Initial Environmental Examination

October 2017

AFG: Energy Supply Improvement Investment Program

Prepared by the project preparatory consultant, on behalf of Da Afghanistan Breshna Sherkat of the Government of Afghanistan, for the Asian Development Bank.

AFG: Energy Supply Improvement Investment Program (Tranche 4)

Arghandeh-Jalalabad 220 kV Double Circuit Transmission Line Project

Draft Initial Environmental Examination (IEE)

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1. Executive Summary

1. Currently 20 out of 34 provinces in Afghanistan are not connected to the power grid supply which increases cost of doing business, deteriorates environment, and subdues sustainable development indicators. This in turn constrains growth opportunities in the east; creates disparities in the country's economic development; and fuels ethnic and regional tensions, insecurity, and discontent. The proposed tranche 4 will extend the national grid into eastern provinces with a population of nearly 2 million, and will allow evacuation of indigenous generation as well as extension of TUTAP power interconnection towards Pakistan. The tranche 4 will construct a 151 kilometer 220-kilovolt (kV) transmission line between capital city Kabul (Arghandeh Substation) and Nangarhar provincial capital Jalalabad.
2. This project is assessed to be a Category B project according to the ADB SPS (2009), for which an Initial Environmental Examination (IEE) is required. The IEE and Environmental Management Plan (EMP) were prepared following the ADB SPS (2009). The purpose of this IEE is to assess environmental impacts of this transmission line project, including environmental legal framework, environmental baseline, project alternatives, its potential impacts and mitigation measures, the institutional requirements and environmental monitoring for the project.
3. The line routing was determined considering technical and economic aspects as well as environmental and social aspects. The detailed design of the line and project other components, including final land survey is shifted to the turnkey contractor and will be part of the tender documents. In the initial phase of the project preparation, the focus was on line routing that is feasible from technical point, avoids significant adverse and strengthen positive environmental and social impacts of the project, specifically:
    - Technically feasible route and avoid crossing other high voltage lines in the area to possible extent;
    - Avoid ecologically sensitive zones as well as cultural and historical areas;
    - To high extent possible avoid the need of resettlement actions;
    - Consideration of security and accessibility on the line route;
    - Less interference with other power and radio infrastructure;
4. However, not all impacts in the line routing can be avoided such is:
    - The line passes Kabul River, Logar River, Kogdara River, Gandamak and Hasham Kale River.
    - Line will pose visual effects to some extent on topography of the area.
    - Some land acquisition and resettlement activities are required in Kabul and Nangarhar areas.
    - Crossover of the current 220kV line from already in place Arghandeh Logar 220kV lines at Gulbagh area of Kabul province.
5. This 220 kV transmission line traverses mountainous terrain, hill sides, semi-desert area, cultivated land, some houses, and settlements. The Arghandeh substation is under construction by Siemens and a new substation will be constructed in Jalalabad, Shaikh Mesri

area. The transmission line ecological impacts are expected to be mostly low if the mitigation measures are properly followed. The socio-economic impacts will be precisely evaluated depending on the detailed line routing and land acquisition measures.

6. Soils in the project area primarily consist of sediments eroded from the mountains and comprise alternating layers of gravels, silts, sands and clays. Nearby to the mountains, the sediments are subjugated by coarse deposits such as gravels and pebbles, deposited by the runoff water from the mountains. Further away from the mountains, the deposits are expected to become increasingly dominated by finer sediments such as fine sands/silts. The dominant rocks along the route are sedimentary and volcanic rocks.

7. Two main sources of seismicity (Chaman and Konar faults) are present in project area (Jalalabad and Kabul) which might contribute to appreciable seismic hazard for Kabul. Estimates show that Kabul, have a 2-percent chance in 50 years of exceeding a peak ground acceleration of 50 percent g (g is the acceleration of gravity 9.8 (m/s^2) and a 10-percent chance in 50 years of exceeding a peak ground acceleration of 27 percent g. Furthermore, the line route has rock falling potential areas as well as floodways. Therefore, tower construction in the potential rock fall areas should be avoided and rock fall protection measures need to be considered in the detail design in case the route cannot be diverted.

8. Due to the sparse vegetation and degraded habitat, not many wild animals inhabit the project area. Only fox and jackals are the mostly seen wild animal in the project area while wolves are rarely seen along the line path. Birds, mammals, amphibians, and insects are the main animal groups there. It is less likely that any endangered wildlife species live in the line corridor.

9. The total population of the Kabul province is 4,679,648 and Nangarhar province is 1,573,973. 86% of Nangarhar population is living in rural areas while the remaining are living in the urban areas mainly Jalalabad city. The most populated districts of the Nangarhar province are Jalalabad, Behsood, Khogiani, Acheen and Surkhrod.

10. Industries in Jalalabad has suffered heavily due to lack of electricity. Jalalabad's power infrastructure is hindered firmly in the 20th century. The main source of its electricity is the Soviet-era Daronta Dam and hydroelectric plant built in 1964. Old equipment and years of neglect have left its intake filters clogged and its power station functioning at about half capacity. Money industries have been closed because of electricity shortages in the region. Recently a 110 kV transmission line has extended from Naghlu hydropower plant (HPP) to Jalalabad city with very limited capacity compared to the region demand.

11. The transmission line route land is a greenfield site. The project passes mostly through rangeland and mountainous terrain. There is no major city or town located along the route and the corridor is owned mostly by the government. The transmission line corridor comprises plain lands at either ends (65 KM) within and adjacent to the municipal limits of Kabul and Jalalabad cities and mountainous terrain in the middle (86 KM). Although project corridor is owned by the Government, it is anticipated that some families might settle on the government land during course of implementation to receive compensations.

12. The precise location of transmission towers will be determined at the detailed design stage by the contractor to be procured in 2018. It is relevant to note that the location of 220-kV towers can safely be adjusted by 10 - 15 meters to minimize the resettlement impact as the average distance between two transmission towers ranges from 200-225 meters.

13. DABS has proposed 500x500 m area at Shaikh Mesri of Surkhrod district for the construction of the proposed new substation for this project. This land is the property of Afghan government allocated for the Farm-e-Hada Canal of Jalalabad. Hada Farm is one of the main olive producer in the Jalalabad city. The water supply to this farm is provided though water canal initiated from Daronta dam. Based on the Jalalabad DABS director Mr. Omaid Sabah, currently they are in the process to officially allocate the land for the substation. And the delegation committee of the different ministries and stakeholders such as agriculture, DABS and urban development has decided in the favor of substation construction in the area. The land clearance is currently under process at Ministry of Agriculture to officially allocate this land for the substation. Therefore, it is important to ensure the land acquisition process is fully resolved before starting the construction.
14. The Land Acquisition and Resettlement Plan (LARP) document which is part of the tender package can provide further socio-economic information about the project affected people and properties.
15. Anticipated impacts and mitigation measures have been discussed considering following four key phases of the project:
    - Design Phase
    - Construction Phase
    - Operation Phase
    - Decommissioning Phase
16. This IEE reveals that there will be both positive and negative impacts due to the construction activities and normal operations after the proposed construction. Mitigation measures have been discussed to mitigate the expected negative impacts. The major positive impact of the project will be economic development and access to energy. The industry will grow and will create short and long term job opportunities for people.
17. The study results suggest that the project will overall have low environmental impacts if the proposed mitigation measures and EMP are implemented properly. The transmission line work impacts such as site characterization, line path survey and monitoring are generally temporary and of relatively lesser magnitude. The possible impacts includes ground clearing (removal of vegetative cover), vehicular and pedestrian traffic, borings for geotechnical surveys, fugitive dust, acoustic noise, visual and drilling to characterize subsurface conditions (e.g., soils, depth to groundwater). In some places the excavation or access road construction is necessary at this stage, impacts to resources would be similar in character, but lesser in magnitude, to those for the construction phase. The mitigation measures mentioned in the report will help reduce and avoid these negative impacts.
18. Impacts to ecological resources (wildlife, vegetation, aquatic biota, special status species, and their habitats) will be minimal and localized in all phases of the project because the line doesn't pass through ecological environmentally sensitive areas. The introduction or spread of some nonnative invasive vegetation could occur as a result of vehicular traffic, but this would be relatively limited in extent. It is worth mentioning that above-ground power lines pose three main risks to birds: risk of electrocution; risk of collision and risks and loss of habitat quality in staging and wintering areas. But as this transmission line doesn't not pass through a protected area or on the bird's migration path this impacts on bird safety is considered as low. But for the safety of air traffic and for the minimization of fatal bird collision on power lines, the

mentioned mitigation measures must be applied to possible extent.

19. Careful line routing during the final design will help to minimize resettlement needs. Involuntary displacement and relocation shall be mitigated to an absolute minimum. If the priority to avoid involuntary displacement is respected by the construction contractor and bypasses are carefully designed, involuntary displacement is likely to be totally avoided.
20. As the line route passes through areas which might contain Buddhism sculptures such as the Sherzad district with various artifacts which include Buddhist icons, coins, jewelry and dishes. The accumulation of sediment mentioned above could serve to protect some buried resources by increasing the amount of protective cover. It is therefore recommended that the mentioned mitigation measures should be followed in order to avoid adverse impacts to these resources.
21. The Environmental Management Plan (EMP) covers all the potential impacts and mitigation measure during design, construction, operation and decommissioning phases of the project. The turnkey contractor will have the responsibility to implement the EMP during the design and construction phase. DABS-PMO will supervise the EMP implementation and compiling reports on environmental performance, as well as in conducting trainings. Environmental monitoring and implementation during the operation phase is the responsibility of DABS.
22. Environmental and social management training of DABS officials at various phases of the project cycle is required to enable them to carryout environmental and social/resettlement monitoring and implementation of environmental management plan. A fitting grievance mechanism discussed in this IEE should be implemented. The grievance mechanism is designed to avoid lengthy court procedures, and provide accessible platform to Affected Person (AP) to raise their concerns.
23. After analysis of all environmental and social aspects of the project it can be concluded that the project will not have adverse environmental impacts in case all the mitigation measures mentioned in this IEE have taken into the consideration.

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ABBREVIATIONS AND ACRONYMS

°C	Degree Celsius
ADB	Asian Development Bank
AFG	Afghanistan
Afs	Afghani
ANDS	Afghanistan National Development Strategy
ANSA	Afghanistan National Standards Authority (ANSA)
AP	Affected Person
APA	American Psychological Association
ARAZI	Afghanistan Independent Land Authority
BPHS	Basic Package of Health Services
BSk	Cold Semi-arid Climate
CBs	Circuit breakers
COI	Corridor of Influence
CSO	Central Statistics Office
CTs	Current transformers
CVTs	Capacitor voltage transformers
DABM	Da Afghanistan Breshna Moassassa
DABS	Da Afghanistan Breshna Sherkat/National Power Utility
DBO	Design, Build and Operate
DC	During Construction
DEWATS	Decentralized Wastewater Treatment System
EA	Environmental Assessment
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
EMP	Environmental Management Plan
ERP	Emergency Response Plan
ES	Environmental Specialist
FDT	Field Density Test
GoA	Government of Afghanistan
GRM	Grievance Redress Mechanism
GW	Giga-watts
Ha	Hectares
HPP	Hydro Power Plant

IA	Implementing Agency
IBA	Important Bird and Biodiversity Area
IBAT	Integrated Biodiversity Assessment Tool
ICIMOD	International Centre for Integrated Mountain Development
IDPs	Internally Displaced Peoples
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
IUCN	International Union for the Conservation of Nature
KM	Kilometers
kV	Kilovolt
LARP	Land Acquisition and Resettlement Plan
LARPF	Land Acquisition and Resettlement Policy Framework
LPG	Liquefied Petroleum Gas
MDG	Millennium Development Goal
MEW	Ministry of Energy and Water
MFF	Multi-Tranche Financing Facility
MFF	Multi-tranche Financing Facility
MM	Millimeter
MoIC	Ministry of Information and Culture
MoPH	Ministry of Public Health
MoPW	Ministry of Public Works
MRRD	Ministry of Rural Rehabilitation and Development
MSDS	Material Safety Data Sheet
MSK	Medvedev Sponheuer Karnik
MVA	Megavolts Ampere
MW	Megawatts
MWh	Megawatts Hour
NEPA	National Environment Protection Agency
NGO	Non-Governmental Organization
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance
OHL	Overhead Line
OSHA	Occupational Safety and Health Administration
PCB	Poly-Chlorinated Biphenyls
PCR	Physical Cultural Resources

PIC	Project Implementation Consultant
PM	Particulate Matters
PMO	Project Management Office
PMU	Project Management Unit
PO	Project Owner
POPs	Persistent Organic Pollutants
PPE	Personal Protection Equipment
PPM	Parts Per Million
ROW	Right of Way
SEA	Strategic Environmental Assessment
SIGAR	Special Inspector General for Afghanistan Reconstruction
SPS	Safeguard Policy Statement
SS	Substation
SWMP	Storm Water Management Plan
TL	Transmission Line
TOR	Terms of Reference
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
VTs	Voltage transformers
WWF	World Wide Fund for Nature

2. Introduction

2.1 Project Background

24. The Project will finance Tranche 4 of the MFF-0090: Energy Supply Improvement Investment Program (Energy MFF-2) in Afghanistan. The tranche will finance construction and commissioning of a 220 kV transmission line (151 KM) between capital city Kabul and Nangarhar provincial capital Jalalabad. The transmission line will be connected to the 220/20-kV Arghandeh substation (under construction in Kabul province under ADB assisted G-0184) at its western end, with a new 220/110/20-kV sub-station in Jalalabad city (Nangarhar province) in eastern Afghanistan, which will be constructed as part of this project at Shaikh Mesri of Jalalabad. An additional transformer of 200 MVA (Megavolt Amperes) will be procured and installed at this substation.

