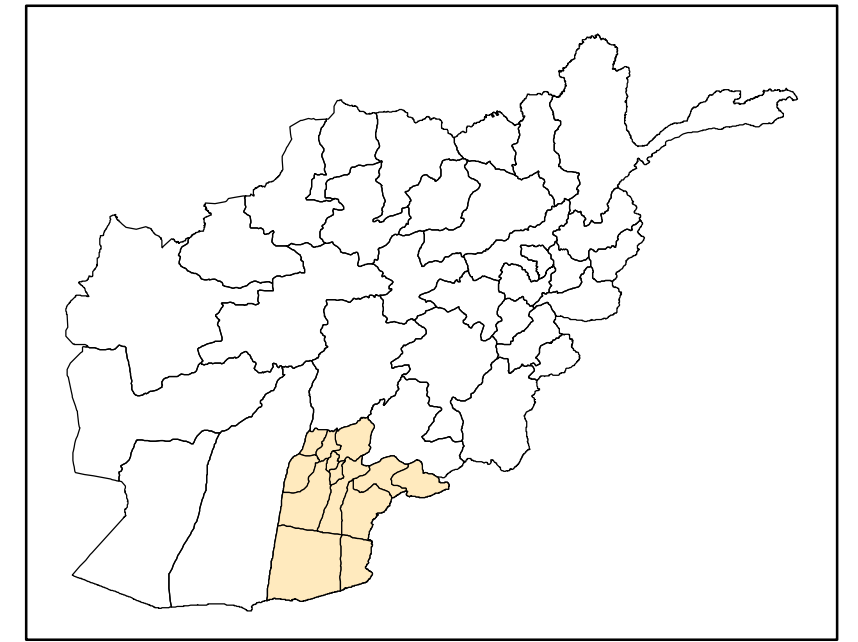
The proposed solar power plant, 15MW Kandahar Solar Project, is located in Daman District of Kandahar province (Figure 1). The coordinates of the solar power plant area are as follows:

Table 1. Project Site Coordinates

Point Table UTM- Grid-41N		
Point #	Northing	Easting
1	3484917.27	772981.77
2	3484955.72	773390.51
3	3484228.18	773458.94
4	3484189.73	773050.21
5	3484955.78	773391.11



Project Location



Legend

- Location
- Project Site

65°51'0"E 65°51'30"E 65°52'0"E 65°52'30"E 65°53'0"E 65°53'30"E 65°54'0"E 65°54'30"E



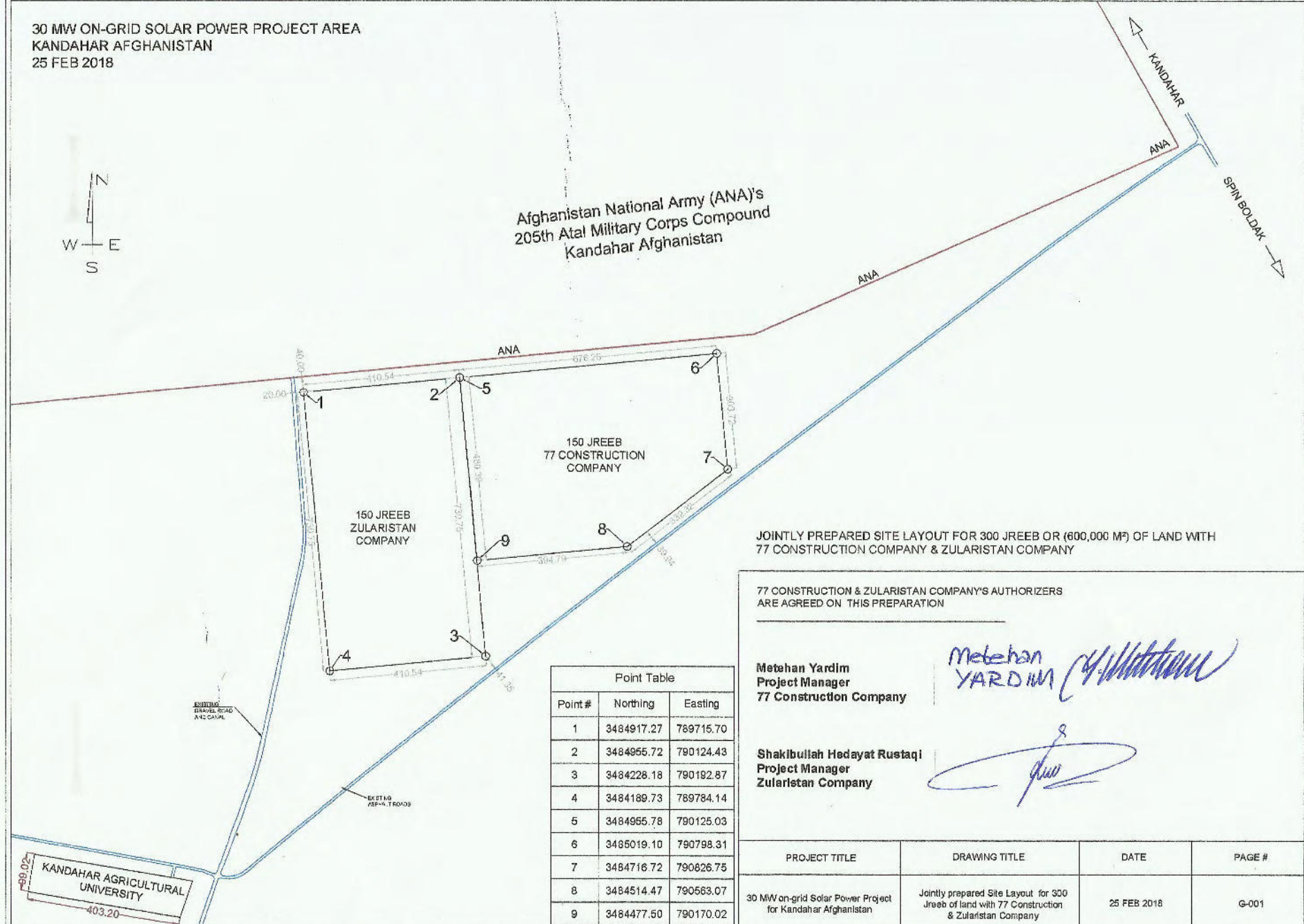
0 32,500 65,000 130,000 195,000 260,000 Meters

31°26'30"N 31°27'0"N 31°27'30"N 31°28'0"N 31°28'30"N 31°29'0"N 31°29'30"N 31°30'0"N

30 MW ON-GRID SOLAR POWER PROJECT AREA
KANDAHAR AFGHANISTAN
25 FEB 2018



Afghanistan National Army (ANA)'s
205th Atal Military Corps Compound
Kandahar Afghanistan



JOINTLY PREPARED SITE LAYOUT FOR 300 JREEB OR (600,000 M²) OF LAND WITH 77 CONSTRUCTION COMPANY & ZULARISTAN COMPANY

77 CONSTRUCTION & ZULARISTAN COMPANY'S AUTHORIZERS ARE AGREED ON THIS PREPARATION

Metehan Yardim
Project Manager
77 Construction Company

Metehan YARDIM

Shakibullah Hedayat Rustaqi
Project Manager
Zularistan Company

Shakibullah Hedayat Rustaqi

Point Table		
Point #	Northing	Easting
1	3484917.27	789715.70
2	3484955.72	790124.43
3	3484228.18	790192.87
4	3484189.73	789784.14
5	3484955.78	790125.03
6	3485019.10	790798.31
7	3484716.72	790826.75
8	3484514.47	790563.07
9	3484477.50	790170.02

P-89.02
KANDAHAR AGRICULTURAL UNIVERSITY
403.20

PROJECT TITLE	DRAWING TITLE	DATE	PAGE #
30 MW on-grid Solar Power Project for Kandahar Afghanistan	Jointly prepared Site Layout for 300 Jreeb of land with 77 Construction & Zularistan Company	25 FEB 2018	G-001

3-4 Project Objective

To provide electricity for industrial parks and overall in Kandahar city, creating jobs, increase the business, local productions and incomes of the people. This system is working parallel with existing diesel generators in the city, the other aim is to reach the diesel cost at least in minimum level.

3-5 Project Components

Solar modules, inverters, transformers, and power cables are the components of the project.

3-6 Characteristics of Solar

PV panels/solar produce DC, or direct current electricity. This is different from the electricity which we are using normally in the industrial and residential area called AC), or alternating current. DC electricity flows in one direction only, while AC electricity changes direction rapidly.

3-7 Project Activities

Construction activities would last about 12-18 months. The major facilities to be constructed will include Land clearing, Civil works, Towers, Transformers, Control building, Weather station.

The proposed construction program would be as follows:

- Construct the site access roads with gates and temporary fencing; excavate the foundations;
- Construct the panel foundations;
- Construct the transformer and install the grid connection; Lay power and instrumentation cables;
- Construct the control station; Erect and connect the panels; Erect weather station;
- Commission the panels/transmission lines; and
- Carry out land reinstatement, remove temporary compounds and clear the site.

4

Description of the Project Environment

4-1 General

This chapter provides a description of the environmental and social setting for the proposed project and includes those components of the environment potentially affected by the proposed project. This has been prepared from available published information, discussions with communities' representatives, relevant mapping, and information collected during two seasons of field investigations, and sampling along with laboratory analyses of the various environmental media collected from the field study.

4-2 Physical Environment

4-2-1 Climate

This province holds a hot semi-tropical climate with very low rainfall. Maximum annual temperature is 45 °C, average temperature is 31.9 Degrees Celsius, and minimum 5 °C. The annual precipitation of Kandahar 76.2 mm. Rainy season starts from January and last until May. No rain in summer season, and it is extremely hot. Wind velocity is approximately 40 km/h.

Temperature

In Kandahar, the hottest and driest month is June with annual high temperatures measured above 45°C. July is the warmest month with an average of 33.12 °C. The lowest average temperatures in the year occur in January, when it is around 9.12 °C. The variation in temperatures throughout the year is 22.1 °C.

Table 2. Kandahar City Temperature.

Month	Year									Average
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Jan	8	10	7	6	9	9	11	13	11	9.33
Feb	12	11	9	7	12	8	15	15	13	11.33
Mar	18	19	16	15	18	15	18	20	20	17.67
Apr	20	24	23	23	23	24	26	25	29	24.11
May	28	29	30	28	28	29	31	33	35	30.11
Jun	28	30	34	31	34	33	34	35	39	33.11
Jul	31	30	32	33	34	33	36	36	39	33.78
Aug	31	29	31	30	32	30	34	33	37	31.89
Sep	26	23	27	26	28	28	28	31	32	27.67
Oct	17	20	22	19	21	22	25	22	27	21.67
Nov	12	12	17	13	15	15	17	15	19	15.00
Dec	9	6	8	10	10	10	11	15	12	10.11
Average	20.0	20.25	21.33	20.08	22.00	21.33	23.83	24.42	26.08	

Precipitation

Average annual precipitation for the Kandahar Province varies from 200 mm at the reservoir to near 400 mm. The majority of the precipitation occurring as rainfall between December and April.

Table 3. Average Precipitation of Kandahar City.

Month	Year									Average
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Jan	68.32	30.5	21.02	47.2	15.52	18.05	10.99	22	46.2	31.08
Feb	19.92	134.48	214.15	81.79	70.57	57.59	26.91	0	103.7	78.79
Mar	28.54	21.32	9.63	6.16	44.32	68.43	19.47	81.5	37.5	35.2
Apr	68.29	16.32	16.33	25.64	17.4	42.58	4.39	23.1	0.8	23.87
May	2.01	22.21	6.3	4.71	1.71	23.24	4.51	1.51	1.1	7.47
Jun	0.2	0	0.59	1.51	1.67	1.29	0	0.1	0	0.59
Jul	0	0	0	0	0.43	0	0.2	0	0	0.07
Aug	0	4.79	0	0	0.9	0	0	0.2	0.1	0.66
Sep	0	1.11	3.31	6.11	0	0.2	0	0	0	1.192
Oct	0.61	4.19	7.39	3.59	0	2.1	3.19	0	0	2.34
Nov	2.4	0.1	15.09	8.3	30.51	21.79	39.8	1.4	2.6	13.55
Dec	88.11	0	0	27.67	1.8	1.2	4.58	1.7	0	13.89
Average	23.20	19.59	24.48	17.72	15.40	19.71	9.50	10.96	16.00	

Wind

The wind speed for Kandahar in Table 4 is based on data collected between 2009 and 2017. The prevailing winds at Kandahar are from the southeast in winter and the southwest in summer. The mean wind speed at Kandahar is 9.2 mph, the average speed is 6.04 mph, and the minimum speed is 3.1 miles per hour.

Table 4. Average Wind Speed of Kandahar City.

Month	Year									Average
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Jan	5.1	4.7	3.6	5.1	3.8	4	4.5	4.3	6.3	4.60
Feb	6.3	7.6	6.3	6.9	4.9	4.7	5.6	4.5	6.5	5.92
Mar	6.9	6.5	5.8	7.4	5.8	5.8	6.3	6.3	6.5	6.37
Apr	7.6	7.6	6.3	7.4	7.6	6.9	7.6	6.9	8.1	7.33
May	9.2	8.9	8.7	9.2	8.5	8.1	8.9	8.9	8.1	8.72
Jun	8.5	8.3	7.2	7.6	8.1	8.1	7.6	7.2	7.8	7.82
Jul	7.6	7.2	6.7	7.4	6.9	6.9	6.9	7.4	6.9	7.10
Aug	7.6	5.4	6.9	6.3	7.4	6	6.5	5.8	6.3	6.47
Sep	6.7	5.6	5.8	5.4	5.1	5.6	5.8	5.6	5.4	5.67
Oct	5.6	4.3	4.9	4.7	4.9	5.4	4.7	5.4	4.9	4.98
Nov	5.4	3.4	3.8	4	3.8	3.8	4.7	4	3.8	4.08
Dec	4.3	3.1	3.4	3.6	3.6	3.1	3.8	3.8	4	3.63
Average	6.733	6.050	5.783	6.250	5.867	5.700	6.075	5.842	6.217	

Sunshine

As shown in the following table, most of the days are sunny during the year in Kandahar City especially on Jun, July, and August, but on January and February, the sunny days are less.

Table 5. Average sunny days of Kandahar Province.