25. The transmission line route passes through a greenfield site along the sealed road connecting Arghandeh in west Kabul to Jalalabad. There are no major cities or towns located along the route and the corridor is owned 100% by the government. The transmission lines corridor comprises plain lands at either ends (65 KM) within and adjacent to the municipal limits of Kabul and Jalalabad cities and mountainous terrain in the middle (86 KM).

26. The precise location of transmission towers will be ascertained at the detailed design stage by the turnkey contractor to be procured in 2018. Although project corridor is owned by the Government, it is anticipated that some families might settle on the government land during course of implementation to receive compensations. It is pertinent to note that the location of 220-kV towers can safely be adjusted by 10 - 15 meters to minimize environmental impact as the average distance between two transmission towers ranges from 200-225 meters. The project preparatory consultants will verify the types and magnitude of impacts and prepare the required initial environment examination report, in consultation with affected people (ADB, 2017).

27. The Project Executing Agency (EA) and Employer is Da Afghanistan Breshna Sherkat (“DABS”), Kabul. This is assessed to be a Category B Project according to the ADB SPS, for which an Initial Environmental Examination (IEE) is required. The IEE and Environmental Management Plan (EMP) has prepared following the recommendation of the ADB Safeguard Policy (2009).

28. The main objective of this study is the assessment of environmental and social impacts of the proposed project. The study was carried out in compliance with the environmental requirements of ADB, as well as the environmental and social laws and regulations of the Islamic Republic of Afghanistan. International conventions, as ratified by the country, were also considered when applicable.

2.2 Scope of the Study

29. Within the scope of this IEE, the assessment of the potential environmental impacts of the construction and operation of the planned 220 kV transmission line from Arghandeh substation in west Kabul, to Jalalabad and the construction and upgrade of the substation at both ends of the cable. On the basis of the existing environmental baseline of the project area (Section 5) the consultant determined the potential environmental impacts and mitigation

measures of the proposed 220 kV transmission line during Design (Section 6.1), Construction (Section 6.2), Operation (Section 6.3) and Decommissioning (Section 6.4) phases. Alternative routings and options (Section 7), as well as appropriate mitigation and monitoring measures were considered to reduce possible adverse impacts (see Environmental Management Plan).

30. This 220 kV transmission line navigates through mountainous terrain, hill sides, semi-desert area, cultivated land, some houses, and settlements. The Arghandeh substation is under construction by Siemens and a new substation will be constructed in Jalalabad, Shaikh Mesri area. The transmission line ecological impacts are expected to be mostly low if the mitigation measures are properly followed. The socio-economic impacts will be precisely evaluated depending on the detailed line routing and land acquisition measures.

31. In the initial phase of the project inspection, the main focus has given to find a line routing that is feasible from technical points of view and achieve the following expectation:

    - Follow environmental friendly route
    - Technically feasible route and avoid crossing other high voltage lines in the area to possible extent
    - Avoid ecologically sensitive zones as well as cultural and historical areas.
    - To high extent possible avoid the need of resettlement actions
    - Consideration of security and accessibility on the line route
    - Less interference with other power and radio infrastructures
    - Wherever impacts cannot be avoided, mitigation measures are suggested. Their implementation should be closely monitored.

2.3 Methodology[1]

32. The IEE has been developed following the ADB SPS (2009) introduced by ADB to promote the sustainability of the project outcomes by protecting the environment and people from projects' potential adverse impacts.

33. The below activities have been carried out for the purpose of this IEE:

    - Desk review of project related data such as TOR, reports, maps, etc.
    - Development of checklist for project related data collection.
    - Afghanistan government environmental laws and legal frameworks review.
    - Site visits for data collection, interviews and review.
    - Stakeholder's engagement: DABS officials, government and local communities.

34. For the development of this IEE, Dynamic Vision has assigned the following team:

    - Environmental Expert and
    - Socio-Economic Expert.

35. A corridor of 500 m on both sides of the planned transmission line has been investigated for the environment impacts examination, during the site survey. The socio-economic baseline surveys have been carried out for sample populations settled along the transmission line corridor. The project likely environmental impacts and mitigation

[1] The referencing style of this report is according to the American Psychological Association (APA) 6th edition.

measures have considered for the project key phrases such as design, construction, operation and decommissioning. The extent of impacts have marked as high, medium, low and no impact.

3. Legal Policies and Institutional Framework[2]

36. The National Environment Protection Agency (NEPA) of Afghanistan is the leading independent government authority responsible for the environment related issues. Other national bodies such as the Ministry of Agriculture, the Ministry of Energy and Water, the Ministry of Mines, etc. also play an essential role. NEPA is responsible for all-encompassing environmental concerns of national significance, including development of national policy, development of environmental standards, coordination between government institutions, regulatory aspects, collection of environmental information and data, monitoring of environmental indicators, licensing, and public awareness (UNEP, 2007).

37. The final version of the Environment Law came into force in January 2007 (Gazette No. 912). This Environmental Law has formed a regulatory framework for the management and sustainable use of Afghanistan's natural resources, and provided the base for the conservation and rehabilitation of the environment towards realizing specified economic, social, and ecological objectives. This law is based on international standards which recognize the current state of Afghanistan's environment while setting a framework for the progressive development of governance, leading ultimately to effective environmental management (NEPA, 2007). Furthermore, there are national environmental impact assessment policy, national environmental strategy, procedures for air pollution prevention and work with wild animals in place which are developed by NEPA.

38. Environmental law defines the process of the development of a preliminary assessment, an environmental impact statement and mitigation plan to be conducted for certain projects and must be submitted to NEPA for approval. Based on Afghanistan's National Environmental Impact Assessment Policy (NEIAP, 2007), the Environmental Impact Assessment (EIA) for transmission lines projects (11 KV and above) is required as it comes under the category 1 of NEIAP projects categories for which NEPA's approval is required. Therefore, prior to commencing Civil and Construction Works, DABS must submit the IEE for regulatory approval of the NEPA, and obtain approval, e.g., environmental clearance, Non-Objection Certificate, forest clearance, and water board clearance as per the Government's regulatory requirements, and submit them promptly to the Asian Development Bank. Furthermore, needs to ensure that the required mitigation measures during implementation of the EMP are included in the bidding document of the subproject, and that all bidders have access to the IEE and EMP.

39. The NEPA is expected to play a major role in environmental protection, as well as to be the central point in dealing with the management of Afghanistan's environment so that it benefits all the citizens of Afghanistan. Furthermore, NEPA is an autonomous body, responsible for implementation of Environmental Act, monitoring, conservation and rehabilitation of biodiversity, etc. Below table provides further details of NEPA's National guidelines and policies.

[2] A portion of this section has been adopted from ADB ESDIP-Tranche 2/3 IEE; and Naghlu Solar Power Project IEE.

Table 1: NEPA's National regulations, guidelines and policies

Regulation/ Guideline/ Policy	**Date**	**Key areas**
Environmental Impact Assessment Regulations	(Official Gazette No. 939, dated 10 March 2008)	These regulations are issued in accordance with Article 22 of the Environmental Law to govern the process of environmental impact assessment. These regulations describe screening (Regulation 5) and environmental assessment (Regulation 7).
Administrative Guidelines for the Preparation of Environmental Impact Assessments	June 2008	These guidelines have been prepared as a companion to the Environmental Impact Assessment Regulations (Official Gazette No. 939, dated 10 March 2008). The guidelines are provided to assist those undertaking development projects that may have a potential impact on the environment, and will guide proponents on the various aspects of dealing with the National Environmental Protection Agency as the competent environmental authority in Afghanistan.
Environmental Impact Assessment Policy – "An Integrated Approach to Environmental Impact Assessment in Afghanistan"	November 2007	NEPA with the assistance from UNEP has developed the EIA Policy of Afghanistan. The policy stipulates energy sector guidelines to the project proponents to integrate EIA in the process of development and the procedures to address environmental consequences and involve necessary institutions in the process of project implementation.

40. Additionally, a summary of concerned Ministries and Agencies related to this transmission project is provided below:

3.1 Ministry of Energy and Water (MEW)

41. MEW regulates electricity, identifies water resources and enterprises for generating power. The Ministry also sets energy policy and taxes on energy use; manages the planning and development of water systems for irrigating land. Furthermore, it develops water policy and administers water rights. In supporting the socio-economic growth of Afghanistan, the MEW is responsible for preparing and managing national policies of the energy sector except for those management or implementation policies that are assigned to the yet-to-be established Afghanistan Energy Regulatory Authority (AERA) by the Electricity Law. The guiding and development direction of the planned energy sector of Afghanistan is subject to the policies under this law.

3.2 Da Afghanistan Breshna Sherkat (DABS)/ the National Power Utility

42. DABS is an independent and autonomous company established under the Corporation and Limited Liabilities Law of Afghanistan. Incorporated on 04 May 2008, DABS replaced Da Afghanistan Breshna Moassassa (DABM) and is serving since then as the nation's main power utility. Its equity shares are owned entirely by the government entities. DABS have witnessed a tremendous growth in its number of customers nation-wide, with the household sector

forming most the customers. The expansion of customers has pushed DABS to increase its imports to be able to meet the demands for electricity in the nation. DABS has its own design standard for transmission line which needs to be considered for this project. DABS operates and manages electric power generation, import, transmission, and distribution throughout Afghanistan on a commercial basis. DABS is the Executing Agency (EA) of the Project.

3.3 Afghanistan National Standards Authority (ANSA)

43. ANSA was established in 2004 by Presidential Decree 952 under the Ministry of Commerce and Industries which was the cornerstone for the establishment of a standards body. Through 2007, the operations of this body were limited due to a lack of human resources, budget, work plan and strategy. The government then placed greater attention in this area. The Council of Ministers approved ANSA as an Independent entity in August 2007 - the first step towards a fully functioning standards body in the country. Recognizing the needs of modern business and cross-border trade - vital for the Afghan private sector - the Parliament of Afghanistan also ratified this decision in February 2008. ANSA now works toward the following objectives:

    - Serve Afghan stakeholders (government, industry and consumers etc) in the fields of standardization, conformity assessment, accreditation and metrology
    - Improve commercial interactions, build the technical infrastructure and capacity, develop human resources, and establish closer ties amongst relevant institutions
    - Encourage the private sector to participate in standardization, conformity assessment, accreditation and metrology activities to contribute to commercial interactions within Afghanistan
    - Enhance implementation of international standards as well as regional and national standards and their application in business and industry
    - Improve awareness of the role and to promote the benefits of standardization and conformity assessment, accreditation and metrology amongst government, the private sector and the general public.

44. ANSA is responsible for the development of national standards. ANSA operates in 13 fields including the environment. But up to now the agency has developed limited numbers of standards particularly in the environment field. Therefore, it is recommended to adopt International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability with coordination of ANSA.

3.4 Ministry of Commerce and Industries

45. The Ministry of Commerce creates the enabling environment for sustainable and equitable economic growth and opportunity for all Afghans by promoting private sector development in a socially responsible free market economy. Further, develops private and government sectors industrial, trade and commerce at a wider national and international dimension. The Ministry has three basic goals: a) to promote the establishment and implementation of a legal and regulatory framework necessary for a free market economy b) to integrate Afghanistan into the regional and global economy and c) to facilitate and promote the development of a dynamic, competitive private sector.

3.5 Civil Society Organizations

46. Save the Environment Afghanistan (SEA) is Afghanistan's only major grassroots and Afghan-managed conservation organization. SEA (then SAVE) was active in environmental issues during the civil war when there was no active government involvement in environmental issues. SEA's mission is protection of the environment, sustainable resource utilization, conservation of biodiversity and integrated development of natural resources. SEA is member of IUCN, IUFRO (The Global Network for Forest Science Cooperation) and APAFRI (Asia Pacific Association of Forestry Research Institutions) and works closely with the International Crane Foundation, the World Wide Fund for Nature (WWF), the International Centre for Integrated Mountain Development (ICIMOD), the International Snow Leopard Trust and other environmental organizations (source: Afghanistan's Fourth National Report to the Convention on Biological Diversity (2009).

3.6 National Health and Safety Regulation

47. Chapter ten of the Afghanistan labor law is dedicated to the Provision of Health and Occupational Safety Conditions. Article 107 of the law states that "The Administration shall be obliged to ensure preservation of health and labor safety, application of safety techniques to prevent work and production related accidents, and to provide healthy conditions to prevent occupational diseases of Employees" (Afghanistan Labor Law, 2007). The labor law is approved based on the Official Gazette, 2007-02-04, No. 914. In 13 article (from 107 to 119) the Labor Law covers relevant occupational health and safety concerns. Furthermore, Regulation on Protection of Health Workers at Risk (2015) was adopted by the Ministry of Justice as another legislative document for occupational safety and health.

48. IFC Environmental, Health, and Safety (EHS) or general EHS guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors should also be applied.

3.7 Government Environmental Policies, Laws and Regulations

49. The power transmission components shall go through the environmental requirements of the Government of Afghanistan. The regulations on environmental impact assessment is based on the Environmental Act of Islamic Republic of Afghanistan (GazetteNo.873), dated 29 Jadi, 1384 (19 January, 2006). The National Environmental Protection Agency (NEPA), as an independent institutional entity, is responsible for coordinating and monitoring conservation and rehabilitation of the environment, and for implementing this act.

50. Other Government environmental legislative documents relevant to this project are as follows:

- The Environment Law 2007
- Water Law 1981
- The Law of Land Ownership 2000
- Nature Protection Law 1986/2000
- Agricultural Quarantine Services Law 2000
- Hunting and Wildlife Protection Law 2000

- Range Management Law 1970/2000
- Agriculture Cooperative Development Law 2000
- Charter for Development of Fertilizer and Agro-Chemicals 2000
- Clean Air Regulation of Afghanistan in 2010
- National Ambient Air Quality Standard of Afghanistan (2011) is as per WHO guidelines.

51. Furthermore, it is necessary to mention that, UNEP is contributing to the development and institutionalization of environmental laws and regulations through training and technical support in the development of an integrated environmental legal, regulatory and policy framework. An essential step throughout the development of this framework is an extensive public consultation process with national and international stakeholders.

52. Previously, UNEP provided extensive technical and drafting support for the Environment Law of the Islamic Republic of Afghanistan, and supported stakeholder consultations and the promulgation of the law through the Ministry of Justice and President's Office. The final version of the environment law, approved by the National Assembly, came into force in January 2007.

53. UNEP’s work in this area has also included:

    - The draft Forestry Law and Protected Area Regulations have been submitted to the Ministry of Justice for review and processing;
    - A Forestry and Rangeland management policy has been developed;
    - The water law has been approved by the Cabinet and is with the Parliament for ratification; and
    - A Rangeland law is under development.
    - Support for regulations covering environmental impact assessments and ozone depleting substances which have been approved by the Cabinet;

54. Likewise, a small but growing EIA sector is now developing in Afghanistan. Achievements to date include:

    - EIA regulations have been approved;
    - EIA administrative guidelines have been approved;
    - A pollution control policy paper has been approved;
    - Work has been started on the development of a waste management policy and of environmental quality standards for air, water and pollution control;
    - A survey to identify the types of chemicals currently used by the industries in Afghanistan and the main chemical pollutants likely to have a significant impact on human health has been conducted.

55. Below table provide details of relevant National acts/laws of Afghanistan

Table 2: National acts/laws of Afghanistan[3]

Act/ Law	Date	Key areas
Environmental Act	2007	This act has been promulgated to give effect to Article 15 of the Constitution of Afghanistan and provide for the management of issues relating to rehabilitation of the environment and the conservation and sustainable use of natural resources, living organisms and non-living organisms.
Minerals Law	2010	The Minerals Law of 2010 governs the ownership, control, prospecting, exploration, exploitation, extraction, marketing, sale, and export of minerals in the territory of Afghanistan. The law provides that all deposits of minerals on or under Afghanistan or in its water courses are the exclusive property of the state. A surface land interest does not include right to minerals. The Ministry of Mines is authorized to grant mineral rights in accordance with the provisions of the law (GIRoA, 2010; Kuo, 2007) (source USAID, 2010).
Water Law	2009	Afghanistan's new Water Law became effective in April 2009 and is one component of the country's strategy to integrate its water systems and institutions. The Water Law adopted a river basin approach under which natural river basin boundaries (versus administrative boundaries) govern all aspects of natural resources management and planning (Wegerich 2009; GIRoA, 2007b). Customary law tends to govern the use of water on private land and in private systems, the resolution of conflicts over water, and water resource conservation. Customary law generally governs allocation of water through the karez system, which is constructed and maintained on a community basis (McMurray and Tarlock, 2005) (source USAID, 2010).
Law on Managing Land Affairs	2008	The 2008 Law on Managing Land Affairs sets out definitions for various land types and classifications, requirements for land deeds, and principles governing allocations of state land, land leasing, land expropriation, settlement of land rights, and restoration of lands.
Draft Rangeland Management Law	Draft 2009	The Rangeland Law is currently under development. Its purpose is to create a framework for community custodianship and management of rangeland resources to provide for sustainable use and management of the rangeland resources, to maximize productivity of rangeland resources and to maintain ecological functions and evolutionary processes of Afghan rangelands, conserve soil and water resources, maintain biological diversity, and combat desertification.
Draft Forest Law	Draft 2009	The Draft Forest Law reflects the principles of community based natural resource management enshrined in the Cabinet-endorsed National Strategy for Forests and Rangeland. The draft is currently with the Ministry of Justice for processing.

3.8 International Treaties

56. Afghanistan is member of many international environmental agreements and treaties. The treaties relevant to the approved development are given below:

[3] Adopted from: AFG: Energy Supply Improvement Investment Program – Tranche 2

- The United Nations Framework Convention on Climate Change (UNFCCC or FCCC): This is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro in 1992. The treaty aimed at reducing emissions of greenhouse gas in order to combat global warming.
- The United Nations Convention to Combat Desertification: This agreement came into force, on 26 December 1996. The Convention was as much about rural development, agricultural growth, and poverty alleviation, as it was about combating desertification.
- The Convention on Biological Diversity: is an international treaty that was adopted at the Earth Summit in Rio de Janeiro in 1992. The Convention has three main goals:
  - Conservation of biological diversity (biodiversity);
  - Sustainable use of its components; and
  - Fair and equitable sharing of benefits arising from genetic resources.
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora: is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Afghanistan became a member of this treaty in 1986.
- The Paris Agreement (French: Accord de Paris), or Paris climate accord and Paris climate agreement: is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020.

3.9 Environmental Safeguards of ADB

57. The ADB requirements for projects environmental assessment are described in the SPS 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediation loans and private sector investment operations.

58. Furthermore, ADB's safeguard policies are central to achieving sustained development impact and poverty reduction. The objective of these policies is to avoid, minimize or mitigate adverse environmental impacts, social costs to third parties or marginalization of vulnerable groups that may result from development projects. Safeguard policies prescribe "do no harm" requirements that must be met for all ADB projects.

59. ADB has the following safeguard policies relevant to the Project:

- Safeguard Policy Statement, June 2009
- Public Communication Policy 2011
- Accountability Mechanism Policy 2012

60. According to ADB SPS (2009) the Project is classified as category “B” and therefore an IEE is required. ADB uses a classification system to reflect the significance of a project’s potential environmental impacts. A project’s category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project’s area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. A

project is classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. As such, projects are screened for their expected environmental impacts and are assigned to one of the following categories:

- Category A: This category project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- Category C: Projects unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.
- Category FI: A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

3.10 Other international Guidelines

61. Other relevant international guidelines:

    - IFC Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution, April 2007
    - ICNIRP Guidelines for Limiting Exposure to time-varying Electric, Magnetic, and Electromagnetic Fields (UP TO 300 GHz) (International Commission on Non-Ionizing Radiation Protection)

62. CIGRE 1998: High Voltage Overhead Lines – Environmental Concerns, Procedures, Impacts & Mitigation.

4. Project Description

63. Currently 20 out of 34 provinces in Afghanistan are not connected to the power grid supply, which increases cost of doing business, deteriorates environment, and subdues sustainable development indicators. This, in turn, constrains growth opportunities in the east; creates disparities in the country's economic development; and fuels ethnic and regional tensions, insecurity, and discontent. The proposed tranche will extend the national grid into eastern provinces with a population of nearly 2 million, and will allow evacuation of indigenous generation as well as extension of TUTAP power interconnection towards Pakistan. The tranche 4 will construct a 151 kilometer 220-kilovolt (kV) transmission line between capital city Kabul and Nangarhar provincial capital Jalalabad. The transmission line will be connected to the 220/20-kV Arghandeh substation (under construction in Kabul province under ADB assisted G-0184) at its western end, with a newly proposed 220/110/20-kV sub-station in Jalalabad city (Nangarhar province) in eastern Afghanistan which construction is part of this project. The proposed transmission line would provide significant value addition to (i) evacuate power from multiple future photovoltaic solar projects (not part of this project; which is under implementation and planned) in the region, (ii) provide sustainable power to two industrial parks in eastern Afghanistan, and (iii) strengthen supplies from 100 MW Naghlu hydropower

plant, and (iv) enable grid stability by interconnection with transmission lines in adjoining provinces. The transmission line will have capacity to energize additional 300,000 new connections to residential, commercial and industrial consumers[4].

4.1 Project Location

64. The transmission line starts from the Kabul Arghandeh substation and ends at the Jalalabad Shaikh Mesri Substation. The line will pass the Reshkhoor, Bagrami, Khaki-Jabbar, Hesarak, Sherzad districts and will end at Surkhrod, Shaikh Mesri Substation.

65. The project area covers the transmission line corridor and its influence perimeter in the provinces of Kabul and Nangarhar of Afghanistan. The terrain is from foothills to highly mountainous, mostly rocky and barren. The below figure shows the project area.

Figure 1 Transmission line propose area

66. There are eight 220 kV outgoing circuits proposed from the Arghandeh substation. Two 220kV circuits have connects to Logar, and two others connects to Ghazni provinces. Two 220 kV circuits are in the plan to connect Arghandeh with Breshna Kot and the remaining two bays will feed this 220 kV transmission line towards Jalalabad. An environmental audit of this substation construction work has done in September 25, 2017 which indicates a complete compliance with the IEE developed for the project.

67. The 220kV Feeders from Arghandeh are entering into the substation from the west side of the layout i.e. between corner points 3 &4. The below figures show the transmission line route.