Month	Year																		Ave
	2009		2010		2011		2012		2013		2014		2015		2016		2017		
	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	
Jan	89.8	17	92.8	23	91.8	22	88.8	20	92.5	24	90.5	22	88.5	26	85.8	26	86.8	23	56.13
Feb	88.5	21	86	16	79.8	10	86.8	17	85.5	12	83	16	79	23	87.8	29	66.3	18	50.26
Mar	124.3	19	125.8	26	125.5	21	127	23	123.3	20	123.3	10	114	28	119.8	17	118	19	71.33
Apr	149.5	17	149.5	21	150	19	48.5	16	148	16	149.8	12	146.8	25	139	22	148.8	29	78.16
May	155	27	155	22	153.8	18	155	22	154.8	26	154.8	10	151	27	155	28	153.5	29	88.72
Jun	150	29	150	30	150	29	150	28	150	26	150	17	150	30	149.8	29	150	30	88.77
Jul	155	31	155	31	155	31	155	31	155	30	155	31	154.8	29	155	31	155	31	92.82
Aug	155	31	154.8	28	155	31	155	31	155	28	155	31	155	31	153.5	31	155	30	92.52
Sep	142	30	143	28	144	28	142	27	142	30	143	29	144	30	142	30	142	30	85.89
Oct	93	28	91.8	28	92.3	25	93	26	92.8	31	92.8	27	90.8	26	93	31	93	31	60.31
Nov	90	27	90	29	88.5	22	89.8	22	89.5	21	88.5	23	88.3	21	87.5	27	86.3	28	56.58
Dec	86.8	22	90.8	31	93	31	90.3	22	92.5	28	92.5	29	89.3	25	87.3	29	86	31	58.69
Ave	123.2	25	123.7	26	123.2	24	115.1	24	123.4	24	123.2	21	121	27	121.3	28	120.1	27	

4-2-2 Geology

4-2-2-1 Soil

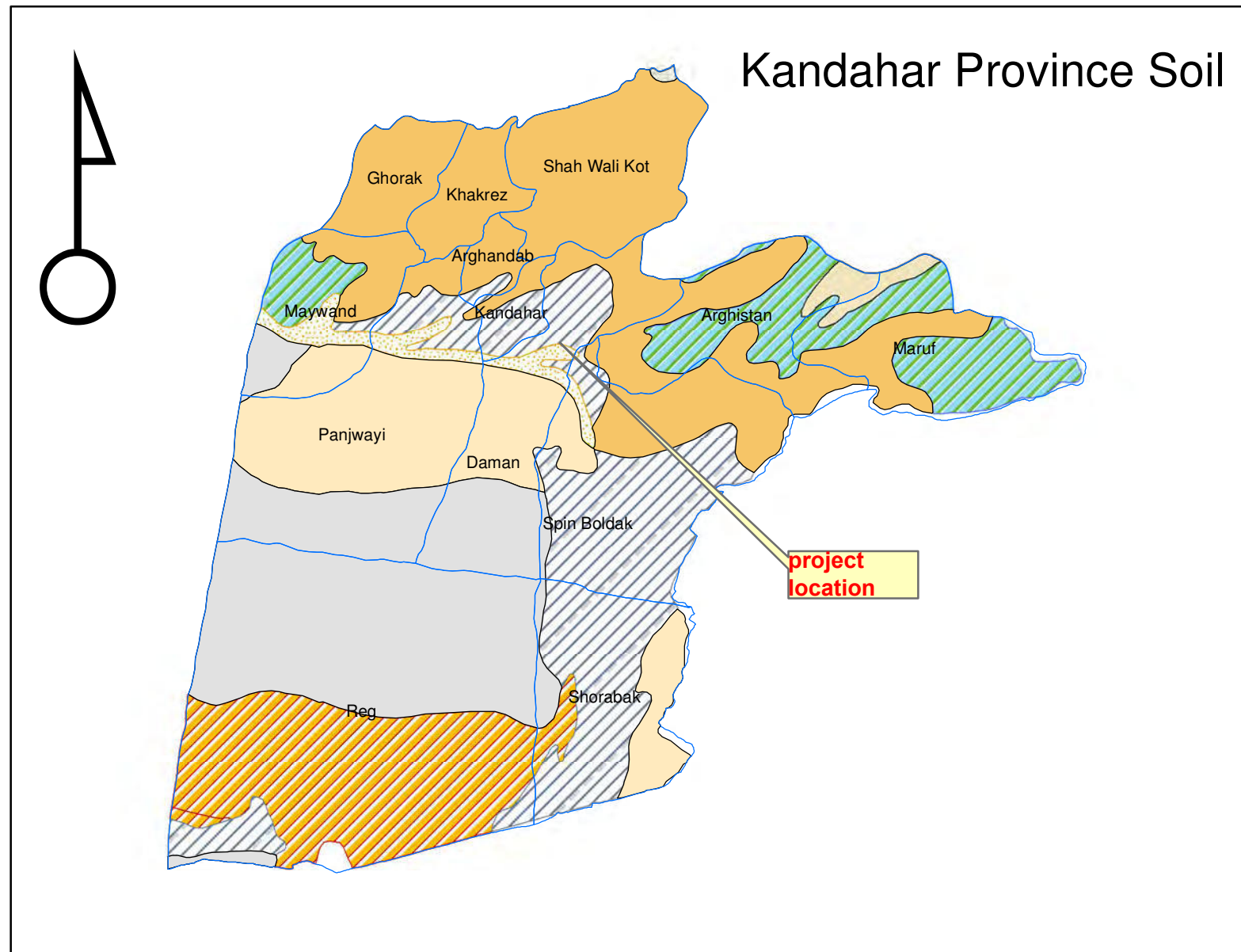
Soil in the project area primarily consist of sediments eroded from the mountains and comprise alternating layers of gravels, sands, silts and clays. Adjacent to the mountains, the sediments are dominated by coarse deposits such as gravels and pebbles, deposited by the runoff water from the mountains. 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 Haplocambids with Torripsamments (Figure 2) and its characteristics are as follows:

Haplocambids

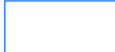

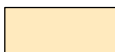




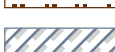



Haplocambids are the most commonly occurring of the Cambids. These soils are characterized by minimal horizon expression. Most Haplocambids have a redistribution of carbonates below the Cambic horizon. The amount of carbonates, however, is insufficient to meet the definition of a calcic horizon, or the upper boundary is more than 100 cm below the soil surface. These soils occur on a variety of landscapes, commonly on those that are younger than late- Pleistocene in age.

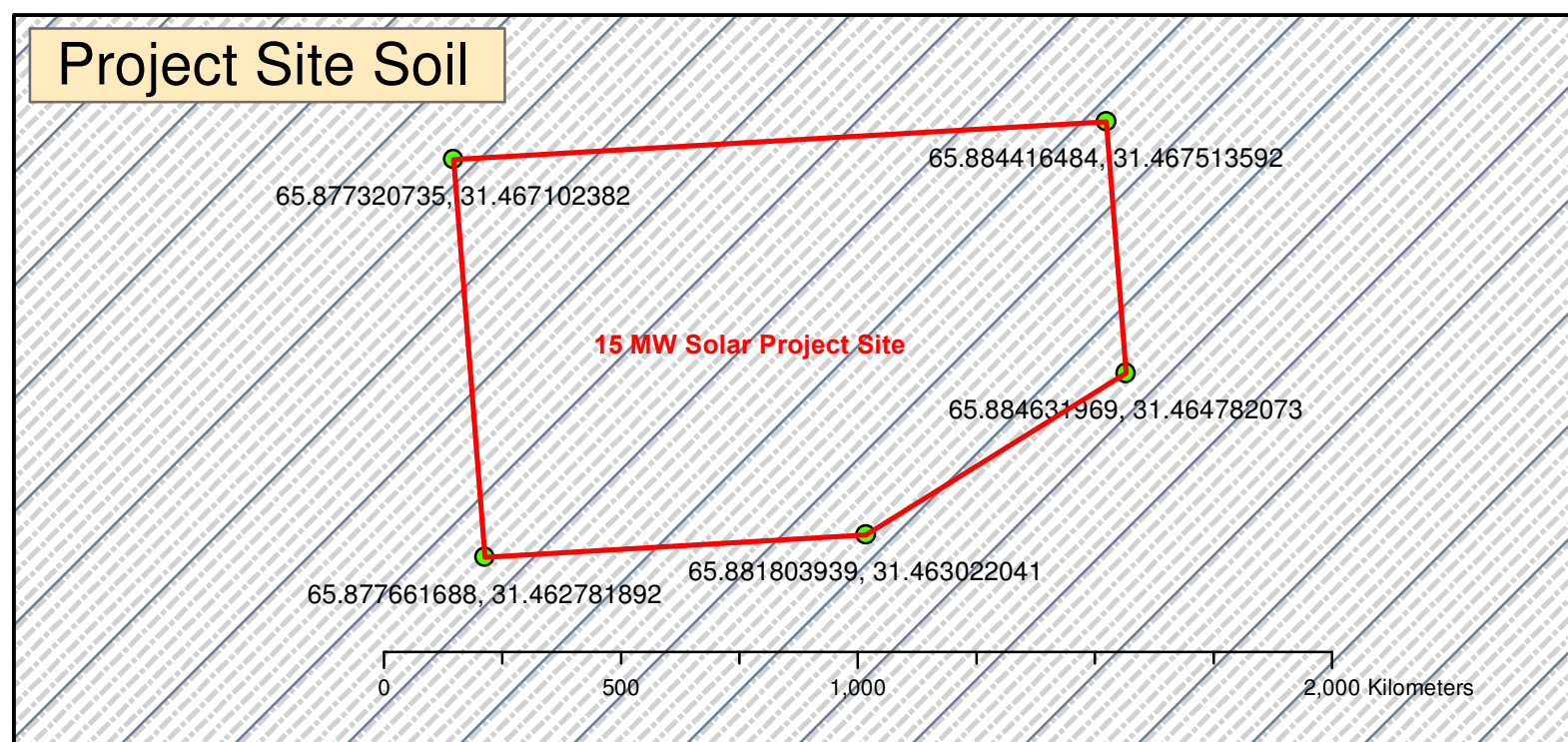
Torripsamments

These are the cool to hot Psamments of arid climates. They have an aridic (or torric) moisture regime and a temperature regime warmer than cryic. Many of these soils are on stable surfaces, some are on dunes, some are stabilized, and some are moving. Torripsamments consist of quartz, mixed sands, volcanic glass, or even gypsum and may have any color. Generally, they are neutral or calcareous and are nearly level to steep. The vegetation consists mostly of xerophytic shrubs, grasses, and forbs. Many of these soils support more vegetation than other soils with an aridic moisture regime, presumably because they lose less water as run-off. Some of the soils on dunes support a few ephemeral plants or have a partial cover of xerophytic and ephemeral plants. The shifting dunes may be devoid of plants in normal years. Most of the deposits are of late-Pleistocene or younger age. These soils are used mainly for grazing.



Legend

-  Distict Boundaries
-  Torripsamments_with_Torriorthents
-  Torripsamments_with_Dunes
-  Torriorthents_with_Torrifluents
-  Torrifluents_with_Haplogypsids
-  Torrifluents
-  Salt_Flats
-  Rocky_land_with_Lithic_Haplocambids
-  Haplocambids_with_Torripsamments
-  Haplocalcids_with_Torriorthents
-  Dunes



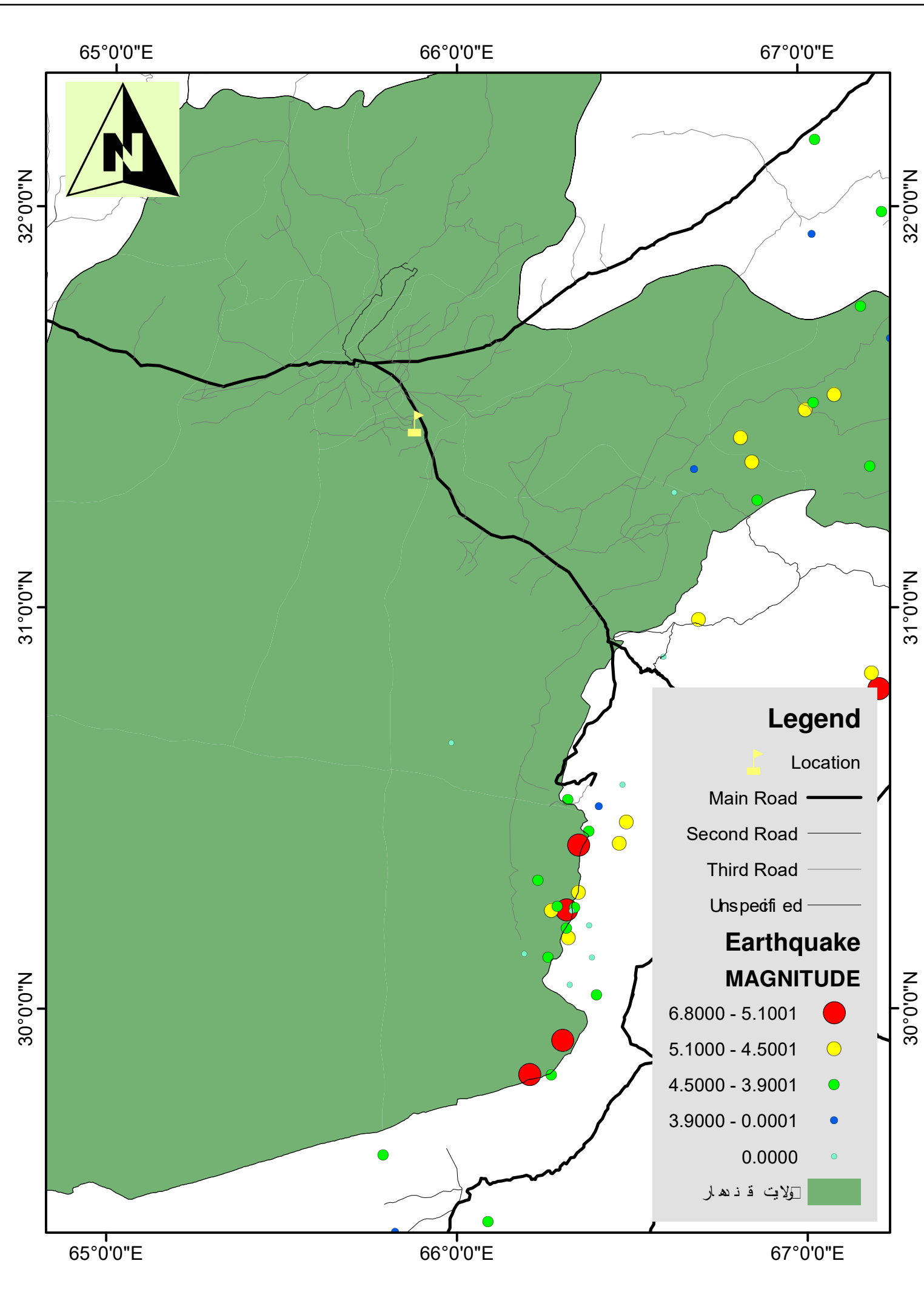
4-2-2-2 Earthquake

Afghanistan is located on earthquakes or earthquakes, and as a result, we occasionally see earthquakes and destruction in some parts of the country. Some areas in Afghanistan, for example, are more earthquake able and their dispersion is shown below. Unlike the north-east, center and east of the country, the southwest area is more distracting in terms of earthquake, because the country's belt or earthquake bar is far away. Only in the western part of this province are Zabul Province and western areas of Kandahar province are earthquakes.