[4] Adopted from ADB project description document PFR Trench 4

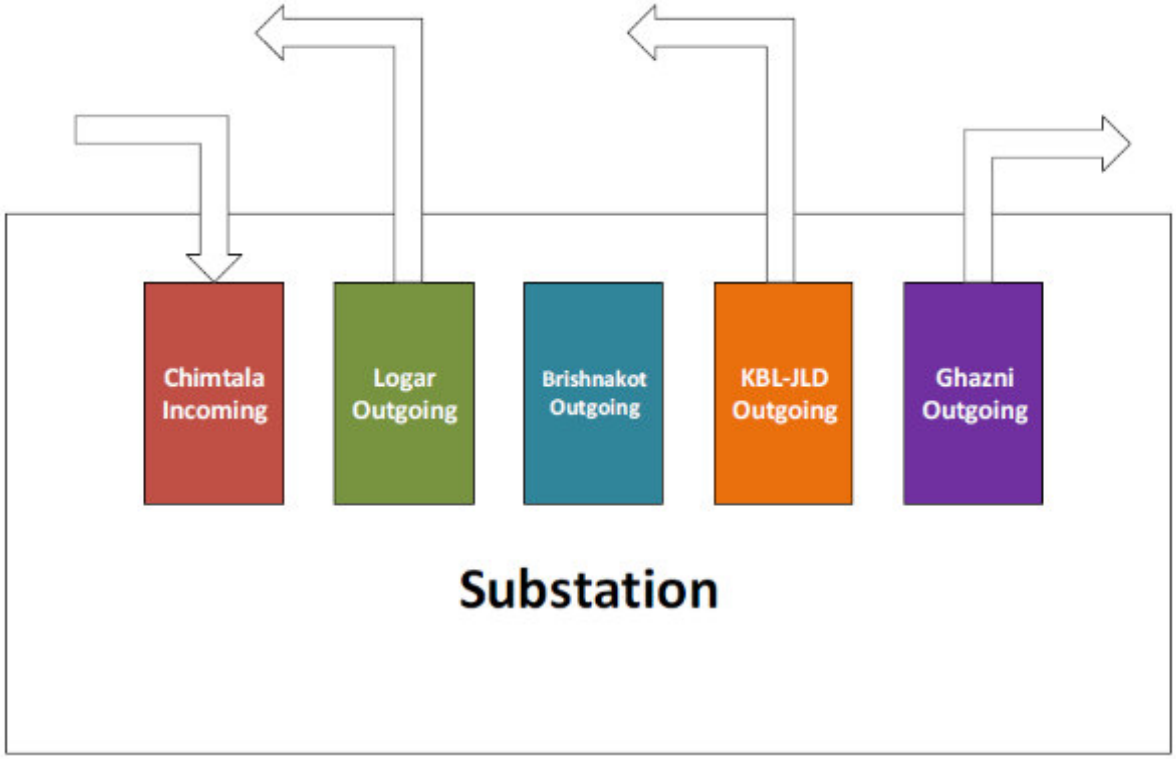

Figure 2 Arghandeh Substation bays configuration

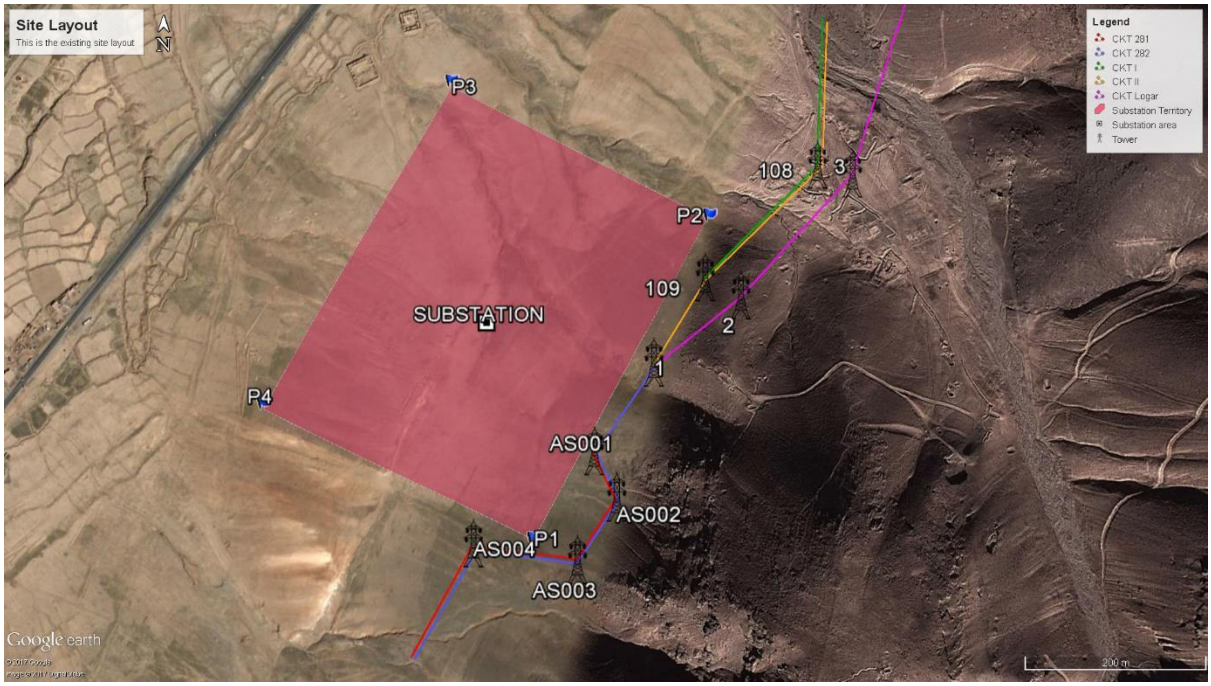

Figure 3 Arghandeh Substation layout

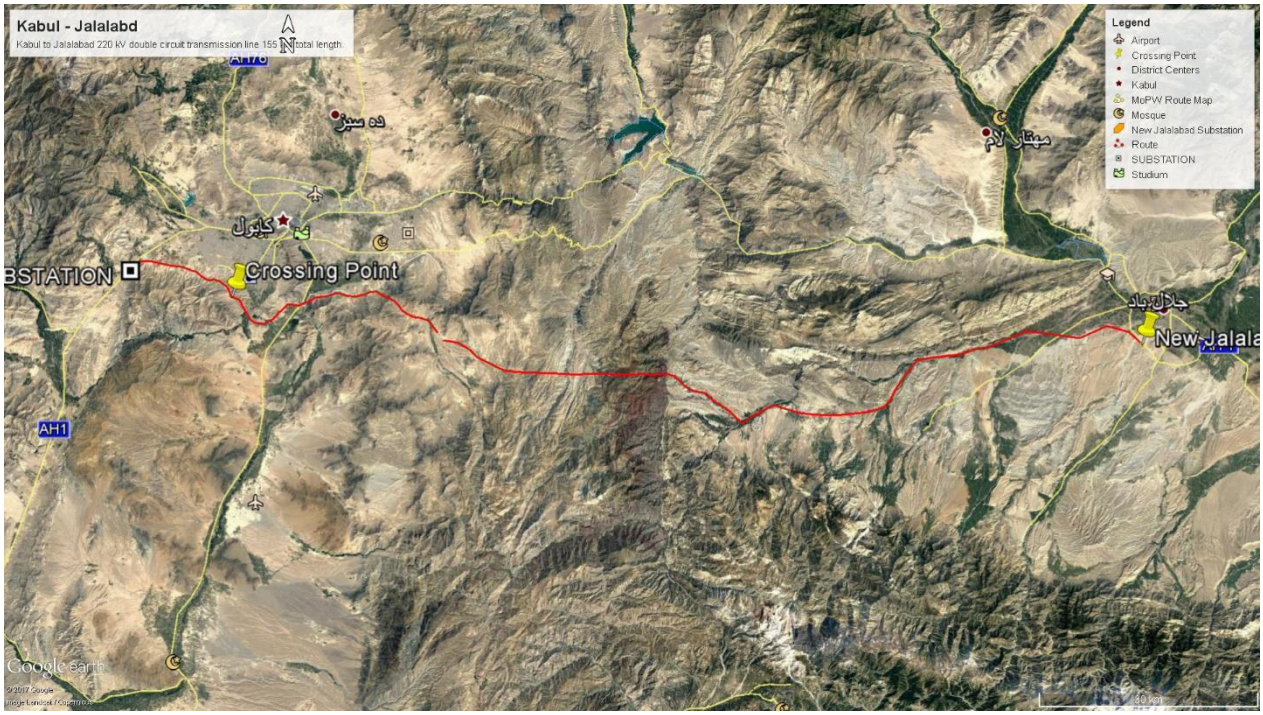

Figure 4 The Transmission line route overview (for detailed route map please see the power design technical report)

Figure 5 First portion of the line route at most populated Kabul city from Arghandeh to Bagrami

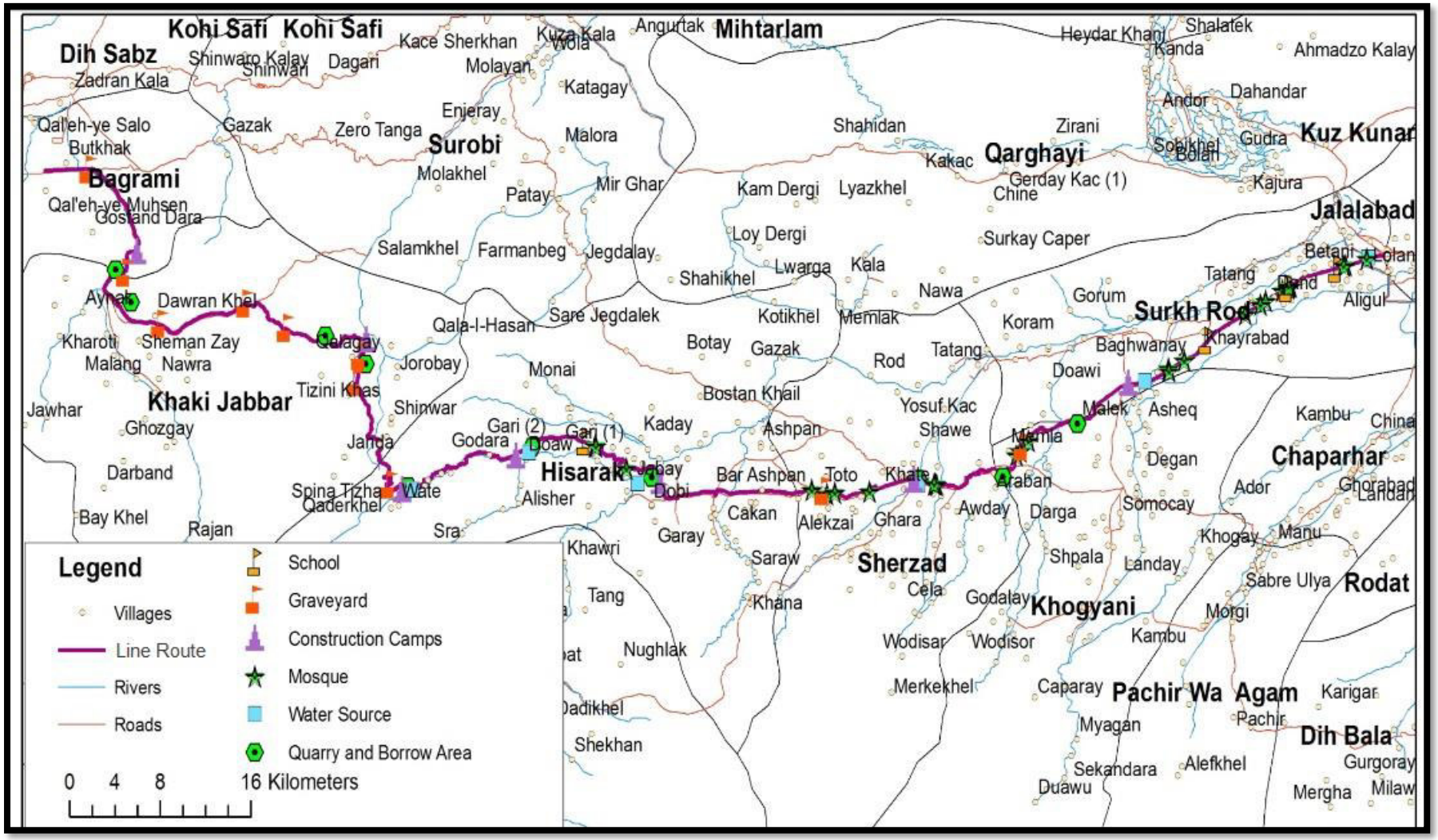

Figure 6 Second portion of the line from Bagrami to Jalalabad

4.2 Technical Description

68. The 320 MW electrical energy will be transmitted from Arghandeh Substation to Jalalabad via a 220 kV overhead double circuit line. The proposed line will be approximately 151 km long. The line will follow the under construction new Kabul Jalalabad road.

69. The following are the high-level design components of Transmission Line:

- The Transmission Line is proposed on steel lattice towers
- Required power transmission capacity is about 300- 320 MW.
- Double conductor Zebra (400sqmm) will be used for power transmission.
- Optical Ground Wire (OPGW) / Steel optical fiber ground wire (24-fiber)
- The Approximate Line length is: 151 KM
- Approximate number of towers: 880
- The Voltage level: 220 kV
- Number of circuits: Two
- Insulator: Composite, alternatively cap and pin toughened glass or porcelain;
- Foundations: Concrete, cast in-situ, concrete shaft or pad and chimney; or concrete cap with rock anchors for firm rock sub-base
- Right of Way: 25 m
- Design Code: EN 50341-1:2012; relevant IEC standards.

70. The starting point of the OHL is the new 500/220 kV Arghandeh substation. Consultants' visited source substation (Arghandeh/Kabul) for the overhead transmission (OHTL) line and reviewed the existing configuration of the outgoing 220 kV feeder bays and discussed with the DABS team on the availability of the feeder bay for connecting the new 220 kV OHTL. It is assumed, that a fully equipped bay is available at this substation to connect the OHTL.

71. The following are the high level design components of Substation:

- The substation switchyard will be an air insulated Substation.
- Three separate voltage levels (220 kV, 110 kV and 20 kV) are proposed by constructing separate 220kV, 110kV & 20 kV Switch Yards.
- The transformation capacity proposed is one 220/110 kV 50 MVA transformer and another 110/20 kV 16 MVA transformer. In future, they are reproducing same transformers at each level.
- 50 MVA, 220/110 kV Transformers are Two Coil Power Transformer with OLTC (Built-in) for On-load Voltage Regulation manually as well as electrically locally/remotely or with automatic Voltage Regulation through RTCC (Remote Tap Changing Cubicle) installed in the control room.
- The station will be provided with 250 KVA auxiliary transformer with LV Panel
- The proposed substation had double main bus bar system in both 110kV and 220kV switch yards.
- Bus-Coupler Bay is proposed for 110kV and 220kV Switch Yards. This will facilitate the maintenance of any Bus without shut down of the feeders and Transformers.
- The vector group of the three-phase 50 MVA 220/110 kV Power Transformer will be

Yna0 and that of 16 MVA 110/20KV Power transformer shall be Dyn5.