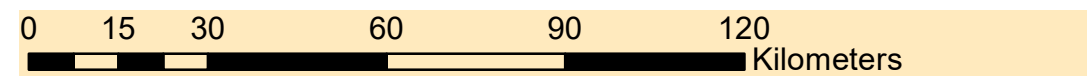
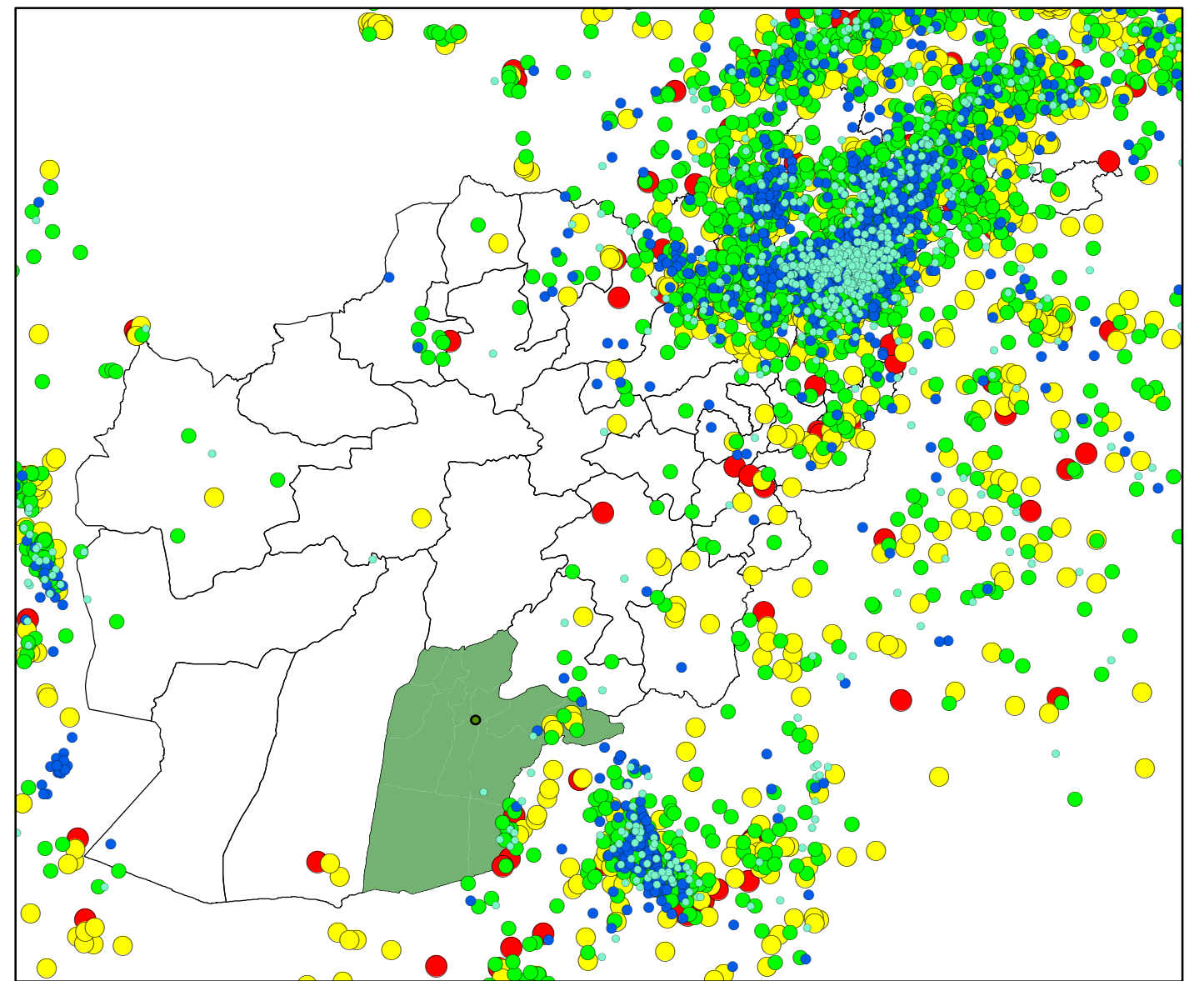
Kandahar province is considered as moderate earthquake and the size of the earthquake intensity in this province reaches 7 to 8 degrees Figure 3.

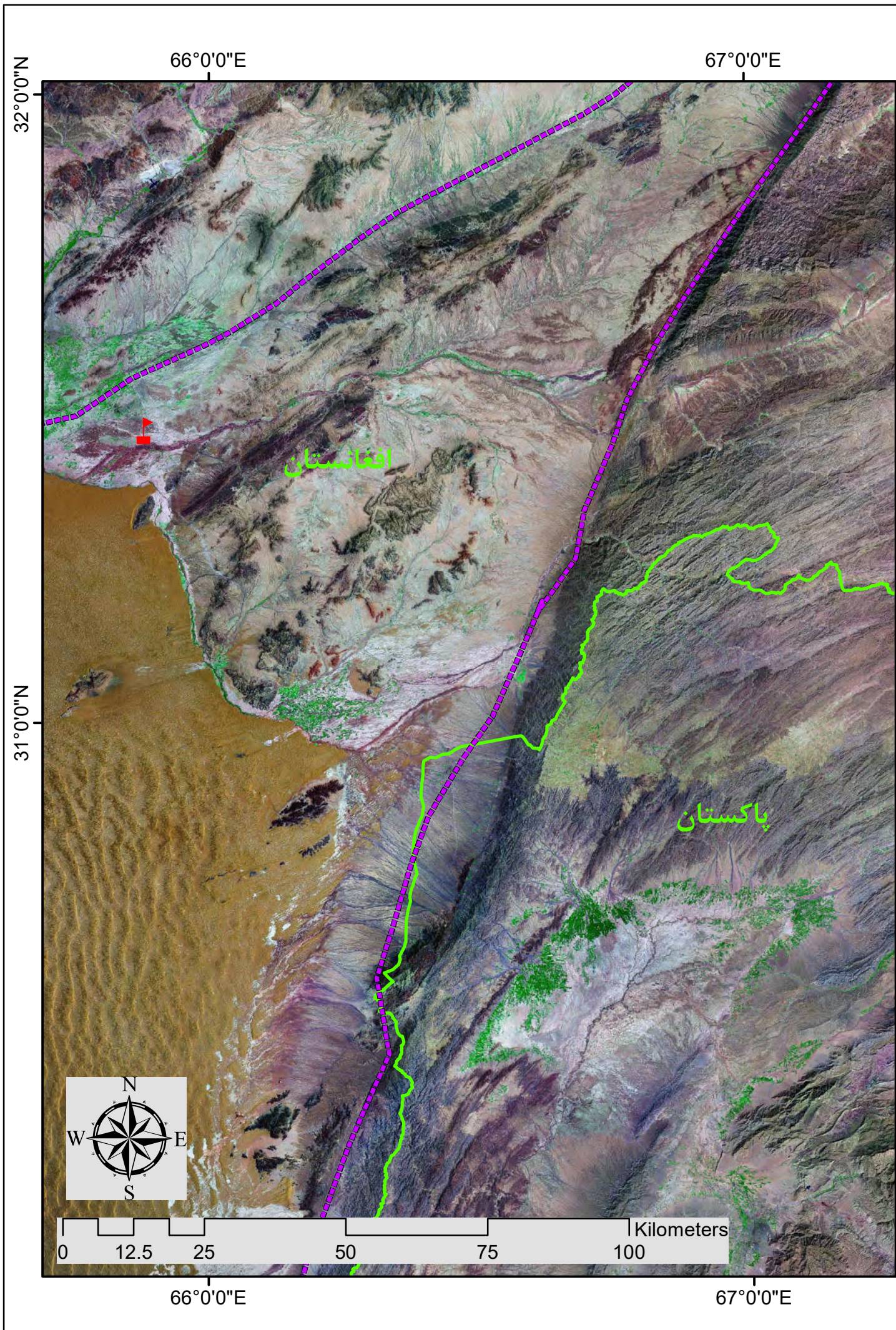
4-2-2-3 Fault

The literature contains evidence and suggestions that 10 large Afghan faults are seismically active. The project is located near the Chaman and Mukor fault. Figure 4 shows the distance of project area and Chaman and Mukor faults.

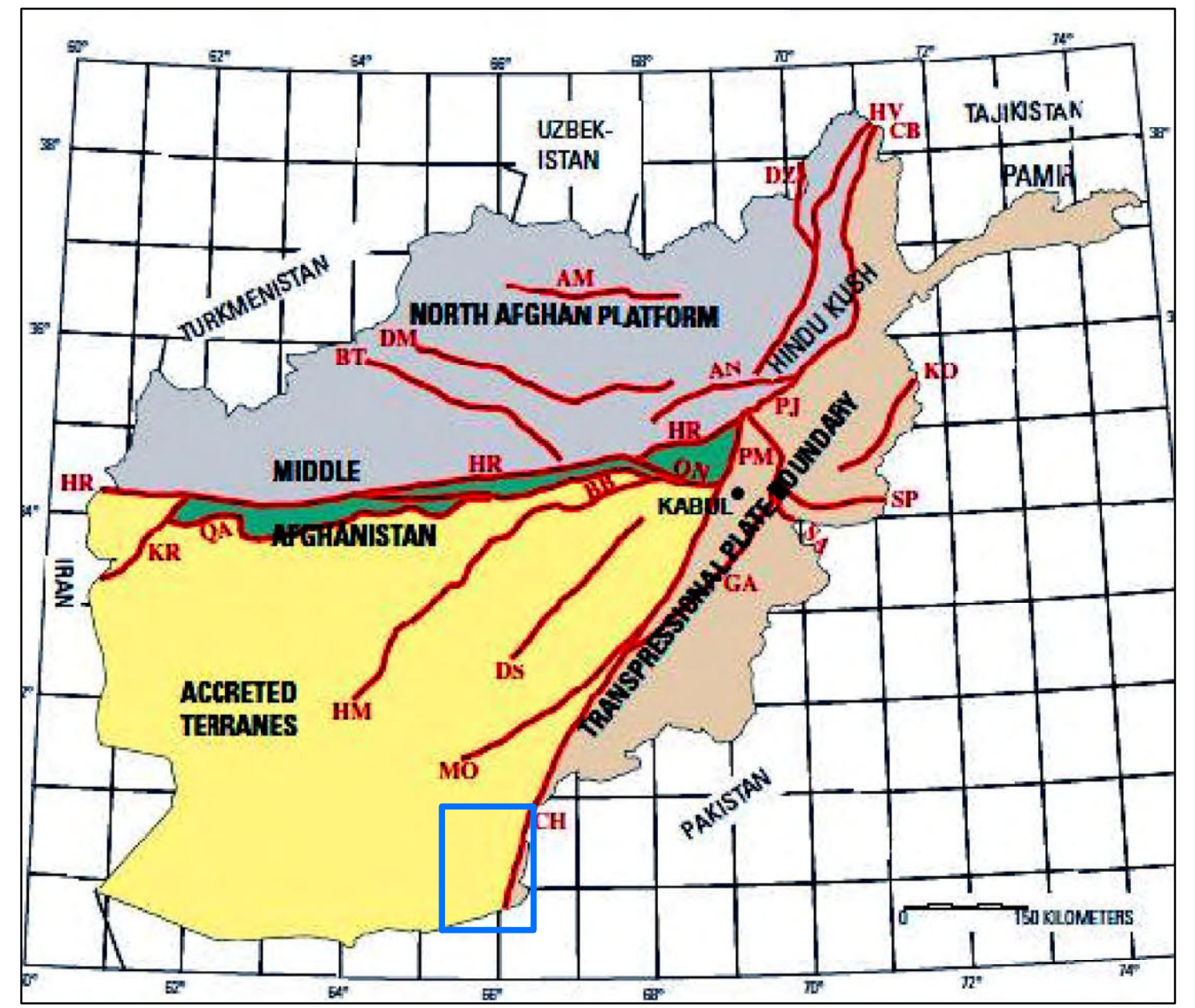


Earthquake






Faults of Project Area




.Green Tech Co

Legend

Project Location 

Faults 

International border 

4-4-3 Hydrology

The study area is located in Helmand's water basin. Helmand is the largest water basin in Afghanistan, accounting for almost 43% of the territory of the country. Despite its size, this water basin makes up only a fraction of the annual flow with a share of 11%. The Helmand Basin includes the following watersheds:

The Sistan-Helmand basin includes fifteen watersheds:

- Upper Helmand watershed;
- Middle Helmand watershed;
- Lower Helmand watershed;
- Sistan-Helmand watershed;
- Upper Arghandab watershed;
- Lower Arghandab watershed;
- Tarnak Rod watershed;
- Chagay watershed;
- Adraskan Rod watershed;
- Farah Rod watershed;
- Khuspas Rod watershed;
- Khash Rod watershed;
- Arghistan Rod watershed;
- Sardih wa Ghazni Rod watershed;
- Dasht-i Nawur watershed.