- Adequate protection system will be established to increase fire, personnel and asset safety.
- Smart monitoring and control system will be supplied to increase efficiency and smart management of the substation. This will decrease loss and reduce environmental damages.
- Interference with outside surroundings will be minimized by using approved engineering design approaches

72. Following figure shows the proposed new substation area at Shaikh Mesri and the existing substation. As shown in the figure the coordinates of the substation proposed area is as following:

    - Corner 1: N: 34°23'44.26", E: 70°24'54.75"
    - Corner 2: N: 34°23'29.95", E: 70°25'13.51"
    - Corner 3: N: 34°23'16.58", E: 70°24'57.14"
    - Corner 4: N: 34°23'35.68", E: 70°24'40.93"

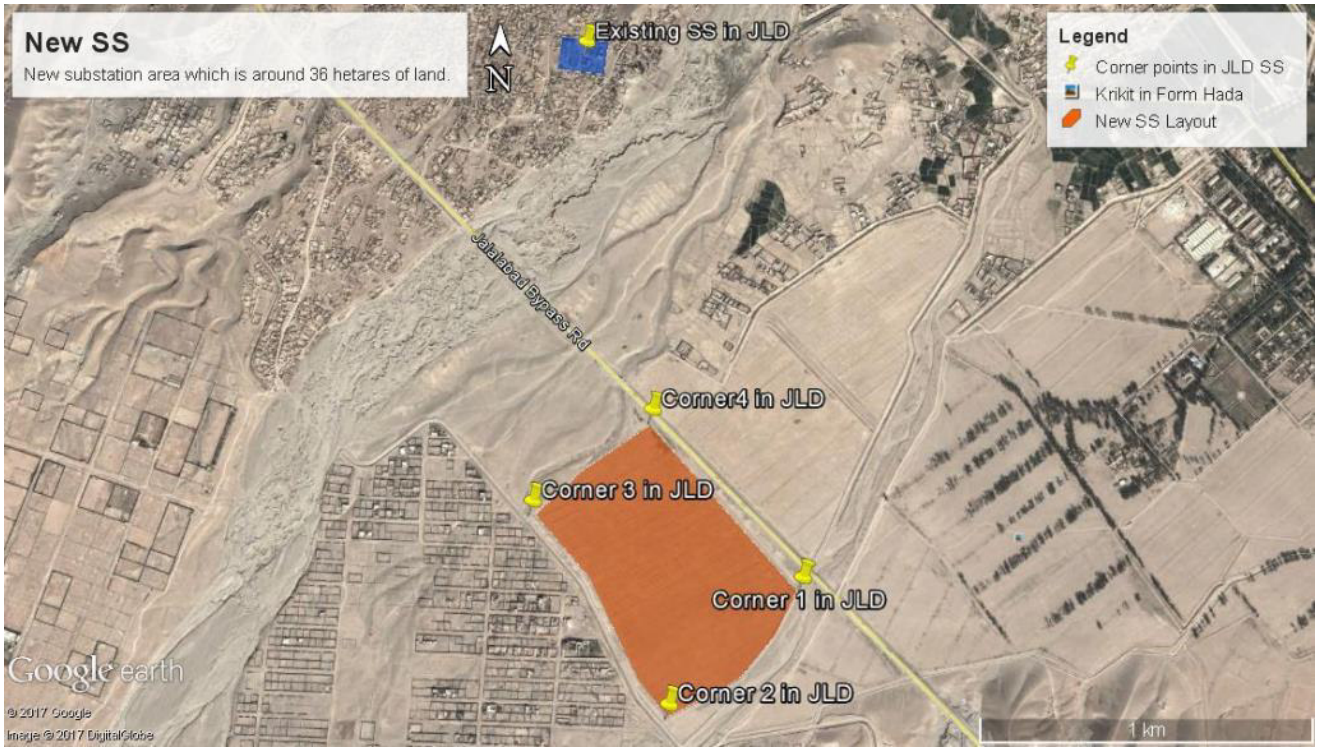

Figure 7 the new proposed substation area (JLD=Jalalabad)

73. The proposed standards are listed in the below table:

Description	IEC Standard
Power Transformers	IEC 60076
Insulating bushings for alternating voltages above 1000V	IEC 60137
Fluids for electro-technical applications - Unused mineral insulating oils for transformers and switchgear	IEC 60296
Degrees of protection provided by enclosures	IEC 60529
Loading guide for oil-immersed transformers	IEC 60354

Tap-changers	IEC 60214
Application guide for on-load tap-changers	IEC 60542

Figure 8 The proposed standard for the design

4.3 Right of Way and Clearance

74. The Right of Way (ROW) for the 220 kV transmissions line is considered to be 25 m (on both sides of the center line) on the basis of the span-width, the line swinging and the electrical safety distance. The minimum safety distance to conductors to respect international standards for electric and magnetic fields (EMF) is assumed to be 15 m in view of the public.

75. Complete clearing of the ROW would be required in the center strip of 25 m (on both sides) allowing for stringing of conductors. Inside the ROW vegetation above 7 m height needs to be cleared, including possible tall danger trees outside but nearby the ROW corridor. Below Table 3 shows the transmission line ground clearance details. The minimum working distance for trained employees based on IFC guideline is 1.5 meter for 220 kV range. ICNIRP exposure limits for occupational exposure to electric and magnetic fields for 50 HZ is 10,000 V/M incorporating to 500 µT (IFC, 2007).

Table 3 Clearance for 220 kV transmission lines

Clearance	**220 kV Line**
Above normal ground	7.0
To roads	8.0
To other OHLs	3.0

4.4 General Profile of the Project Affected Area

76. **Arghandeh to Bagrami-Butkhak (0-50 KM):** This section passes through Reshkhoor, Chaharasyab and Musahi valley. The line follows the Paghman mountains skirts and enters Reshkhoor where it crosses a Kabul River tributary. The line also passes near the Rishkhoor military compound. In Gulbagh area the line crossovers the existing Logar 220 kV transmission line at (Latitude – 34°26'29.03"N; Longitude – 69° 5'41.23"E). The line then enters Chaharasyab district where it passes through some agriculture lands. At (518195.00 m E, 3810489.00 m N) point the line passes the Kabul Gardez highway. In 25 KM from Arghandeh the line then passes through Musahi district territory where it passes Logar River. The line then goes through the mountains side towards Sahak village and reaches Bagrami district. From Bagrami the line reaches Butkhak where then it follows the new Kabul-Jalalabad road.

Figure 9 Arghandeh to Bagrami-Butkhak (0-50 KM) line key features

Figure 10 In this portion the line follow mostly the hills and mountains sides

77. **Butkhak to Sherzad Totu Village (50-100 KM):** This section starts with hilly and semi desert areas. In 5 KM from the beginning of this section the route has some minor land acquisition issues. Then it follows the ROW of the new Kabul-Jalalabad road. After passing Qaderkhel village the line enters Kogdara valley. In this section the line will cross Kogdara River (known as Abjangani River), which passes through the valley. Three micro-hydropower stations are located near this river.

78. The villages located in this section are Khakejabar, Dawrankhail, Tezin, Kafarkhail, Gulabkhail, Godara, Bodaynaw, Doaw, Khanjar, Pitla, Dhai, Kandai, Bar Asphan, Peshdare, and Totu. Potential rock fall areas as well as floodways are located at 62 KM and 64 KM;

where rock fall protection measures are required for towers. Hisarak is located at 78 KM which is relatively densely populated area. At 88 KM the section traverses rolling/hilly terrain, which changes into mountainous terrain from 88 to 90 KM. In Bar Ashpan, Buddhism sculptures relics are reported in 1.8 KM distance from the line route.

79. In Hesarak area the tents of several Kuchi (nomadic tribes) are located. Totu is a bigger village after Hesarak in the line route and has educational (Tutu high school), market, and health facilities. Land acquisition, resettlement and vegetation removal is required at Totu village. The main agriculture products in this area are wheat fields while the apple, mulberry and walnut trees can be also observed.

Figure 11 Semi desert area at Butkhak area

80. **Sherzad to Jalalabad Surkhrod (Shaikh Mesri SS) (100-151 KM):** This section starts with a combination of a plateau/rolling and mountainous terrain of Spin Ghar mountain. The line crosses two small rivers: at 107 KM the Gandamak River and at 113 KM Hasham Kale River. This section also contains another river called Marki Khail River which will not be affected by the project. It was reported that Gandomak, Marki Khail and Kodi Khail are severely affected by river flooding in this section.

81. This section covers Khogiani and Sherzad districts. Two major valleys Araban and Memla are located at 120 KM of this section. Both these valleys are predominantly cultivated by wheat. At 117 KM the historical Memla (or Nemla Bagh) garden is located at Khogiani district. This garden was established 400 years ago during Mughal period. The garden has been constructed by Sha Jahan by the name of his daughter (Nimla).The garden occupies 40 hectares and contains several mulberry, pines, walnut and different types of citrus tree. It is located 6.18 KM away from the line route. The line also passes Darya-e-Sang Lech River which is a sort of flood way at (34.393962°, 70.205603°) coordinates.

Figure 12 Memla Bagh in the project area

82. From 120 to 132 KM the line follows a valley terrain. At 125 KM the line crosses a major torrent at Khogiani known as Khogiani Floodways. The gravel road ends at Gaza village and meets the asphalt concrete road of Surkhrod-Khogiani. At 127.5 and 139 KM graveyards are located. Agricultural lands are located on both sides of the line. At 133 KM deposits of gravel and boulders are located which can be used for construction. The bricks furnaces are also observed in this section. The famous mosque locate at 150 KM of this section is the Moi Mubarak mosque in 6 KM distance from the line.

83. Villages in this section include Farhan (Dharwazagay), Gandamak, Nokorkhil, Aji Saheban, Ahmedzai, Mastikhail, Sawati, Naghrak, Ghare Khail, Bala Bagh, Surkhrod and Shaikh Mesri. Agriculture in this section includes olive, sugarcane, wheat, cotton, corn, barley, tomatoes, onions and various other vegetables. The route needs minor land acquisition work at Bala Gagh area. At the east side of Shaikh Mesri proposed substation area a main floodway is located.

Figure 13 Proposed new substation area key features

Figure 14 Semi desert area at Surkhrod near Shaikh Mesri

5. Description of the Environment (Baseline)

84. This section of the IEE describes the environmental baseline in the project area. The environmental baseline aspects were grouped into four categories, specifically: Physical Resources, Ecological Resources, Economic Development, and Social and Culture Resources.

5.1 Physical Resources

5.1.1 Atmosphere and Climate

85. The climate throughout the project area is mainly dry continental climate. It has four diverse seasons: winter lasts from December to February, spring - from March to April, summer - from May to September and autumn - from October to November.

86. Average annual precipitation (1957–77 and 2003–06) in the Kabul Basin was about 330 mm/yr (millimeters per year), but annual precipitation has varied considerably in the past few decades, ranging from several years of no precipitation in the early 2000s to about 525 mm/yr in 1959. Observations of past (1961–91) and recent (2003–07) mean monthly temperatures in the basin indicate an apparent warming trend. The rate of temperature increase has been greatest, about 2 degrees Celsius per decade since the early 1960s (Mack, 2010).

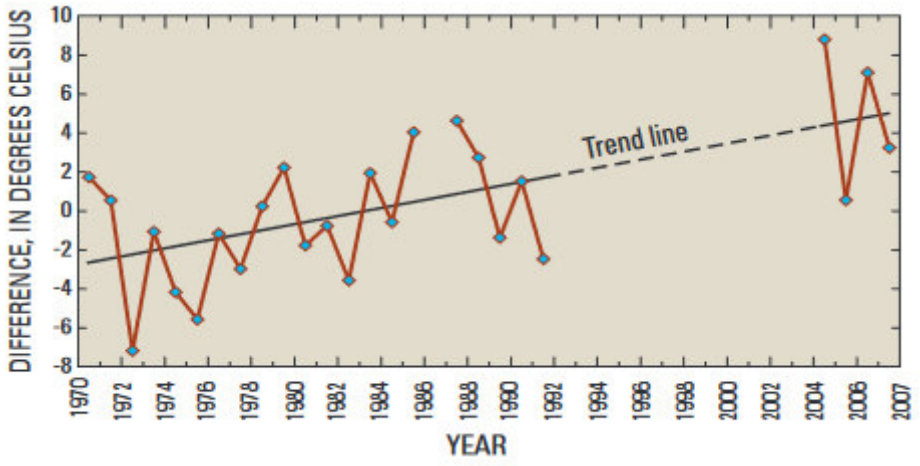

Figure 15: Difference between annual mean February temperature and historical mean February temperature in Kabul, 1970–2007 (Mack, 2010)

87. Based on the Köppen-Geiger climate classification Kabul is classified as Cfb. The temperature here averages 13.3 °C. Kabul's driest month is December with 20 mm of precipitation. The precipitation reaches its peak in August (Climate-data, 2017).

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	13.4	14.1	14.9	14.5	13.9	12.9	12.3	12.2	12.8	12.9	13.2	13
Min. Temperature (°C)	5.6	6.7	7.9	8.2	7.8	7.3	7.5	7.2	7.2	6.4	6.1	5.1
Max. Temperature (°C)	21.2	21.6	21.9	20.8	20.1	18.5	17.2	17.2	18.4	19.5	20.3	21
Avg. Temperature (°F)	56.1	57.4	58.8	58.1	57.0	55.2	54.1	54.0	55.0	55.2	55.8	55.4
Min. Temperature (°F)	42.1	44.1	46.2	46.8	46.0	45.1	45.5	45.0	45.0	43.5	43.0	41.2
Max. Temperature (°F)	70.2	70.9	71.4	69.4	68.2	65.3	63.0	63.0	65.1	67.1	68.5	69.8
Precipitation / Rainfall (mm)	25	48	88	118	104	121	190	199	166	70	23	20

Figure 16: Kabul weather data sheet (Climate-data, 2017)

88. The climate of Nangarhar is classified as BWh, by Köppen and Geiger and is hot desert climate. The average temperature in Nangarhar is 21.5 °C. About 206 mm of precipitation falls annually (Climate-data, 2017).