4-2-3-1 Tarnak Rod Watershed

The Tarnak Rod watershed drains the water from the Moqur and Gelan districts of Ghazni province and goes through Zabul province (Shajoy, Qalat, Tarnak wa Jaldak districts). The Tarnac Rod watershed ends at the Joy-i Zaher Shahi canal (from the Band-i Dahlan on the Aghandab River). However, when the river flow is high, it reaches the Dori River south of Kandahar. The Tarnac River flows parallel to the Arghandab River for about 380 km, and is sandwiched between the Arghandab and Lora Rod Rivers in the Arghistan watershed.

Tarnak Watershed



66°0'0"E

67°0'0"E

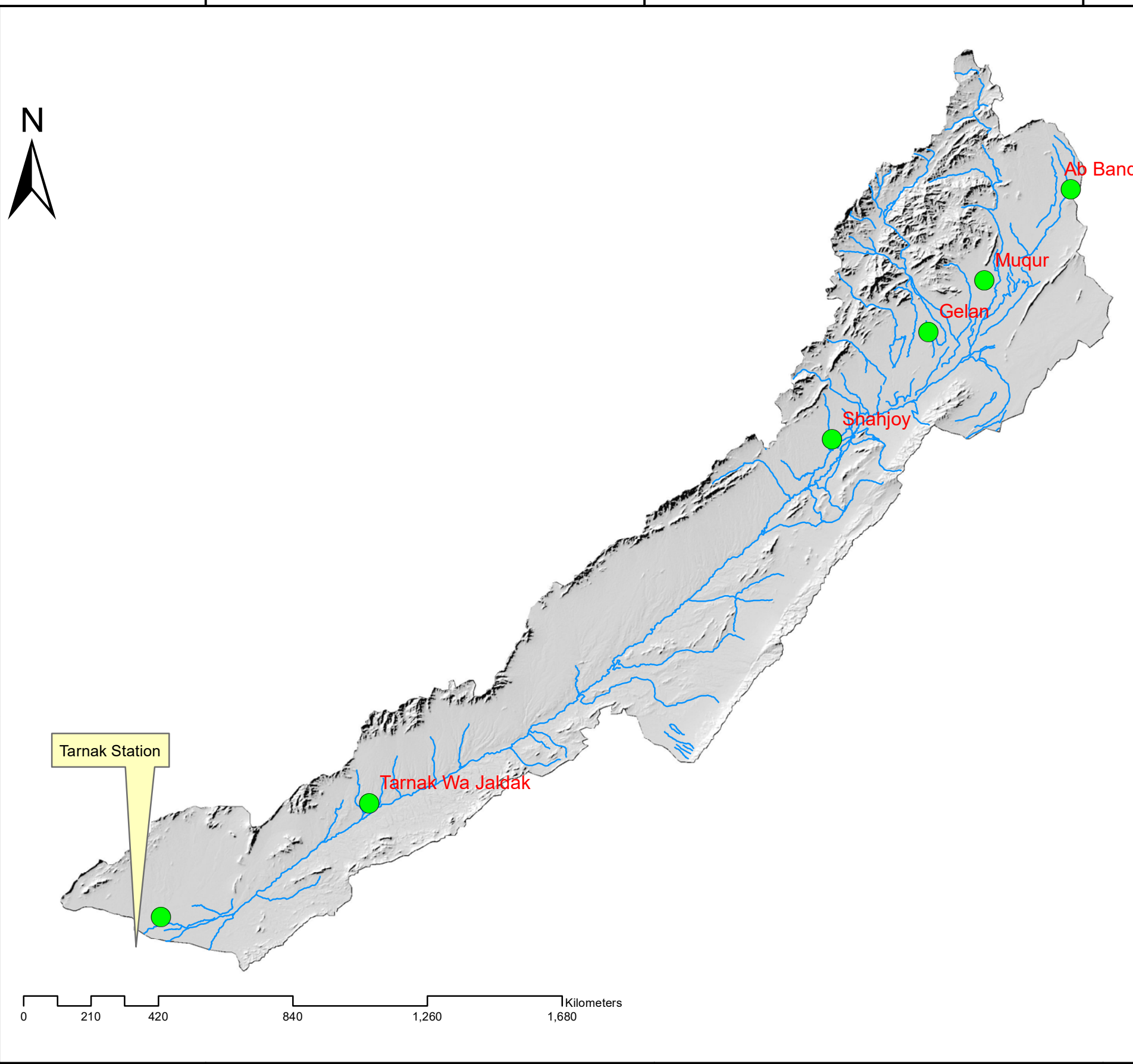
68°0'0"E

33°0'0"N

33°0'0"N

32°0'0"N

32°0'0"N

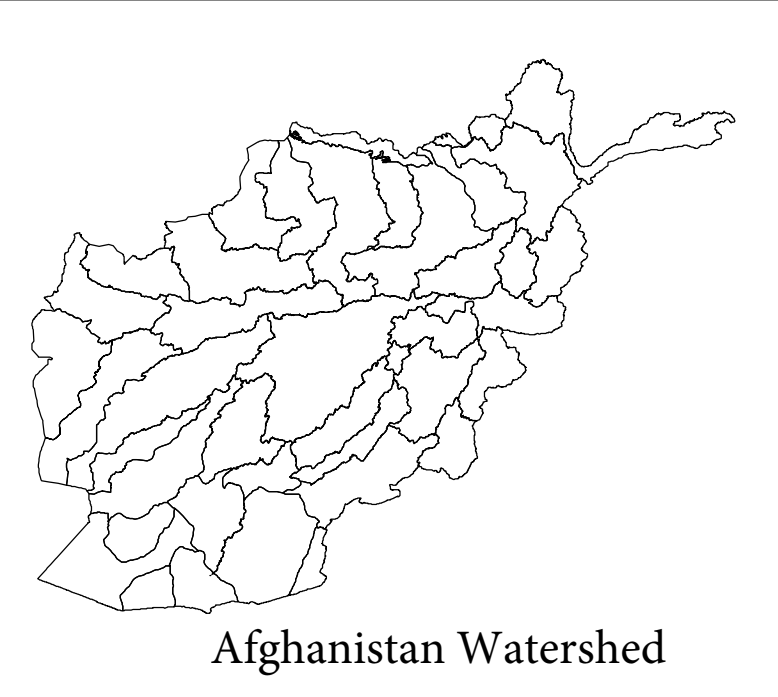


0 210 420 840 1,260 1,680 Kilometers

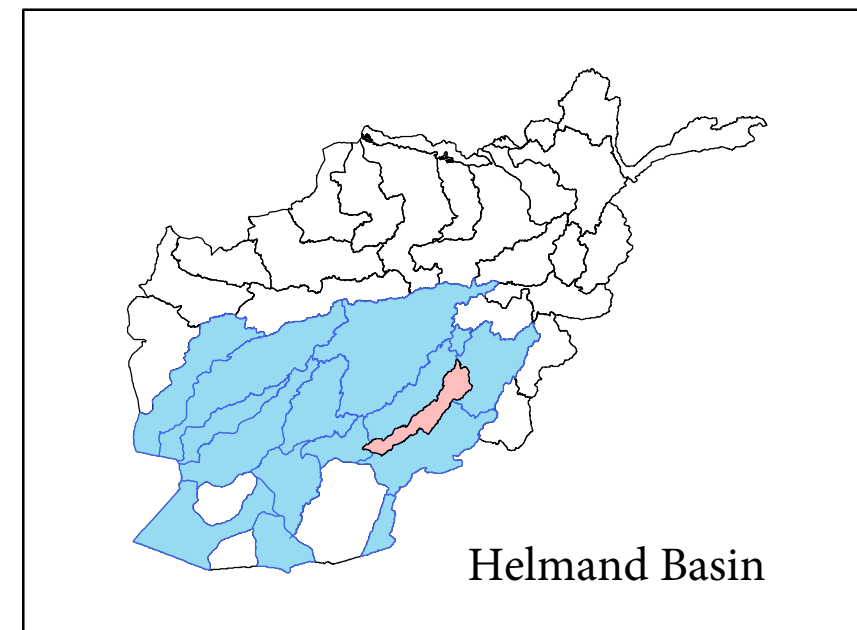
66°0'0"E

67°0'0"E

68°0'0"E



Afghanistan Watershed



Helmand Basin

Legend

istrict Centre ●

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4-2-4 Water Quality

Samples of groundwater and surface water were collected from the project area and sent to the Laboratory in Kabul (Green Tech water and wastewater Laboratory) for analysis and testing. The results of the water test are shown in the table below. These samples are collected from wells and open canals in the project area.

The water quality of the studied area has been investigated in terms of physical, chemical and microbiological quality, and the results of the water samples are shown in the tables below.



Table 8. Surface Water Sampling.



Table 9. Groundwater Sampling.

Table 10. Surface water quality.

<i>Analytical Report</i>							
Project: Surface water Client: 77 Constriction Company				sample no : GT-F-18-42 Sampling location: Sampling date: 29.03.2018			
Type of Sample:	water <input checked="" type="checkbox"/>	wastewater <input type="checkbox"/>	lab receipt time: 11:00 AM				
Sample Source:	well <input type="checkbox"/>	Surface Water <input checked="" type="checkbox"/>	lab receipt date: 01.04.2018				
Source type:	municipal <input checked="" type="checkbox"/>	industrial <input type="checkbox"/>					
<i>Chemical analysis</i>							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
<i>Physical Test</i>							
PH	8.72	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	802	mg/l	D5907-10		2540 C	1000	1000
Conductivity	1604	µs/cm	D1125-91		2510 B	-	-
Salinity	0.81	%	-		2520 B	-	-
<i>Chemical Test</i>							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	177	mg/l as CaCO ₃	D1126-12		2340 C	500	500
Calcium	50.1	mg/l	D511-09		3500-Ca	75	-
Magnesium	12.6	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	109	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Carbonate	6.7	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Bicarbonate	102.3	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Iron, Total	0.03	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.05	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	229	mg/l	D512-10		4500-Cl C	250	250
Sulfate	281	mg/l	D4327-11	200.5Rev	4500-SO ₄ ²⁻	250	400
Nitrate	0.5	mg/l NO ₃	D3867-09	300.1	4500-NO ₃	50	10
Potassium	7.1	mg/l	D4192-08		3500-K C	10	50
<i>Microbiological Test</i>							
Test	Result			Method			
Total coli form	23 MPN/100mL			Standard Methods-9221			
Fecal coli form	Present			Standard Methods-9230			
E-coli	present			Standard Methods-9223 F			
MCL-Maximum contaminant level for drinking purpose.							

Table 11. Groundwater quality

<i>Analytical Report</i>							
Project: 15MW Kandahar Solar Project Client: 77 Construction Co.				sample no : GT-F-18-43 Sampling location: Agriculture University Sampling date: 24.03.2018			
Type of Sample:	water	<input checked="" type="checkbox"/>	wastewater	<input type="checkbox"/>	lab receipt time: 11:00 AM		
Sample Source:	well	<input checked="" type="checkbox"/>	Surface Water	<input type="checkbox"/>	lab receipt date: 30.03.2018		
Source type:	municipal	<input checked="" type="checkbox"/>	industrial	<input type="checkbox"/>			
<i>Chemical analysis</i>							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
<i>Physical Test</i>							
PH	7.80	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	795	mg/l	D5907-10		2540 C	1000	1000
Conductivity	1589	µs/cm	D1125-91		2510 B	-	-
Salinity	0.80	%	-		2520 B	-	-
<i>Chemical Test</i>							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	343	mg/l as CaCO ₃	D1126-12		2340 C	500	500
Calcium	93.7	mg/l	D511-09		3500-Ca	75	-
Magnesium	26.4	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	181	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Carbonate	0.0	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Bicarbonate	181	mg/l as CaCO ₃	D1067-11		2320 B	-	-
Iron, Total	0.06	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.08	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	161	mg/l	D512-10		4500-Cl C	250	250
Sulfate	292	mg/l	D4327-11	200.5Rev	4500-SO ₄ ²⁻	250	400
Nitrate	0.7	mg/l NO ₃	D3867-09	300.1	4500-NO ₃	50	10
Potassium	5.2	mg/l	D4192-08		3500-K C	10	50
<i>Microbiological Test</i>							
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 for drinking purpose.							

4-2-5 Air Quality

As there is limited industry in the area air quality is generally good. Air emissions in the area are generated by vehicle movement and are not very since the project area lies in a remote area. At the site of the project there is no permanent monitoring station, nor in the wider project area. In order to collect baseline information monitoring of ambient air quality was carried out at project site.

During the air quality test, airborne primary pollutants such as carbon monoxide (CO), carbon dioxide (NO₂), sulfur dioxide (SO₂) and particulate matter (PM₁₀ & PM_{2.5}) were collect, the results are presented in Table 12.



Figure 6. Monitoring of Sound Level.

Table 12. Air quality and sound level of project site.

Air & Noise Test							
Parameter	Equipment/ Method	Date & Time of sampling	Sampling point	Test results	ANSA Standard		
					Unit	Time Weighted Average	Concentrat ion in Ambient Air, maximum
PM ₁₀	Signal Street Box PM Meter	28.03.2018 10:30 AM	N 31° 27.856' E 066° 53.01'	20.27	µg/m ³	Annual	70
				210.36		24-hour	150
NO ₂	Signal Street Box Gas monitor			0.936	mg/m ³	Annual	40
				0.113		24-hour	80
SO ₂	Signal Street Box Gas monitor			3.05	µg/m ³	24-hour	50
CO ₂	SERIES 200 Portable Air Quality Monitor			3.05	mg/m ³	30 Min	60
						1-hour	30
Noise Level	SDL600 Sound Level Meter			42.3	dB	Day	55

4-3 Biological Condition

The ecosystems in the area show a relatively high biodiversity, including a rich variety in flora. The vegetation pattern of the project area has largely been influenced by the relief of the area, the nature of the sediments, drainage characteristics and the prevailing (micro) climatic conditions (humidity). There are a nature reserves or wild-life reserves and other environmentally sensitive places.

4-31 Fauna

The fauna in Kandahar Province are including mammals, reptiles and amphibian. Mammals are including of jackal, fox, cat, dog, wolf, rabbit, and squirrel, mice that some of them are common and some of them are fair. Reptiles and amphibians are snake, lizard, scorpion, crab, spider, frog, matrix, crab and many other.

There are different kinds of birds in the study area like turkey, gannet, sparrows, swallow, stork, duck, nightingale, myna, dove, eagle, and partridge.

4-3-2 Flora

The study area forms a part of the western territory within Province and its districts. Physiognomically, the plant cover comprises 3 growth forms which including fruit trees, medicinal plants, and shrubs.