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	9.2	12.1	16.6	21	26.3	32.6	33.3	32.2	28.4	22.3	14.6	9.9
Min. Temperature (°C)	2.5	5.9	10.5	14.7	19	24.8	27	26.5	21.7	14.5	6.5	2.8
Max. Temperature (°C)	15.9	18.4	22.7	27.3	33.7	40.5	39.6	38	35.2	30.1	22.8	17.1
Avg. Temperature (°F)	48.6	53.8	61.9	69.8	79.3	90.7	91.9	90.0	83.1	72.1	58.3	49.8
Min. Temperature (°F)	36.5	42.6	50.9	58.5	66.2	76.6	80.6	79.7	71.1	58.1	43.7	37.0
Max. Temperature (°F)	60.6	65.1	72.9	81.1	92.7	104.9	103.3	100.4	95.4	86.2	73.0	62.8
Precipitation / Rainfall (mm)	19	27	43	46	20	2	7	3	3	8	9	19

Figure 17: Nangarhar weather annual data sheet (Climate-data, 2017)

89. The difference in precipitation between the driest month and the wettest month is 44 mm. The average temperatures vary during the year by 24.1 °C.

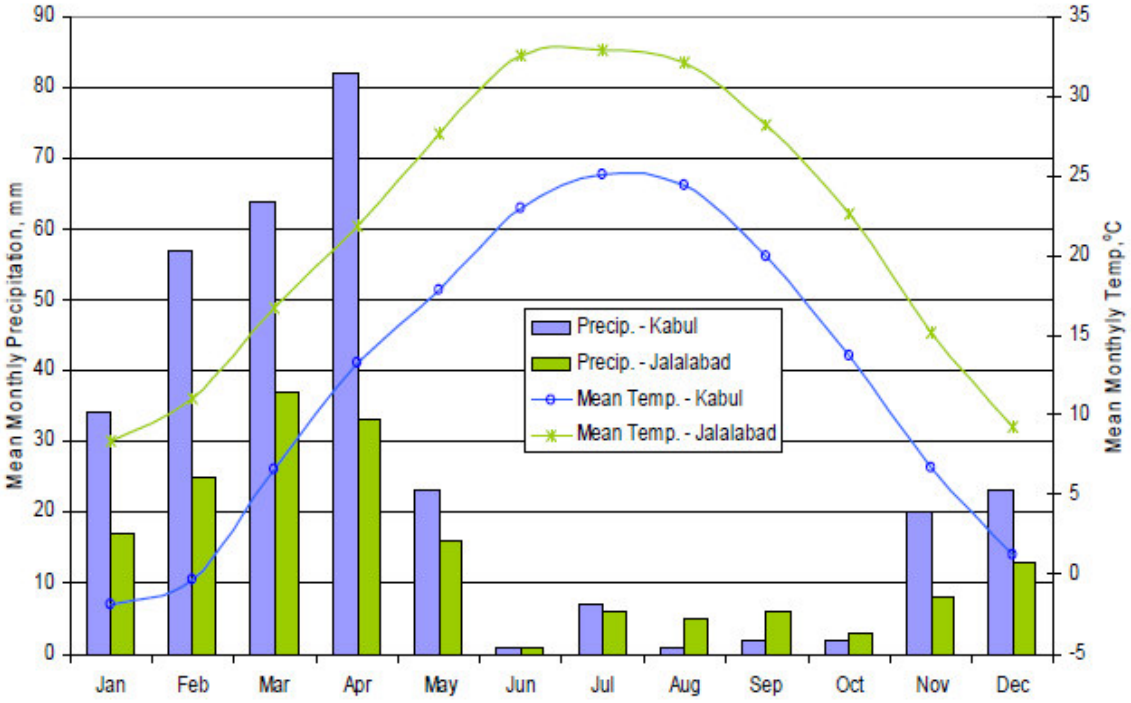

Figure 18 Project site area climate details (ADB, 2012)

90. Urban air quality in major cities of Afghanistan such as Kandahar, Herat, Mazar-i-Sharif, and Jalalabad, and specifically Kabul is poor. For Kabul, the reasons for high pollution level are both natural and anthropogenic. The natural cause is the location of the city that results in atmospheric inversions during fall and winter trapping air pollutants. Among anthropogenic reasons are rapid growth of the urban vehicle fleet with high share of old and/or poorly maintained vehicles, substandard fuel, roads with poor surfaces generating fugitive dust, burning fuels, coal and tires, and widespread use of diesel generators. As the line route is mostly follow Kabul City outskirts and mountainous terrain the air quality is quite good with very little dust and low vehicular traffics.

5.1.2 Geology and Soil

91. Afghanistan is a landlocked country and has 652,000 km^2 area. About 82 % of Afghanistan's total land is rangeland and bare land, less than 2 % of the country area is covered by forests

and about 10 % of the territory is arable. One quarter of the Afghan territory lies above 2,500 meters of the sea level (Habib, 2014).

92. Soils 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. The dominant rocks along the route are sedimentary and volcanic rocks.

5.1.3 Topography

93. The transmission line from Arghandeh toward Bagrami district of Kabul will go through Arghandeh mountainous terrains toward Reshkhoor and will follow a reasonably flat area towards Butkhak area of Kabul with land acquisition requirement. From Butkhak the line will follow the new Kabul Jalalabad road which is currently under construction.

The line goes through different offshoots of Spinghar range, which lies immediately south of Jalalabad and forms a mountain frontier with Pakistan. The elevation profile of this portion is given in below figure. The elevation of this area ranges from 600 m to 2,890 m, nearly 30% of the line passes through mountainous terrain, 32% passing through rolling to mountainous terrain, 27% passing through rolling terrain and 11% through flat terrain.

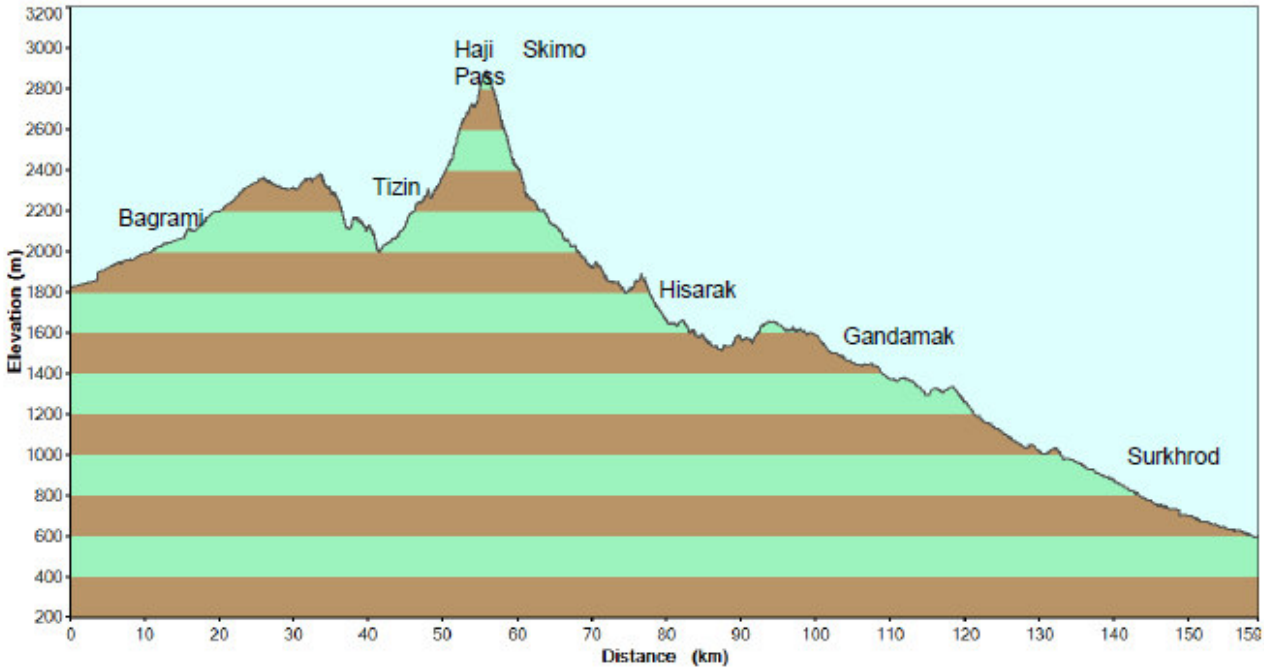

Figure 19 From Bagrami to Surkhrod, Jalalabad line route elevation profile (ADB, 2012)

94. The main features of the project area are:

- High hills and mountains in the Kabul side
- Roads in several places
- Settlements in Kabul and Jalalabad ends
- Rivers crossed by the transmission line

- Cultural villages and assets
- Crossover with other transmission line

5.1.4 Seismicity

95. Research shows that future earthquakes, driven by ongoing active geologic processes in the project region mainly Kabul will occur. The seismic hazard must be considered in the siting, construction, and restoration of communities and facilities. Large earthquakes can devastate unreinforced brick and stone buildings and trigger large landslides in mountainous terrain (Boyd et al, 2007).

96. Two main sources of seismicity (Chaman and Konar faults) are present in project area (Jalalabad and Kabul) which might contribute to appreciable seismic hazard for Kabul. Estimates show that Kabul, have a 2-percent chance in 50 years of exceeding a peak ground acceleration of 50 percent g (g is the acceleration of gravity 9.8 (m/s^2) and a 10-percent chance in 50 years of exceeding a peak ground acceleration of 27 percent g (Boyd et al, 2007).

97. Below figure shows the seismic hazard map for Afghanistan. Medium to high risk seismicity level (Richter scale 6-7.5) is proposed to be taken into design consideration in the Pre-Design Report. This translates into peak ground acceleration of 2.4 to 3.2 m/s. However, the hazard values for project area is relatively uncertain owing to a lack of information characterizing the sources of seismic hazard, particularly the many faults that might be active.

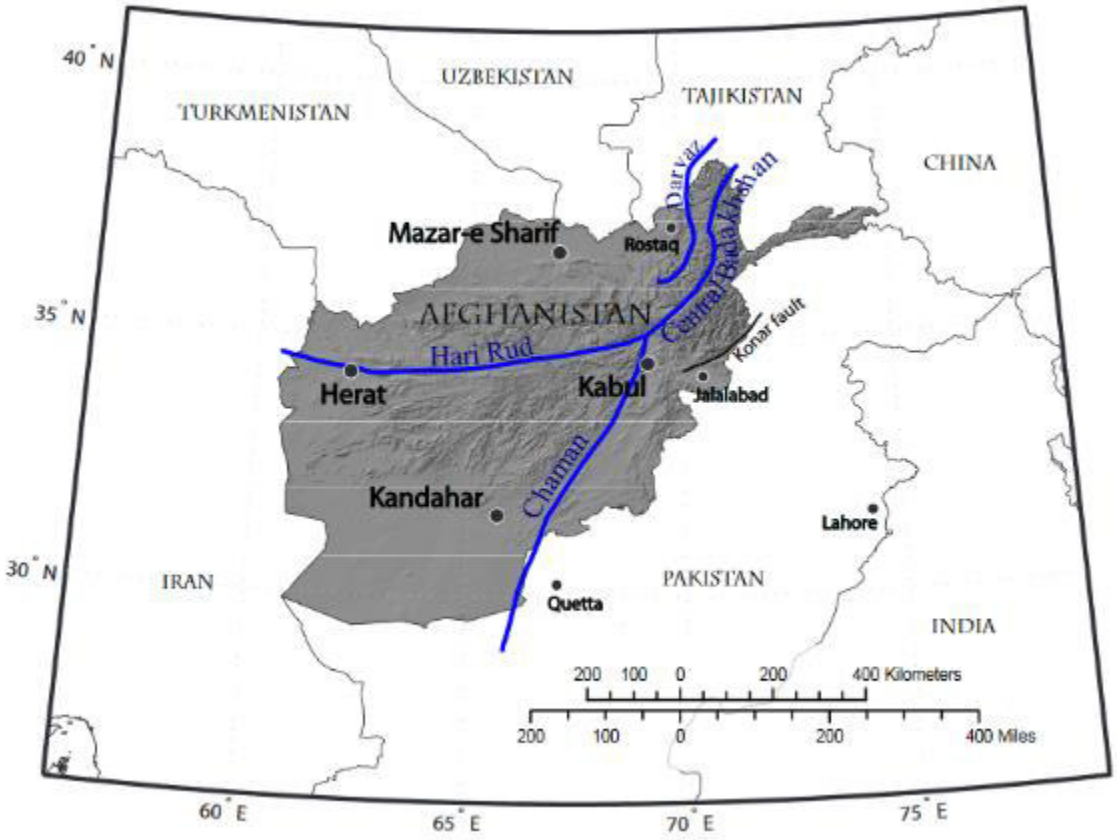

Figure 20: Map of Afghanistan showing the locations of modeled fault sources (heavy blue lines), (Boyd et al, 2007)

98. In addition to earthquakes, the project area is also prone to flooding, landslides, and avalanches.

5.1.5 Surface Water

99. Most hydrologic and climatic data-collection activities in Afghanistan were interrupted in the early 1980s because of war and civil strife and did not resume until 2003 or later. Because of the gap of more than 20 years in the record of hydrologic and climatic observations, most investigations have made considerable use of remotely sensed data and, where available, historical records to investigate the water resources of the country (Mack, 2010).