1- Fruit Trees

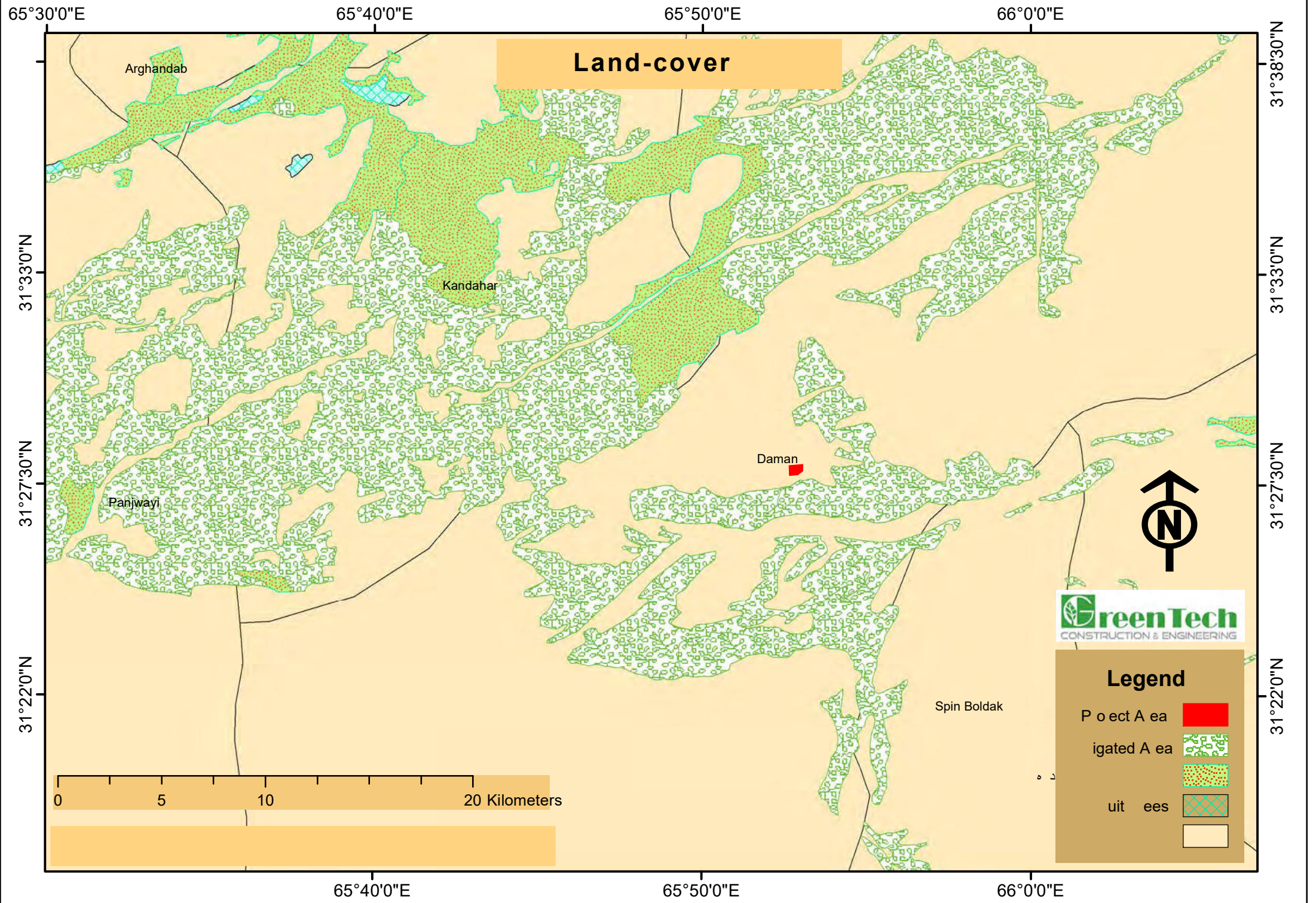
Kandahar Province is very rich with natural resources in particular with potential that exists in the province for Agriculture, Livestock, Fishery, Poultry, and Forestry. The important fruit trees in Kandahar Province are Grape, Pomegranate, Walnut, Apple, mulberry, Common fig, Apricot, Nectarine, Prune, plum, Peach, Lemon, Orange, Bitter Orange, Almond. The vegetation pattern of Kandahar is closely related to the topographic, soil features and climatic conditions.

2- Medicinal Plants

Medicinal plants including short grasses and short leaved forbs appear in the spring after when the weather getting warm in both Nawor and Jaghato districts. They are consist of different sorts as following Cinnamon, Plantago major, Eremurus, Merendera, Gagea, Absinthium, Cousinia, Lactuca orientlis boiss, 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.

3- Grasses and Shrubs

Grasses and shrubs grow in monsoon and spring season and covers all hill slopes of the province and its vicinity. Some of them are aquatic plants and natural vegetation that are palatable for livestock. These grasses and shrubs are including phragmites australis, chara, tulip, brassica, thistle, eremurus, merendera, absinthium, plantago major, gagea, cousinia, alhagi, astragalus, arundo etc.



Land-cover



Legend

- Project Area
- Irrigated Area
- Cultivated Areas
- Uncultivated Areas

0 5 10 20 Kilometers

4-4 Socio-economic

4-4-1 General

Kandahar is located in the Southern region, and it bordered by the provinces of Zabul in the East, Urozgan in the North, and Hilmand in the West. It has common borders with Pakistan in the South. Kandahar covers a land area of 54,845 squared kilometers, representing 8.40 percent of the total Afghan territory. It is the third largest province in Afghanistan in terms of land area, after Hilmand and Hirat. The province is divided into 16 districts—the provincial center, Kandahar, Daman, Shah Wali Kot, Arghandab, Khakrez, Ghorak, Maywand, Zhire, Panjwayi, Shiga (Reg), Shorabak, Spin Boldak, Arghistan, Maruf, Miyanishin, and Nish.

4-4-2 Population

Kandahar province has an estimated population of 563,885 residents that 287,178 is male and 276,707 is female. The urban population is 461,864 (234,508 male and 227,356 female). The following table shows the estimated population, 2017.

Table 13. Population of Kandahar Province.

Districts	Total population			Urban			Rural		
	Total	Male	female	Total	Male	female	Total	Male	Female
Total	1,279,520	654,998	624,522	461,864	234,508	227,356	817656	420490	397166
Province Center	563,885	287,178	276,707	461,864	234,508	227,356	102021	52670	49351
Arghandab	65,328	33,744	31,584	-	-	-	65,328	33744	31,584
Daman	36,569	18,926	17,643	-	-	-	36,569	18,926	17,643
Panjayee	91,856	46,943	44,913	-	-	-	91,856	46,943	44,913
Zhire	90,493	46,569	43,924	-	-	-	90,493	46,569	43,924
Shah Wali Kot	45,742	23,534	22,208	-	-	-	45,742	23,534	22,208
Khakrez	24,048	12,327	11,721	-	-	-	24,048	12,327	11,721
Arghistan	36,321	18,677	17,644	-	-	-	36,321	18,677	17,644
Ghorak	10,164	5,229	4,935	-	-	-	10,164	5,229	4,935
Maiwand	61,857	31,502	30,355	-	-	-	61,857	31,502	30,355
Spin Boldak	106,111	54,786	51,325	-	-	-	106111	54,786	51,325
Nesh	14,132	7,222	6,910	-	-	-	14,132	7,222	6,910
Miyanshin	15,868	8,218	7,650	-	-	-	15,868	8,218	7,650
Shorabak	12,148	6,226	5,922	-	-	-	12,148	6,226	5,922
Maruf	34,834	17,931	16,903	-	-	-	34,834	17,931	16,903
Reg (Shiga)	9,422	4,857	4,565	-	-	-	9,422	4,857	4,565
Dand	47,357	24,156	23,198	-	-	-	47,357	24,156	23,198
Takhta pul	13,388	6,937	6,415	-	-	-	13,388	6,937	6,415

4-4-3 Ethnic group

More than 70% of the people of this city are Pashtuns. After Pashtuns, Tajik people population in this city is about 20% of the population. Hazaras, Baluchis and Arabs are also living in this province, but with low percentage.

4-4-4 Social Infrastructure and Services

Health

Health services for residents of Kandahar are provided by 18 public health centers and 27 comprehensive health centers. There are 534 Pharmacies in this city.

There are 2 publics and 9 private hospitals in the city with 65 specialists. There are a combination of public and private hospitals and clinics in Kandahar. The Ministry of Public Health has also established 16 clinics in different parts of the city, 2 of them are supported by the government. The largest hospital in the whole area is, Mirwais Hospital.

Education

A number of 2875 students have been entered in Kandahar Higher Education University in 2015, which 2760 is male and 115 is female. In addition, a number of 959 were graduated in 2015, 947 males and 12 females. There are 223 professor, 221 meal and 2 female.

There are 4 private university in Kandahar:

- Mirwas Nika University;
- Mala lay University;
- Benawa University;
- Saba University.

Also, there are 3 institute in Kandahar Province:

- Kasirul Rashtavi (228 students with 17 tethers);
- Accounting & Management Institute (690 students with 24 tethers);
- Agriculture and Veterinary Institute (90 students with 4 teachers).

Table 14. Number of student in Kandahar Province.

	Kandahar		Daman District	
	Meal	Female	Meal	Female
Student	100832	47210	4991	1356
Teacher	1798	606	80	30

Drinking Water

Kandahar is the largest and most populous city of Kandahar province, in addition to this city serve other districts too. Therefore, the city has 563, 885 inhabitants (32.3%) access to safe drinking water. Some residents in Daman district have access to clean drinking water and the government is trying to extend this service to any home.

Electricity

Most of the residents of Kandahar city have access to government electricity. The city has supplied its electricity from Kajaki dam in the neighboring Helmand province, which has been expanding in recent years. Around 30 km (20 miles) north of Kandahar, Dhaleh Dam, the second largest dam of Afghanistan, that located in this city provides the electricity of Kandahar City. 92% of Kandahar people have access to electricity.

Access to road

The road situation in this districts is good. There are asphalt and unpaved roads in this district that connects the district to other districts, villages and capital of Kandahar city. Spin Boldak highway passes through the district. Kabul-Kandahar-Herat highway also passes through Daman district.

4-4-2 Economic

The main occupation and economic condition of the inhabitants of the Kandahar Province are based on agriculture and Livestock. The livelihood of the local population of the districts mainly depends on agriculture and livestock rearing.

Agriculture

Agriculture in Kandahar province could be divided into 2 categories A) Field Crops and B) Orchards; the main crops which are considered to be cash

crop for farmers in Kandahar, are wheat, maize, corn, and in the rain fed areas melon and water melon; Kandahar is famous for its orchards with Pomegranates, Grapes and Apricots. The area under orchards was severely reduced during the drought: trees were cut for firewood. Also war destroyed some of them, especially in Panjwayi district.

Crops

The main field crop is wheat, followed by maize, green gram and okra. Poppy and marihuana, often grown on the same plot in succession, is an important cash earner. Also water melon and ordinary melon are grown and widely sold during summer to traders and Kandahari. There is some vegetable production. Kandahar is famous for its fruits in particular Grapes (Kishmish), Pomegranates, Palms and Apricots. There are different varieties of Grapes available which are being further processed (dried) through local and traditional mechanisms of (kishmishkhana) to raisins (kishmish) and being traded.

Livestock

Kandahar used to be very rich in terms of livestock in the past. It was the route as well as road stop or temporary station for Kuchi movements from Ghazni and Zabul to Herat and Badghis. The devastating drought has severely affected the Kuchi's lives and their normal lifestyle, many Kuchi lost their livestock, mainly sheep & Goats. The business of wool, skin, intestines and other by-products such as ghee, quroot (dried butter milk), milk etc has also been strongly affected due to the reduction in the number of livestock; while Kandahar was very famous for its wool trade with other countries. According to Businessmen Kandahar wool was sold in India, Russia and USA in the past. There used to be many wool washing and sorting yards in Kandahar. In Kuchi communities women had the skill for wool spinning as well as weaving of wool products such as Kuchi Tents, kelims (krasta) carpets and etc; the skill should still be existing but due to lack of resources they are not able to utilize their skills in full capacity.

Industry

There are many businesses going on in Kandahar province as it has got two good and beneficial elements for business:

It is located on the highway (or Transit rout) between Herat which is bordering with Iran and Turkmenistan and Kabul as well as Spin Boldak which is bordering to Pakistan so the goods coming form Herat, Farah, Nimroz is passing through Kandahar to both Pakistan as well as Kabul.

It is bordering with Pakistan which has a very good sea-port for business and Spin Boldak is a potential place for business for the people of the district and Chaman of Pakistan. There is a big potential of work for the people of the province in particular Spin Boldak as well as Maruf and Shorabak to smaller level.

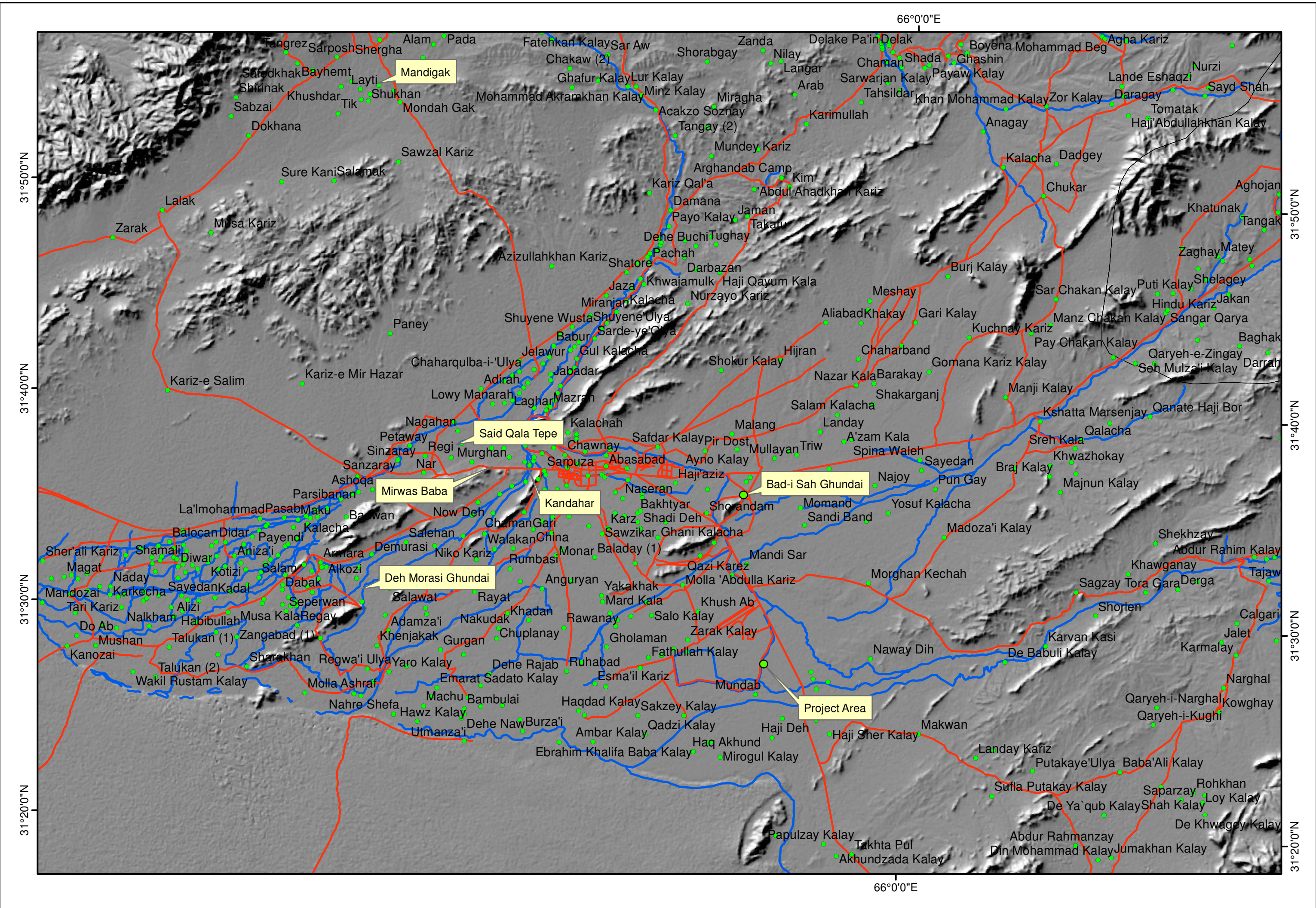
Kandahar has got business of all goods starting from Automobiles and spare parts to medicines and food items being supplied to other provinces of the region and even all over the country. This industry is largely based on the import-export trade which is being practiced by rich Afghani in Kandahar province.

Kandahar also has got number of industries which are established in recent years in the industrial park which has not been given with any facilities such as power, roads and etc.

4-5 Historic and Cultural Resources

Historic and cultural resources include monuments, structures, works of art, the sites of outstanding universal value from historical, aesthetic, scientific ethnological and/or anthropological points of view, including unrecorded graveyards and burial sites. Afghanistan is rich in historic and cultural resources. The responsibility for preservation, maintenance and assessment of historical and cultural monuments in Afghanistan rests with the Archaeological Committee under the Ministry of Information and Culture (MOIC).

There some historical and cultural resource in Kandahar Province. Figure 7 shows the location of each historical and cultural resource and the distance from project site.



Stockholder Consultant

5-1 General

In order to gather local knowledge for baseline, understand project affected person's perceptions regarding impact significance, and propose meaningful mitigation measures, participation of stakeholders has been part of the Project ESIA process. An attempt has been made to consult with a full range of stakeholders to obtain their views on project interventions.

The logic behind stakeholder consultation is that a project proponent has shared with all stakeholders' relevant information on the project interventions including potential environmental and social, (positive and negative) impacts. The consultation process consists of initiating dialogues among all the stakeholders.

The following consultative objectives have served as the moving force for the design, implementation and fact findings for participation process:

- To provide key project information and create awareness among various stakeholders about project intervention;
- To have interaction for primary and secondary data collection with project affected and other stakeholders;
- To begin establishing communication and an evolving mechanism for the resolution of social and environmental problems at local and project level;
- To involve project stakeholders in an inclusive manner;
- To receive feedback from primary stakeholders on mitigation and enhancement measures for environmental and social impacts.

5-2 Consultation with Government department

Meetings with institutional stakeholders like 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 salient features of the project, its location and activities. Institutional stakeholders showed their concerns and gave suggestions /

recommendations for the implementation of the project. These are listed below:

- Project shall be done with high quality work and materials;
- Construction related issues like excavated material, soil erosion and hazards for local communities and labor force should be appropriately addressed during the construction activities;
- Safe transportation of construction material;
- Health and safety measures for labor force;
- For the project, local people taken as workers.



Figure 9. Consultant Meeting with Director of NEPA.



Figure 10. Consultant with Director of Information and Culture Department.



Figure 11. Consultant Meeting with representative of Agriculture Department.



Figure 12. Consultant Meeting with Director of Rural Rehabilitation and Development Department.



Figure 13. Consultant Meeting with Director of Public Health Department.

5-3 Consultation with Community Representatives

A public meeting was held with representatives of the residents of Daman district in the presence of the commander of Daman district. In the meeting, there were representative from all the villages (Kindly see Annex). The following topics were discussed at this meeting:

- Project description;
- The social and economic situation of people; and
- Positive and negative impacts of the project on the natural and social environment;

Institutional stakeholders showed their concerns and gave suggestions / recommendations for the implementation of the project. These 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;
- Professional company shall be awarded for accomplishing the project;
- Possible damage to flora and fauna particularly at proposed site for power house should be addressed;
- Construction related issues like excavated material, soil erosion and hazards for local communities and labor force should be appropriately addressed during the construction activities; Safe transportation of construction material;
- Health and safety measures for labor force; and
- Rights of employment in this Project for local community.

The opinions and concerns of people as follows:

- The work and activities of this project should not harass the people of the region;
- All needs that are considered by the environment in construction work;
- If possible, workers should be selected from the people of the region;
- If workers are from other parts of Afghanistan, they should respect the traditions of the people of this region;

- Whenever possible, local products such as food for project workers should be used;
- To prevent the occurrence of contamination in the long run; and
- People also acknowledged that the implementation of the project would increase the work in the region and would be a temporary source of income for the people of the region.



Figure 14. Interview with local.



Figure 15. Public Consulting Meeting in Daman District.

Environmental and Social Impacts

6-1 General

This chapter identifies and evaluates the potential environmental and social impacts of the proposed solar power project on the physical, social and human environment within the area of influence of the proposed project. The likely impacts were assessed for all activities in the construction; installation, operation and maintenance, and decommissioning/abandonment phases of the project development.

6-2 Methodology

To ensure a comprehensive evaluation, a variety of measures to identify and weigh likely impacts, were considered. These included overlaying project components on maps of existing conditions to identify potential impact areas and issues; consultation with project area residents; experience from similar projects worldwide; and published and unpublished documents providing guidance on performing impact analysis for industrial development activities (such as the World Bank Environmental Assessment Sourcebook, and the EIA provisions of Afghanistan's Environmental laws and regulations).

6-3 Impact Significance

Impact significance criteria were used to identify significant impacts in terms of environmental and social risks, public health and safety, environmental contamination and pollution, and asset/property damage, including land acquisition and involuntary resettlement. Taking into consideration the nature and extent of each activity, the following criteria were applied:

- Magnitude – the level or intensity of the impact. An impact of high magnitude signifies that a large amount of the resource or population is affected.
- Areal Extent – the area of coverage of an impact
- Duration – estimated time for a population or resource to return to its initial state prior to the impact

6-4 Potential Impacts

The project has overall positive impacts by providing a competitive, cost-effective, pollution free, reliable power source. It will certainly help to meet the increasing demand for stable power supply and to reduce dependency on fossil fuels. The project will also help to create jobs and add economic value to the local community. Nevertheless, there are few adverse environmental and social impacts associated with the project activities especially at the project construction phase.

6-5 Potential Environmental Impacts

6-5-1 Air Pollution

The potential sources of emissions during pre-construction phase are:

- Site clearing, leveling, excavation and grading, unpaved roads, storage piles and material transfer points, which include both fallout dusts and high levels of particulates;
- Emissions (NO_x, SO_x, PM) from heavy trucks, generators and compressors; and
- Construction equipment and material hauling could potentially affect traffic flow increase vehicular emissions.

The impact duration will be short-termed, the likelihood is classified as medium and risk level is moderate.

Site preparation, road and drainage construction, excavation for tower erection and transmission line construction would generate dust which would temporarily degrade air quality.

Exposure to dust and other gaseous emissions may impact the health of the local people and construction workers. However, the magnitude of impact on air quality is low and areal extent is localized. The impact duration will be short-termed, the likelihood is classified as medium and risk level is moderate.

There would be no significant air pollutants during plant operation as there is no emission. The proposed project will not consume energy, but will instead provide a new source of clean, renewable electricity national grid.

6-5-2 Noise

Temporary elevated noise levels from equipment and vehicular traffic during mobilization of equipment and personnel to site. Noise levels will be transient and localized.

Noise and attendant vibration effects from fabrication and associated welding equipment and vehicular traffic. The operation of the construction equipment will generate noise ranging between 75–90 dB. Noise levels will be transient and localized. The duration of impact will be short-term and severity is minor considering that workers working near high noise generating activities will be provided with protective instruments. Overall risk level is expected to be low.

Plant operations will increase ambient noise level in few areas, mainly due to operation of the electrical components but the noise generated will not be audible at sensitive receivers, Low levels of noise will be generated during routine maintenance activities. The highest noise level will be from daily vehicular traffic movements. This impact will be localized within the site and the impact severity/risk level is considered to be low.

6-5-3 Soil Erosion

Site clearing and site preparation activities (vegetation clearing, road and drainage construction) will result in loss of vegetation cover (grass and shrubs) and topsoil which could lead to soil erosion.

During construction, soil compaction as well as other soil works such as excavation and trenching will lead to topsoil erosion, and surface water pollution and riverbed silting. Accidental spill of chemicals could result in soil contamination and in-fauna habitat's destruction. In addition, generation of waste material can also lead to soil degradation.

The likelihood of occurrence of impact is medium, the severity is moderate considering the impact mitigation and control measures to be put in place, and the duration is short-term. Overall impact risk level is therefore moderate.

6-5-4 Solid Waste

Solid waste will be produced by activities of workers. The waste at this site includes household waste, construction materials, and cleaned plants. Temporary waste may be stored locally, causing problems such as fly accumulation, leakage and odor. Also, it can affect the quality of the water in the area.

The likelihood of the impact is high and severity is moderate since the effect is limited to the project site and given the controls to be put in place in accordance with the construction waste management plan.

6-5-5 Surface Water

Runoff from the site preparation activities leads to increased pollution of the surrounding waters. This affects the quality of water and aquatic organisms. The likelihood of occurrence, its severity and its high risk has been high.

Changing the structure of the soil during construction can lead to erosion and subsequent flooding in the surface water in the downstream area. Changes in surface hydrology can unconsciously affect the conditions that affect healthy biological sources. Accidental discharge of hazardous materials, inappropriate waste disposal of solid, liquid and hazardous waste and contaminated surface runoff from both the site and the campus of construction workers can also affect aquatic environments.

Site construction activities and construction activities are limited in time and locally. The probability of occurrence is high, the severity of the impact is moderate, and the overall level of risk is high.

6-5-6 Groundwater

During site preparation, ground water resources may be impacted from spills and leaks of hazardous substances such as fuel and oil as a result of improper storage and handling of these chemicals. The likelihood and severity is however low if implementation of a construction management plan is carried out. Thus, the overall risk level is low.

6-5-7 Ecology

Potential impacts on plants include plant depletion when cleaning the area and transforming the natural habitat into the industrial environment. This will

destroy the natural habitat. Also, wildlife and migratory birds will not travel in this area (the project area). Therefore, significant impact on wildlife and migratory birds is anticipated.

There are no wildlife habitats in the studied area and migratory birds do not come to this place. Therefore, there are only local animals and birds in the project's position, which may be affected as a result of the activity or harassment of workers and construction, and, taking into account the reduction measures, the negative effects on animals will be minimized.

Plant removal from soil can lead to soil erosion. However, such effects are largely limited to the construction phase of the project. The effects of the operational phase on the vegetation are negligible and the level of severity / risk is negligible.

During the operation, the reflection of the solar panels and power lines will cause the birds to die. This will disrupt the habitats of the wildlife and result in their migration. Given the fact that the project area is under local influence, the likelihood and severity of these effects are negligible.

6-6 Socio-economic Impacts

During the construction phase, the influx of workers in the work area will increase, most of them local residents. Therefore, this project, with increasing workforce and increasing the skill level of employed people, can be said that the project has a positive social impact during the construction phase. Due to the limited number of local employment opportunities, these effects may be small.

The impact on the population of the region is negligible at the exploitation stage because the solar panels are pre-designed and continuously unattended.

6-6-1 Job Opportunities

The construction of a solar power plant creates job opportunities for skilled and unskilled workers. The work force may be from the whole of Afghanistan and around the project site. Providing local resources and demand for local goods and services will increase the local businesses' ability to earn money.

In the project operation phase, job opportunities are created for limited individuals. Occupational opportunities are also created outside the project area.

6-6-2 Community Infrastructure

Youth and community organizations shall be adequately notified prior to site mobilization to prevent delays in project execution. Adequate consultation shall be held with relevant authorities and community groups, especially the community relationship committee (CRC). Throughout the project life-cycle, periodic community consultation meetings shall be held to address issues and challenges as they may occur.

6-6-3 Construction Disturbances and Possible Conflicts with Local Population

The Project construction activities to be carried out near the local communities may cause disturbance and possible conflicts between the work force and the local population.

- Due to increased use of trucks and other vehicles on the roads in the project area on the access roads to the urban areas elderly people, women and children will be more exposed to dangerous situations;
- There might be noise and dust pollution due to blasting and use of heavy machinery;
- The influx and accommodation of work forces will result in increased concerns for the safety of women and children. The mobility of women might be reduced;
- Workers coming from different parts of Afghanistan may have different norms and values in social behavior as compared with the resident population. In addition, migrant labor force could disturb the privacy of the local population. Miscommunications between these two groups could easily lead to social unrest;
- There could be shortage of supplies in local markets and shops due to the temporary presence of workforces. This could be a hindrance for the local population, especially for elderly people.