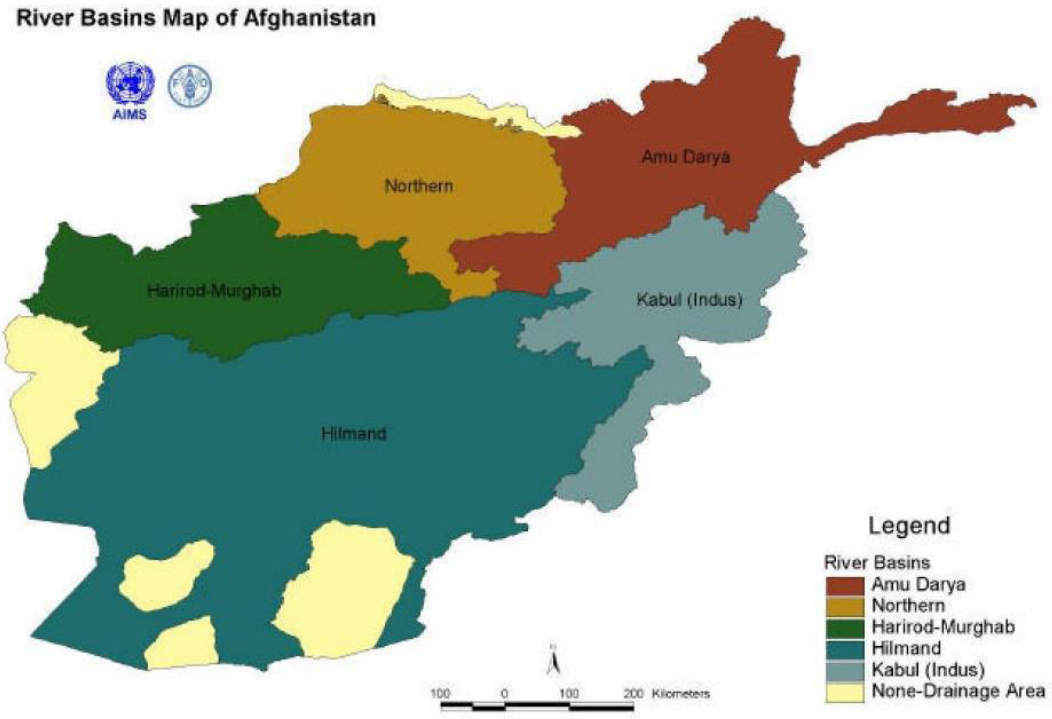

Figure 21: Afghanistan rivers basins map (UN-FAO, 2012)

100. The project in entirely located in the Kabul (Indus) river basin which comprises Kabul River and its tributaries such as Logar River, Pajsheer River, Surkhrod River, Kogdara River, Gandamak, Hasham Kale River and Kunar River. The transmission line route crosses Kabul River, Loagar River, Kogdara River, Gandamak, Darya-e-Sang Lech and Hasham Kale River. Furthermore, the proposed substation is located at 2.91 km distance from Daronta Canal (Hada Irrigation Canal) which comes from Daronta Dam at 8 km distance from the project site.

101. The Kabul Basin is an 80-kilometer-long valley, formed by the Paghman Mountains (from where the transmission line starts) to the west and the Kohe Safi Mountains (the route is mainly goes inside the Kohe Safi) to the east that contains Kabul City and surrounding communities. Sub-basins of the Kabul Basin, formed by inter-basin ridges and river drainages, include Central Kabul, Paghman and Upper Kabul, Logar, Deh Sabz, Shomali, and Panjsher as shown in below figure.

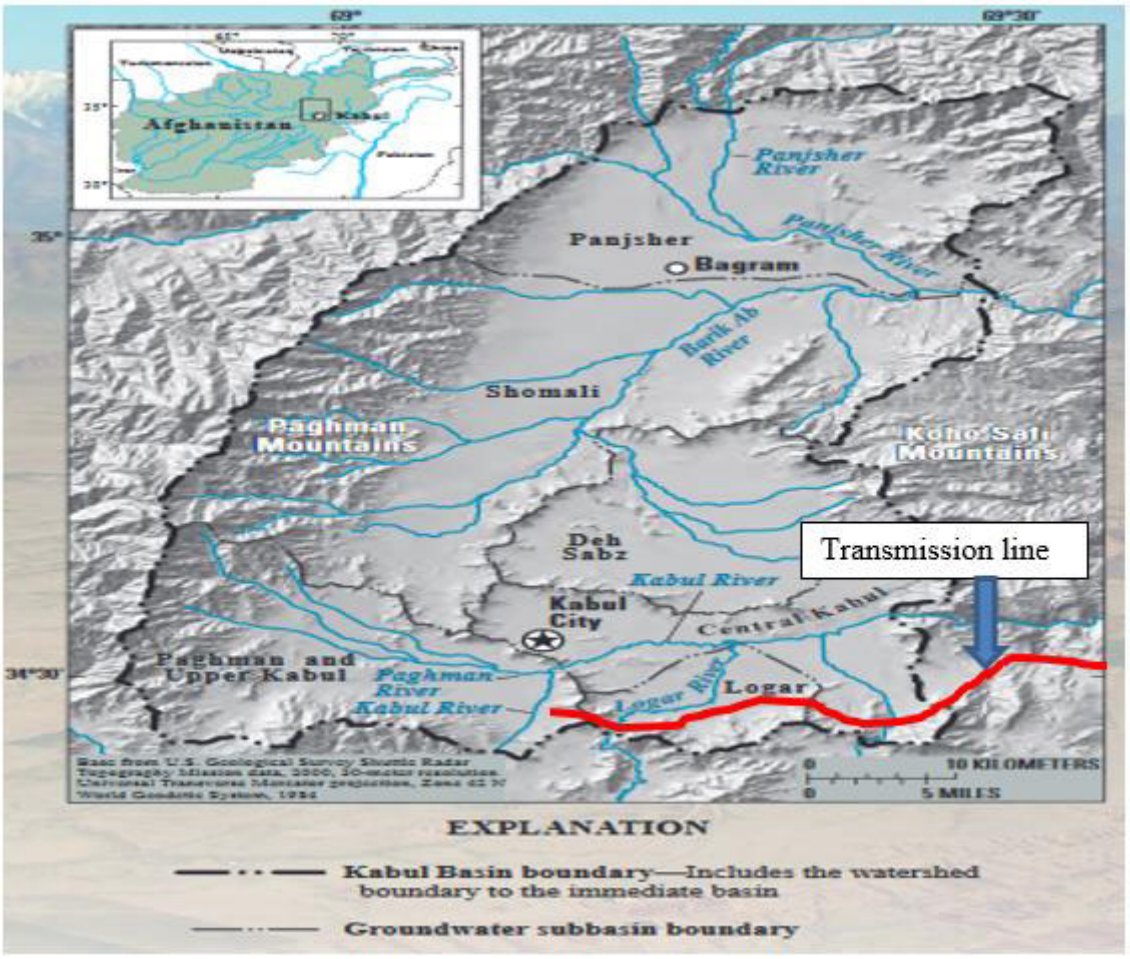

Figure 22: Location of the Kabul River Basin and TL (Mack, 2010)

102. The source of the water resources of the project is rainfall and seasonal melting of snow in the surrounding mountains. In general, the peak flow of melted water occurs in spring. During summer the flow is sporadic or non-existent in many water courses (Mack, 2010). The nearest water canal to the proposed substation area is Farm-e-Had canal for agriculture which provide water for the agriculture farms in the area.

103. Almost all precipitation in the region occurs during the winter. This precipitation is being accumulated in the mountains as snow and recharges the rivers during snow melt. This water then recharges the aquifers in the Kabul Basin. Rivers run dry when the snow has completely thawed. No continuous water flow is currently observed in the rivers flowing through the Kabul Basin.

104. At 2.91 KM of the proposed Shaikh Mesri substation the Hada Irrigation Canal is passing through the area. The canal water is coming from Daronta water dam.

Figure 23 Showing proposed substation area with the Hada Irrigation Canal

105. Kabul and Logar Rivers have a pluvial regime, in which rain and snowmelt produce a late winter-spring maximum, and a late summer – early fall minimum. Most of the small water courses carry no water at all from April-May to November-December. The monsoon precipitation increases the level during summer.

5.1.5.1 Surface Water Quality

106. Majority of the population does not have access to safe drinking water. This, in combination with a lack of sanitation and hygiene has serious consequences for the health and well-being of the population. A comparison of water quality variables under both high and low flow conditions done by (IUCN, 1994) showed that water quality was generally poorer under low flow conditions. An exception to this were concentrations of some metals including chromium and copper which were higher under high flow conditions. 'The Kabul River is a sewer' is a phrase that has been used more frequently among concerned environmentalists, scientists, NGOs and government officials in recent years. Large volumes of industrial effluents and human wastes have been dumped into the river.

Figure 24. Kabul River bed heavily contaminated by waste

107. There are no recent studies on the upstream Kabul River water quality on Afghanistan side. The most recent research on the downstream side (Peshawar, Pakistan) indicates that the Water Ecosystem Sustainability Index (WESI) contamination with nutrients. According to the River Pollution Index (RPI), waters in the river have low alkalinity and low salinity, and are contaminated with nutrients. Surface plots and Canonical Correspondence Analysis (CCA) showed that salinity, nitrates, temperature, and Biochemical Oxygen Demand (BOD) can be defined as major factors affecting algal diversity (Khuram et al, 2017). These pollutants have not just deteriorated the river water but the sub-surface water of the area as well.

108. The river water has high concentrations of nitrate, boron, and dissolved solids and can be harmful to humans and crops. In lower reaches of river valleys, groundwater is frequently saline or brackish and not usable for either drinking or irrigation purposes. In a groundwater quality survey of 1,400 wells conducted in 1996, it was reported that 45 percent of wells exceeded US Environmental Protection Agency Standard for E. Coli, and 10.8 percent exceeded nitrate standard (ADB, 2011).

109. For Kogdara River, Gandamak, Darya-e-Sang Lech and Hasham Kale River the water quality data is not available. These rivers are mostly seasonal with almost no water during dry seasons.

5.1.6 Groundwater

110. Although there is no actual information on groundwater table in the project area from Kabul to Jalalabad, assessment can be done based on groundwater data at the provincial level as discussed below.

111. In the project area groundwater has traditionally been utilized for irrigation and drinking purposes using karezes (a karez is a tunnel system used to extract shallow groundwater), springs and shallow hand dug open wells. In more recent years, deep drilled wells have

become a more common means of water extraction.

5.1.7 Acoustic Environment

112. The noise baseline in the project area varies. On the outskirts of Kabul, Jalalabad and in vicinity of other settlements traversed by the transmission line the noise levels are from low to moderate. In remote areas of Nangarhar province with no economic activities, the levels are low. The current noise level in most of the transmission line route is 45-60 dBA.

5.2 Ecological Baseline

5.2.1 Protected Areas

113. Based on IBAT database the two protected areas in the project area are Kole Hashmat Khan Waterfowl Sanctuary and Safed Koh Important Bird and Biodiversity Area (IBA).