6-6-4 Transport of Materials

The Project is implemented near the Kandahar-Spin Boldak Road and about 3 km of Kandahar Airfield. When mobilization and construction commences, traffic intensity will rise minor as a result of construction of the powerhouse and related infrastructure, delivery of resources (materials, plant and labor) to the work site, and transfer of borrowed materials from the source to the Project area. Prevention and mitigation can be achieved by preparing a traffic management plan which indicates the designated areas and access roads for vehicles and moving equipment to be used and speed limits to be applied.

6-7 Public Health and Safety

During construction, health and safety of workers and the general public is at risk. Contractor's occupational safety procedures will mitigate against impact to the safety of workers during construction. The likelihood of occurrence of impact on the safety of workers is high, however given the measures to be put in place, the severity ranking is low.

The influx of workers may also impact on local security as armed robbers and hoodlums may be attracted to the area. The likelihood is low and impact minor. Influx of construction workers may also lead to an increase in prevalence sexually transmitted diseases among the local population.

The influx of construction workers to the area may also increase the incidence of HIV/AIDs. However, due to the low population density of the area, and the relatively small size of the labour force, the potential risk to family structures and social networks is regarded as low.

Mobilization of equipment including heavy duty trucks will pose a risk for road accident to workers, community people and other road users. The impact is however, expected to be minor and the likelihood is low. Increase dust level may lead to an increase in respiratory diseases among the local population.

Possible exposure to electromagnetic interference could occur during these activities. The impact will be high if not adequately mitigated through awareness campaign.

The safety of workers and the public around the project area may be impacted during operation due to exposure to occupational hazards on-site. However, the likelihood of occurrence of such incidents is low taking into consideration the mitigation measures and occupational safety procedures to be implemented.

Mitigation Measures

7-1 General

Spatially, the impacts have been assessed over the study area of 2 km radius of the solar farm project site and 1km wide of the transmission line. These are considered the area of influence of the proposed project in quantitative terms.

The project has overall positive impacts by providing a competitive, cost-effective, pollution free, reliable power source. It will certainly help to meet the increasing demand for stable power supply and to reduce dependency on fossil fuels. The project will also help to create jobs and add economic value to the local community. Nevertheless, there are few adverse environmental and social impacts associated with the project activities especially at the project construction phase.

7-2 Mitigation Measures

7-2-1 Air Quality

Contractor should fit all vehicles and machinery with proper exhaust systems and emission control devices. Machinery and vehicles causing excess pollution should be banned from the project. Dust generation from construction sites should be restricted as much as possible, and water sprinkling should be carried out as appropriate.

7-2-2 Noise

Noise pollution should be restricted to day time periods and levels should be properly monitored. Workers in drilling areas should wear suitable ear protection. Noise monitoring at the residential colonies will be required, and if the noise levels at these locations are beyond the acceptable limits, appropriate mitigation measures such as noise barriers will need to be employed. Workers will be instructed in the proper use of equipment and all blasting activities will be properly designed and managed.

Noise reduction measures will be applied such as:

- Enclosing the powerhouse within a solid structure;
- Acoustic screening of noisy equipment;
- A maintenance program for all equipment and machinery
- Construction shall be restricted to day time so as to avoid disturbance to nearby communities during night hour rest and
- All noise generating equipment shall be fitted with noise control as well as vibration devices, and properly maintained.

The power plant will be generated during the operation of the project.

7-2-3 Soil Erosion

Construction personnel shall adhere to the recommended erosion and sedimentation control practices such as management of excavations to avoid the generation of drainage pathways to underlying aquifers, provision of bunded areas for storage of hazardous materials (e.g. fuel) and equipment maintenance to prevent absorption of spillages and stockpile topsoil for site rehabilitation as contained in this report.

To minimize soil erosion and soil quality degradation, construction personnel shall adhere to the recommended erosion and sedimentation control practices as contained in this report. Construction crew shall be properly trained in handling and disposal of solid and liquid wastes to avoid accidental spills.

In selecting the location for workshops and batching plant areas with thick and dense vegetation will be avoided as far as possible. A tree plantation plan should be prepared for compensation of lost trees and beautification of the landscape around the Project.

7-2-4 Surface Water

During site clearing and civil works, soil surfaces would be exposed and an elevated level of suspended particles would be present in the surface runoff. Sediment laden runoff may carry pollutants (adsorbed onto the particle surfaces) into the storm water drainage system. Other potential source of

contamination includes release of cement materials with rain wash, wash water from dust suppression sprays, fuel (diesel and gasoline) and lubricants from construction equipment maintenance.

Measures should be taken to ensure that excavated materials are stacked properly to reduce turbidity effect on surface runoffs and cleared materials should be stacked properly to reduce turbidity effect on surface runoffs.

Fueling and maintenance of vehicles shall be conducted in a concrete paved and bunded area in order to contain any spills that may occur, and shall not be conducted within 30m of any water resources. All potential sources of leaks from operation and maintenance activities and equipment shall be blocked through regular maintenance and inspection. Adequate maintenance of drainage systems shall be carried out to prevent any overflow.

In operation phase, wastewater from PV modules' washing and domestic waste water will be routed to a wastewater treatment plant. Waste water shall be treated and its properties shall be monitored to ensure that it meets the NEPA set standard before discharge. Hazardous materials spill contingency plan shall be developed prior to start-up. Sanitary waste treatment facilities shall also be provided prior to project's commissioning, while sewage shall be collected for off-site disposal through government approved and licensed third party waste management contractor.

7-2-5 Groundwater

During pre-construction and construction activities oils, lubricant, and diesel fuel can seep into the ground, posing a real source of groundwater contamination. The handling, storage and disposal of materials and wastes during construction shall be done in an environmentally safe manner with bunded wall and concrete floor as well as other measures recommended in the ESMP. Hazardous material storage areas shall be built with impervious materials.

Reduce groundwater usage by recycling wastewater from the periodic cleaning of PV modules for landscaping of the site. Training on safe practices for personnel involved in handling, storage and disposal of materials and wastes shall also be provided.

When the wastewater from the PV modules is injected into the ground, it reduces the quality of water, so it is not suitable for drinking and the management of groundwater during construction and operation is essential.

To manage groundwater, the following measure should consider:

Control the quality of groundwater to be used for drinking water on the bases of standards for drinking water. Safe and sustainable discharges are to be ascertained prior to selection of pumps.

Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination

All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned;

Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor and report on the water quality and water levels.

7-2-6 Ecology

Construction work will be limited to daily hours. Movement of construction equipment and workers shall be restricted to the construction site. In addition, Hunting, killing or collecting animals from an unauthorized area is completely prohibited. Construction work must be carried out in a limited area of the project in order to prevent disturbances in natural habitats. It also reduces the anti-reflective coating or glass to reduce the reflected sunlight and increase its absorption.

Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human- living. As such damage to flora has wide range of adverse environmental impacts.

- The following mitigation measures are required for the management and conservation of plants and animals in the region:
- Reduce disturbance to surrounding vegetation
- Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation

- Clear only the vegetation that needs to be cleared in accordance with the plans
- Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction
- Supply appropriate fuel in the work caps to prevent fuel wood collection
- Not be permitted to destruct active nests or eggs of migratory birds
- Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds and
- Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

7-3 Measures to reduce the adverse socio-economic effects

7-3-1 Cultural resources

In the event that archaeological resources identified, the relevant legislation will be implemented.

7-3-2 Population Demography

Identifiable negative impacts relate to increase in population of non-residents in the event that youths and local people are not recruited into the labour force during construction. However, it is proposed that contractor should recruit among all of Afghanistan, at all phases of development of the project and throughout its lifetime. In addition, there is also the likelihood of gender imbalance.

Local engineers and technicians will benefit from this project, as training programs will be implemented to teach them how to properly manage the solar field.

This project creates an opportunity to ensure the policy and implementation of the project in accordance with international labor standards and standards. The contract must meet the following requirements for hired workers:

- The legal provisions regarding the minimum age for child labor are met, and international standards do not apply to people under the age of 16 years and do not allow dangerous activities to persons under the age of 18 years. Contractors must employ people aged below 18 years for permanent employment, as well as a short-term training plan for young people as much as possible
- Compliance with national minimum wage and labor laws and regulations;
- Ensuring that no worker will pay for the job;
- Ensure that there is a strict standard for occupational safety and health at the site (see below); and
- Creating a complaints mechanism for the workforce and documenting their complaints about unfair treatment and unsafe working conditions without compensation.

7-3-4 Prevention of Social Conflicts and Environmental Degradation

The influx of a large construction force may easily lead to social conflicts with the local population. Workers also might misbehave or get involved in illegal practices, e.g. poaching or hunting. In order to contribute to a harmonious relationship with local communities, to reduce behaviors that could lead to social conflict, and to prevent further environmental degradation a Code of Conduct should be developed for the labor force. To avoid illegal practices of workers, use the following principles:

- 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 consumption of alcohol and drugs;
- Safe driving practices; and
- Respect for the local community and its cultural norms in which laborers are working.

7-3-5 Sociocultural

It needs to inform construction workers to sensitive norms and values in order to prevent cultural conflicts. To prevent delays in project implementation, youth and community organizations should be fully informed of the project before starting work. Proper counseling is provided with relevant authorities and social groups, especially the Social Relations Committee. During the lifetime of the project, periodic advisory meetings should be organized to address issues and challenges that may occur.

Environmental and Social Management Plan

8-1 General

The Environmental and Social Management plan (ESMP) is the most important part of the Environmental and Social Impact Assessment (ESIA) Assessment and describes a series of regulatory activities to mitigate the negative environmental and social impacts and increase the beneficial effects of the project.

8-2 Object of ESMP

The basic objective of the ESMP is to manage adverse impacts of project interventions in a way which minimizes the adverse impact on the environment of the Project area. The specific objectives of the ESMP are to:

- Monitor the project proponent's compliance with all the mitigation measures and commitments in the ESIA report;
- Monitor the project proponent's compliance with legal standards and limits for waste discharge and emissions;
- Provide early warning signals on potential environmental changes, so that appropriate actions can be taken to prevent or minimize environmental and social impacts;
- Encourage and achieve the highest environmental and socio-economic performance and response from individual employees and contractors throughout the duration of the project; and
- Routinely check all measures/devices put in place for effective monitoring of project functions and activities.

Table 15. Environmental and Social Management Plan (ESMP).

Issue/Impact	Mitigation Measures	Monitoring	Responsibility		Timing
			Execution	Monitoring	
Air Quality					
Dust and undesirable gases emissions caused by construction vehicular, construction machinery, and activities.	<ul style="list-style-type: none"> ▪ Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. ▪ Operate the vehicles in a fuel-efficient manner. ▪ Cover haul vehicles carrying dusty materials moving outside the construction site. ▪ Impose speed limits on all vehicle movement at the worksite to reduce dust emissions. ▪ Control the movement of construction traffic. ▪ Water construction materials prior to loading and transport. ▪ Service all vehicles regularly to minimize emissions. 	<ul style="list-style-type: none"> ▪ Monthly monitoring for NO₂, SO₂, CO, and PM Daily observation of dust generation ▪ Log of respiratory tract infection among workers Incident reporting system Complaints register 	All contractors on site	NEPA	Pre-construction Phase

- Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition.
- Focus special attention on containing the emissions from generators.
- Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites.

Noise

Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting public and wildlife.

- Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures
 - Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc.
 - Appropriately site all noise generating activities to avoid noise pollution to local residents
 - Use the quietest available plant and equipment.
 - Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines).
- Quarterly monitoring of noise pressure level in dB(A) near noise sources
 - Continuous monitoring is required to ensure contractor complies with ESMP

Contractor

NEPA

Pre-construction Phase

- Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures.
- Install acoustic enclosures around generators to reduce noise levels.
- Fit high efficiency mufflers to appropriate construction equipment.

Water Quality

<ul style="list-style-type: none"> ▪ Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage ▪ Soil erosion and dust from the material stockpiles 	<ul style="list-style-type: none"> ▪ Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. ▪ Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials. ▪ Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site. 	<ul style="list-style-type: none"> ▪ Monthly monitoring pH, BOD, TSS, TDS, Turbidity, metals, microbiology, oil & grease, nitrate, conductivity & total nitrogen ▪ Implementation of good management practices 	Contractor	NEPA	Pre-construction Phase
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will increase the sediment and contaminant loading of surface water bodies.

- Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot.
- Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bounded areas on site.
- Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels.
- Each construction vehicle to ensure the local roads are kept clean.

Ecology

All Construction activities will damage a wide range of flora and it has adverse

- Reduce disturbance to surrounding vegetation.
- Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation.
- Get approval from NEPA for clearance of vegetation.

Good site management practices Monitor loss of vegetation during site preparation

All contractors

NEPA

Pre-construction Phase

environmental impacts.

- Make selective and careful pruning of trees where possible to reduce need of tree removal.
- Control noxious weeds by disposing of at designated dumpsite or burn on site.
- Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc.
- Restrict the tree removal to the minimum required.
- Retain tree hollows on site, or relocate hollows, where appropriate.
- Leave dead trees where possible as habitat for fauna.

Soil Impact

Erosion, contamination from hazardous waste disposal, oil spillage of chemicals.

- Development of effective site drainage systems,
- Restriction of access only to site areas.
- Disposal of waste materials at appropriately licensed/approved sites,
- Soil & groundwater sampling where contamination is suspected
- Monthly site inspections

All contractors

NEPA

Pre-construction Phase

- Management of excavations to avoid the generation of drainage pathways to underlying aquifers
- Provision of bunded areas for storage of hazardous materials (e.g. fuel) and equipment maintenance to prevent absorption of spillages
- Hazardous wastes must be disposed of by a licensed contractor
- Stockpile topsoil for site rehabilitation.
- Records of compliance with site management plans and mitigation measures

Traffic and Transport

Increased traffic, heavy equipment and machinery transport	<ul style="list-style-type: none"> ▪ Schedule of traffic to avoid peak hours on major local roads. ▪ Implement traffic management plan optimize/schedule material movement to non peak hours 	Continuous monitoring to ensure compliance with traffic on management plan	Contractor	NEPA	Pre-construction Phase
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Public Health & Safety

<ul style="list-style-type: none"> ▪ Increased prevalence of sexually transmitted diseases including HIV/AIDS, 	<ul style="list-style-type: none"> ▪ Public health awareness ▪ Traffic control and speed limits ▪ Specifications for noise level for heavy equipment ▪ Use of personal protective equipment for workers 	<ul style="list-style-type: none"> ▪ Health records ▪ Noise complaint register ▪ Periodic inspection of noise monitoring log 	Contractor	NEPA	Pre-construction Phase
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- | | | |
|--|---|---|
| <ul style="list-style-type: none"> ▪ Road accidents, ▪ Increase noise level by equipment ▪ Slips and falls, ▪ Fires. | <ul style="list-style-type: none"> ▪ Provision of adequate fire-fighting equipment onsite Emergency response/evacuation plan Implementation of HSE procedures as a condition of contract implementation of a Fire Safety Plan prior to starting activities at the site ▪ Clear marking of worksite and hazard recognition ▪ Maintenance of a high standard of housekeeping at all times. | <ul style="list-style-type: none"> ▪ Regular inspection, review and recording of HSE performance |
|--|---|---|

Hazardous and Solid Waste Management

- | | | | | |
|--|--|--|--------------------|-------------------------------|
| <ul style="list-style-type: none"> ▪ Site contamination from leakage. ▪ Soil and ground water contamination from spill of hazardous waste. | <ul style="list-style-type: none"> ▪ Designated waste storage areas for solid wastes ▪ Waste disposal trucks must be adequately covered to minimize windblown litter ▪ Storage areas for hazardous materials must be sealed and banded ▪ Regular collection and proper disposal of solid waste at a licensed disposal site ▪ Provision of spill kits for on-site management of accidental spills and leaks of contaminants. | <ul style="list-style-type: none"> ▪ Monitoring the Contractor implementation of waste and management plans. ▪ Record quantities of wastes generated, recycled and disposed. | <p>HSE Manager</p> | <p>Pre-construction Phase</p> |
|--|--|--|--------------------|-------------------------------|

Air Quality

Dust and air emissions caused by vehicular movement and delivery of construction materials such as sand and excavation

- Wetting of roads via a water sprinkler tanker
- Compacting roads where necessary and repair of damaged roads once construction is completed
- Restricting onsite vehicle speed limits to <20 km/h
- Use of well maintained vehicles and equipment

- Monthly monitoring for NO₂, SO₂, CO, and PM
- Daily observation of dust generation
- Log of respiratory tract infection among workers
- Incident reporting system
- Complaints register

Contractor

NEPA

Construction Phase

Noise

Use of heavy construction equipment and vehicles

- Enforcement of vehicle speed
- Strict controls of vehicle routing
- Vehicles/equipment to be fitted with silencers

- Quarterly monitoring of noise pressure level in dB(A) near noise sources
- Continuous monitoring is required to ensure contractor complies with ESMP

Contractor

NEPA

Construction Phase

Water Quality

Water quality impact from surface run-off
Accidental spill of lubricant, chemicals or oil
Sewage discharge from construction camp
Sediment contamination

- Design site drainage to reduce flow velocity and sediment load;
 - Proper site management to minimize surface water run-off, soil erosion and the impacts of sewage effluents;
 - Temporary channels to facilitate run-off discharge into via suitable retention pond;
 - Temporary water/toilet facilities will be provided.
- Monthly monitoring pH, BOD, TSS, TDS, Turbidity, metals, microbiology, oil & grease, nitrate, conductivity & total nitrogen
 - Implementation of good management practices

Contractor

NEPA

Construction Phase

Ecology

Vegetation loss during clearing and site excavation and wildlife habitat disturbance

- Good site management practices will be observed to ensure that disturbance of habitats off-site are minimized.
 - Restricting personnel and vehicles to site boundaries laydown areas, and access roads.
 - Minimize vegetation clearance during site preparation
- Good site management practices
 - Monitor loss of vegetation during site preparation.

Construction Phase

- Re-vegetation of native species in open spaces post-construction.
- Prevention of animal hunting by construction workers.
- Bird-friendly tower designs to minimize electrocution.

Soil Impact

Erosion, contamination from hazardous waste disposal, oil spillage of chemicals Change in topography

- Development of effective site drainage systems
- Restriction of access only to site areas.
- Disposal of waste materials at appropriately licensed/approved sites
- Management of excavations to avoid the generation of drainage pathways to underlying aquifers
- Provision of bunded areas for storage of hazardous materials (e.g. fuel) and equipment maintenance to prevent absorption of spillages
- Hazardous wastes must be disposed of by a licensed contractor
- Stockpile topsoil for site rehabilitation

- Soil & groundwater sampling where contamination is suspected
- Monthly site inspections
- Records of compliance with site management plans and mitigation measures

Contractor

NEPA

Construction Phase

Traffic and Transport						
Increased traffic, heavy equipment and machinery transport	<ul style="list-style-type: none"> ▪ Schedule of traffic to avoid peak hours on major local roads ▪ Implement traffic management plan ▪ Optimize/schedule material movement to non-peak hours 	Continuous monitoring to ensure compliance with traffic management plan	Contractor	NEPA	Construction Phase	
Public Health & Safety						
Increased prevalence of sexually transmitted diseases including HIV/AIDS, Road accidents, Increase noise level by equipment Slips, trips and falls, Fires	<ul style="list-style-type: none"> ▪ Public health awareness ▪ Traffic control and speed limits ▪ Specifications for noise level for heavy equipment ▪ Curfew on operation of heavy equipment and vehicles ▪ Use of personal protective equipment for workers ▪ Provision of adequate fire-fighting equipment onsite ▪ Emergency response/evacuation plan ▪ Implementation of HSE procedures as a condition of contract 	Regular inspection, review and recording of HSE performance	Contractor	NEPA	Construction Phase	

- Implementation of a Fire Safety Plan prior to starting activities at the site
- Clear marking of worksite and hazard recognition
- Maintenance of a high standard of housekeeping at all times

Hazardous and Solid Waste Management

Site contamination from litter Soil and ground water contamination from spill of hazardous waste

- Designated waste storage areas for solid wastes
- Waste disposal trucks must be adequately covered to minimize windblown litter
- Storage areas for hazardous materials must be sealed and banded
- Regular collection and proper disposal of solid waste at a licensed disposal site
- Provision of spill kits for on-site management of accidental spills and leaks of contaminants

- Monitoring the implementation of waste management plans
- Record quantities of wastes generated, recycled and disposed

Contractor

NEPA

Construction Phase

Water Quality

Discharge of PV module wash- water, domestic wastewater, sewage.

- Treatment of wash water before discharge
- Off-site disposal of sewage by appropriate waste collection and disposal authority

Physical and chemical parameters

Contractor

NEPA

Operation Phase

- Regular maintenance of site drainage system to ensure efficient operation
- All discharges will comply with national and World Bank guidelines
- Groundwater study will be required to assist NSCP in taking informed decision on controlled abstraction limit on the amount of water that can be extracted per time.
- Water conservation measures through recycling and reuse

Ecology					
Habitats disturbance as a result of noise, vehicle and personnel movement, Bird mortality along the Transmission line	Restrict personnel and vehicle movements to site boundaries only	Annual inspections of wildlife, native habitats and agricultural crops in surrounding areas	Contractor	NEPA	Operation Phase
Visual Impact					
Visual image of solar plant from surrounding areas	The visual effect of the solar plant will be improved through creation and maintenance of landscaped boundary around the plant	No monitoring is envisaged	Contractor	NEPA	Operation Phase

Soil and Hydrology					
Spillage of oils, chemicals or fuels on site	<ul style="list-style-type: none"> ▪ Regular checks of bunds and drainage systems to ensure containment and efficient operation ▪ Develop an oil spill contingency plan 	Continuously monitoring and good site management practices	Contractor	NEPA	Operation Phase
Hazardous and Solid Waste Management					
Solid Waste	<ul style="list-style-type: none"> ▪ Good disposal practice 	<ul style="list-style-type: none"> ▪ Records of final disposal of waste ▪ Log of waste generated 	Contractor	NEPA	Operation Phase
Public Health & Safety					
<ul style="list-style-type: none"> ▪ Traffic & Accidents ▪ Contamination of water bodies ▪ Crime 	<ul style="list-style-type: none"> ▪ Proper traffic control ▪ Standard operating procedures to keep waste parameters within permissible limit ▪ Police patrol and organized community vigilante 	<ul style="list-style-type: none"> ▪ Health records ▪ Period checks for compliance to health and safety procedures ▪ Crime rate records 	Contractor	NEPA	Operation Phase

Occupational Health and Safety

<ul style="list-style-type: none">▪ Standard International HSE Practice shall be employed on site▪ Use of protective equipment▪ Clear marking of work site hazards and training in recognition of hazard symbols▪ Development of site emergency response plans	<ul style="list-style-type: none">▪ Regular on-site HSE training, fire drill etc▪ Regular staff checks, system checks and field tests of emergency procedures by on-site management	Contractor	NEPA	Operation Phase
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8-3 Cost Estimated

The ESMP will be implemented in line with the finalized overall project schedule, as all activities are integrated into the project design. The total cost of implementing the ESMP is estimated at US\$ **100,000.00** (Table 16).

Table 16. Summary of Implementation Cost of the ESMP.

Phase of Implementation	Estimated Cost (US\$)
Monitoring & Evaluation, Environmental Management	30,000.00
Training and Capacity building	15,000.00
Monitoring & Evaluation workers health/safety/wellbeing	45,000.00
Information and Communication Strategy	10,000.00
Total	100,000.00

8-4 Monitoring Plan (MP)

The compliance monitoring of the project activities is principally a tool to ensure that the environmental and social control measures identified during the ESIA are strictly adhered to during the project execution. Various aspects of the ESIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors or any other persons associated with the project
- Verify that the activities are undertaken in compliance with the ESIA and ESMP
- Maintain a record of all incidents of environmental and social significance and related actions and corrective measures
- Maintain contact with the communities, solicit their views and concerns, and discuss them during the fortnightly meetings and
- Prepare periodic reports of the environmental and social performance of project.

The mitigation plan that has been discussed will be used as a management and monitoring tool for compliance monitoring. Inspections will be carried out using checklists prepared by the contractor.

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 physical, biological, as well as socioeconomic 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, effects monitoring will be undertaken during the Project activities, with the overall objective of proper management of environmental and social risks and uncertainties. Broadly, effects monitoring has the following objectives:

- To immediately warn the Project proponents (and the regulatory agencies, if required) 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;
- The effects monitoring plan is provided in Table 17 below. The detailed 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 are including soil erosion, landslide, water quality, oil spills, waste, air quality, noise, socioeconomic aspects, and Grievance monitoring.

Table 17. Monitoring Plan (MP).

Monitoring Location	Frequency	Responsibility	Methodology	Documentation
Soil				
Construction sites, labor campsites, borrow areas, disposal sites.	During routine monitoring.	NEPA/ ESMU	Visual observation, digital camera	Record of visual observation and photographs
Construction sites Borrow areas, disposal sites	Monthly	NEPA/ ESMU	Numbered, glass strips positioned strategically across key areas Visual observations, digital camera	Record of visual observation and photographs
Water Quality				
<ul style="list-style-type: none"> • At wells and surface water bodies and labor campsite. • Selected local wells • Selected locations at nearby surface water bodies. 	Monthly	NEPA/ ESMU	Sampling bottles	Record of sampling and analysis

Damage to Groundwater wells, watercourse						
Construction site	During monitoring.	routine	NEPA/ ESMU	Visual observations, digital camera	Record of visual observation and photographs	
Oil Spill						
Construction workshops and storage areas	During monitoring	routine	NEPA/ ESMU	Visual observations, digital camera	Record of visual observation and photographs	
Solid Waste						
Construction site, labor campsite labor	During monitoring	routine	NEPA/ ESMU	Visual observations, digital camera	Record of visual observation and photographs	
Waste Water						
Labor campsite	During monitoring	routine	NEPA/ ESMU	Sampling bottles	Record of sampling and analysis	
Air Quality						
Construction site, labor campsite	Before mobilization		NEPA/ ESMU	Ambient air quality monitoring equipment	Record of sampling and analysis	
Construction site, labor campsite	Once every two months					

Exhaust Emissions				
Construction sites, camp site	During routine monitoring	NEPA/ ESMU	Visual observations, digital camera	Record of visual observations and photographs
Dust Emissions				
Construction sites, labor camp site, project roads	During routine monitoring	NEPA/ ESMU	Visual observations, digital camera	Record of visual observations and photographs
Noise				
Nearby communities	Fortnightly or during construction activities causing noise	NEPA/ ESMU	Noise meter	Complete record of noise measurement and location.
Public Grievance				
Nearby communities	Throughout construction work	NEPA/ ESMU	Complaints register	Complete record of any complaints

Annex:
Public Consultant Meeting

۵. نام مصاحبه شونده یا مصاحبه شوندگان به همراه وظیفه در ارگان یا سازمان مربوطه

ساعت شروع جلسه:

ساعت ختم جلسه:

محل برگزاری جلسه:

تاریخ:

لیست اشتراک کننده گان

شماره	نام	وظیفه	ارگان / سازمان	نمبر تېلفون	امضاء
1	حاجي شاکر خان	میس ولس شورا د امان	د امان	۰۷۰۰۳۵۲۴۳۰	
2	حاجي محبوب	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۰۸۶۹۸	MNB A Gami
3	نناج حکم	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۵۲۴۳۰	
4	عطا جان	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۶۷۲۵۱۸	
5	حاجي التور در	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۸۵۵۹۳۹	
6	عليه سليم	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۰۱۸۱۰	
7	بيير اهر	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۰۶۷۶۶	
8	عبد الولي	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۸۶۵۲۴۳۲	
9	حاجي ضوراجي	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۰۴۴۱۷	
10	عبدالرضي	عضو شورا ولسوالي د امان	د امان	۰۷۰۰۳۶۱۹۴۴۵	

امین

مکبر

عرض سورا دامان

کا امیر



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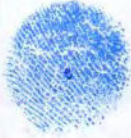
حاجی عبدالباقی

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حاجی ہمایون خان

دامان ولسوالی، دکلیوالو چارو مدینہ
د قاضی کاریز کلی، ملک ہمایون
۰۷۰۰۳۳۹۳۴۲



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فقیر محمد

دامان ولسوالی، دکلیوالو چارو مدینہ
د حاجی انی کلی، ملک حاجی عبدالواحد
۰۷۰۰۳۳۸۹۲۲



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حاجی عبدالواحد

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حاجی محمد گل محمدی



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سرپرست کے ولسوال دامان

میر ولس



۱۷۰۳۵۱۵۱۹

محمد نواز ولسوال دامان

عبدالودود