Figure 25: Location of Kole Hashmat Khan Waterfowl Sanctuary (Birdlife.org, 2017-a)

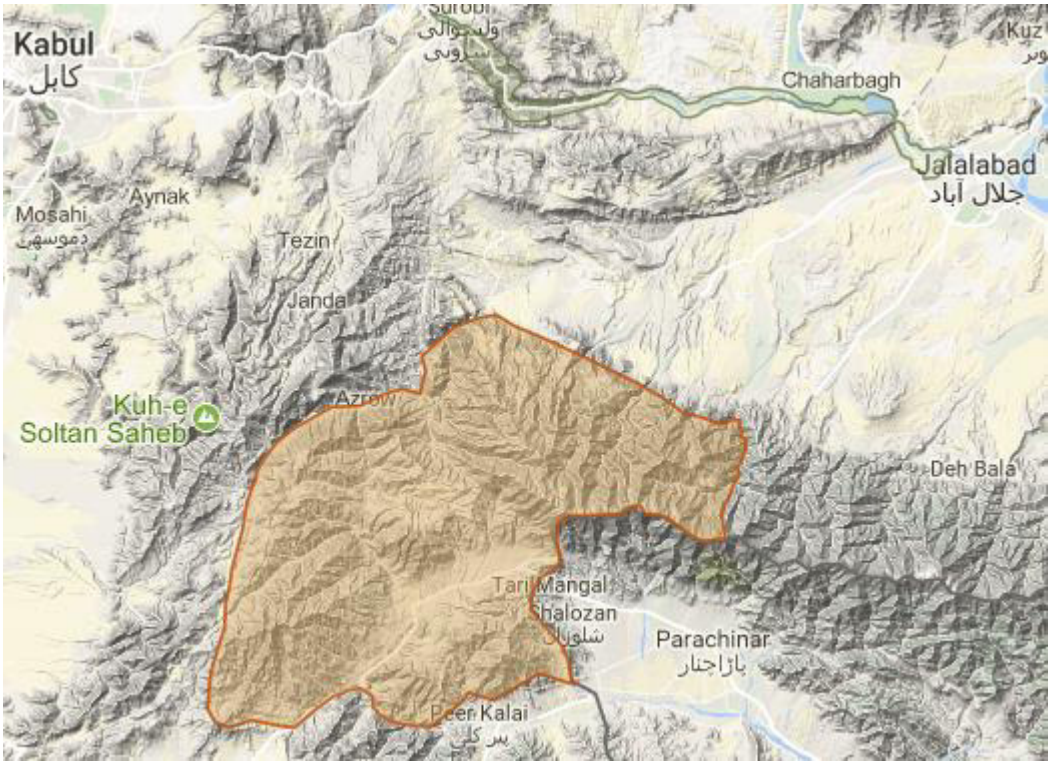

Figure 26. Location of Safed Koh (Birdlife.org, 2017-b)

114. **Kole Hashmat Khan:** is the only wetland remaining from the once extensive Kabul marshes on the southeast outskirts of Kabul city lying in a basin surrounded by the Hindu Kush foothills. Elevation here is approximately 1,800m. Kole Hashmat Khan is a shallow, reed-covered lake approximately 2.5 KM in-length and between 300 –1,000m wide. This area was previously a royal hunting place, before being declared a wildfowl reserve in the 1930s with restricted hunting. Although the site has great potential as a protected area, it faces a large array of threats, including water diversion for irrigation and cultivation, pollution, egg collecting and indiscriminate hunting, and extensive reed cutting. The site is used as a migration staging post by waterfowl en route from Pakistan/India to Central Asia and Siberia. This IBA meets category[5] A1 (1994) of Global IBA Criteria (Birdlife.org, 2017-a). The closest distance of the transmission line from the lake is 6 KM.

115. **Safed Koh:** This IBA occupies an area of 200,000 hectares. The upper zone of a range of mountains south-east of Kabul and bordering the North-West Frontier province of Pakistan, from 2,000 m to over 3,000 m. Among known species in this area are: *Buteo rufinus, Tetraogallus himalayensis, Lophophorus impejanus, Psittacula himalayana, Picus squamatus, Anthus similis, A. roseatus* (breeds over Pakistan border), *Prunella strophiata, Turdus rubrocanus, Phylloscopus chloronotus* (breeds over Pakistan border), *P. occipitalis, P. subviridis, Muscicapa sibirica, M. ruficauda, Ficedula superciliaris, Aegithalos leucogenys, Parus melanolophus, P. rufonuchalis, Sitta leucopsis, S. cashmirensis, Certhia himalayana, Garrulus lanceolatus, Nucifraga caryocatactes, Corvus macrorhynchos, Dicrurus leucophaeus, Mycerobas carnipes* and *M. icterioides*. The closest distance of this IBS from the transmission line is 9.5 KM. This IBA meets A2 and A3 criteria (1994) of Global IBA Criteria

[5] A1. Globally threatened species; A2. Restricted-range species; and A3. Biome-restricted species

(Birdlife.org, 2017-b).

5.2.2 Flora and Fauna

116. Project area's climate is continental with particularly hot summers in Nangarhar/Jalalabad, and very cold winters at the higher altitudes towards Kabul. This supports a wide range of flora and fauna species.

117. Typical trees in the Kohe Safi and Speen Ghar mountains (through which this transmission line will pass) are evergreens, oaks, and poplars. The plains traversed by the line are largely dry, treeless steppes with nearly uninhabitable deserts. Camel thorn, locoweed, and wormwood, a variety of sagebrush plants are visible on the project route. The project can affect fruit trees, such as apricots, peaches, apples, citrus, berry, etc. A total of 2,986 timber trees and 2,115 fruit trees will be lost.

118. Due to the sparse vegetation and degraded habitat, not many wild animals live along the project area. Therefore, wild animals are very rare in the project route. Only fox and jackals are reported in the project area, and wolves are rarely observed along the proposed route.

119. Birds, mammals, amphibians, and insects are the main animal groups there. It is less likely that any endangered wildlife species live along the line corridor (Wildlife Conservation Society - WCS, 2009).

5.2.2.1 Avifauna

120. As mentioned above two IBA are located in the project area: Kole Hashmat Khan (at 6 KM distance) and Safed Koh or Speen Ghar (at 9.5 KM). The central point of the latter IBA is Aryob Zazi area, a mountainous woodland located at the distance of 37.5 KM from the line.

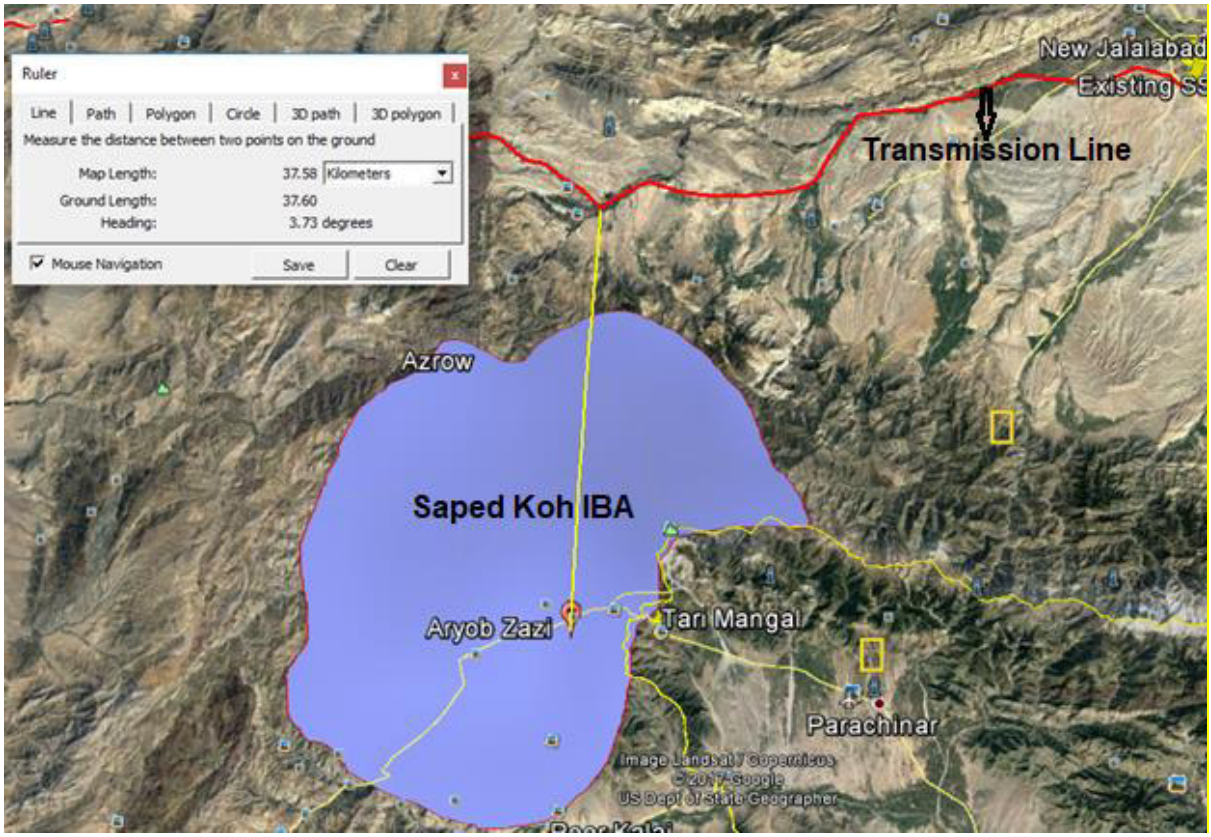

Figure 27 Safed Koh IBA with respect to line

121. The Farm-e-Hada has a recreational park area as well located at 1.5 km of the substation area.

Figure 28 Farm-e-Had recreational park

5.3 Economic Development

5.3.1 Industries

122. Afghanistan key industries are small-scale production of bricks, textiles, soap, furniture, shoes, fertilizer, tile, apparel, food products, non-alcoholic beverages, mineral water, cement; hand-woven carpets; natural gas, coal, copper (CIA, 2016). Approximately 22% percent of Afghanistan's economy is based in industry, and approximately 22% percent is based in agriculture and livestock, primarily wheat, fruit, wool and mutton, as of 2016. The rest of the economy 56% is service-based. In the project area around160 big and small factories are operate in Jalalabad.

123. Industries in Jalalabad has severely suffered due to lack of electricity. Jalalabad's power infrastructure is mired firmly in the 20th century. The main source of its electricity is the Soviet-era Daronta Dam and hydroelectric plant built in 1964. Old equipment and years of neglect have left its intake filters clogged and its power station functioning at about half capacity. Many industries have been closed because of electricity shortages in the region. Recently an 110kV line has extended from Naghlu hydropower plant (HPP) to Jalalabad city with very limited capacity compared to the region demand.

124. Furthermore, In Jalalabad there are around 2,500 poultry farms which has met

domestic need and generated thousands of jobs for people (Zarifi, 2017).

5.3.2 Agriculture

125. Nangarhar can be called the food basket of Afghanistan. The province good environment is favorable for various crops during different seasons. There is a trend to increased production of vegetables due to favorable market demand and its price. Most farmers have livestock, with dominant sheep and goats. Nangarhar key export products are grape, orange, watermelon, walnut, potato, and pomegranate.

Table 4 Main agricultural corps of Nangarhar Province

FRUIT AND NUTS	GRAPE
	Orange, Olives, Watermelon
	Walnut/Mulberry
GRAINS	Wheat, Maize
VEGETABLES	Onion, Potato
INDUSTRIAL	Cotton, Sugarcane

126. The key agricultural improvement areas as highlighted by UCDAVIS, (2013) are: Farmers in Nangarhar produce different crops, especially fruits and vegetables such as grape, olive, orange, watermelon, okra, tomato, spinach, etc. Financial services for farmers (Credit), animal husbandry, horticultural project (nursery improvement), value adding (product processing), postharvest technology and irrigation system improvement are some potential areas for development.

127. Some 59 % of rural households own or manage agricultural land or garden. Some 55% of rural households rely on agriculture as their main source of revenue. Some 28% of households in rural areas receive some income from trade and services and 40% of households in rural areas earn some income through nonfarm related labor. Livestock also accounts for income for 14% of rural households in Nangarhar (UCDAVIS, 2013). Most crops are cultivated by men in Nangarhar, except for vegetables, which are cultivated by both men and women. Harvesting is done by both men and women for all crop categories.

128. The agricultural cultures in the project area include wheat, corn, potatoes, tomatoes, onions, garlic, and a few other vegetables in small or negligible quantities. Melons and watermelons have the largest share amongst these crops with average yields of 2.8 to 3.5 ton for each type per ha. Crop cultivation within the corridor can continue after the stringing of lines has taken place. However, inside the ROW vegetation above 7 m height needs to be permanently cleared, including possible tall trees outside but nearby the ROW corridor. As reported in the LARP 1,523 m² area of wheat crops can be affected.

5.3.2.1 Fisheries

129. The transmission line crosses two tributaries of Kabul river at the Reshkhoor and Bagrami areas. As those rivers are seasonal the fisheries and fishing activities are very limited or nonsexist in these rivers. Fish does not contribute much to the country economy and therefore, not much attention is paid on aquatic resources. Furthermore, no fish types in Afghanistan are among endangered species list. The most commonly available fish in

Afghanistan is trout. Various varieties of fish families available in downstream Kabul River which is in significant distance from the project area (13 KM).

5.3.3 Transportation

130. Currently there is only one asphalted road connecting Kabul to Jalalabad. This road is called Kabul-Jalalabad Highway which length is 144 KM. This road follows the Kabul River for 64 kilometers. Fatal traffic accidents often occur in this area, mainly due to reckless driving and narrow lanes. The road is of utmost strategic importance, facilitating trade, humanitarian aid and reconstruction efforts.

Figure 29: Kabul Jalalabad High Way Google Map

131. Construction of the second road, which will connect Surkhrod of Jalalabad to Kabul Bagrami Area (the path has shown in the below figure) is currently in progress, funded by ADB. The 220 kV transmission line under this project will follow the new road from Butkhak, Bagrami, towards Jalalabad.

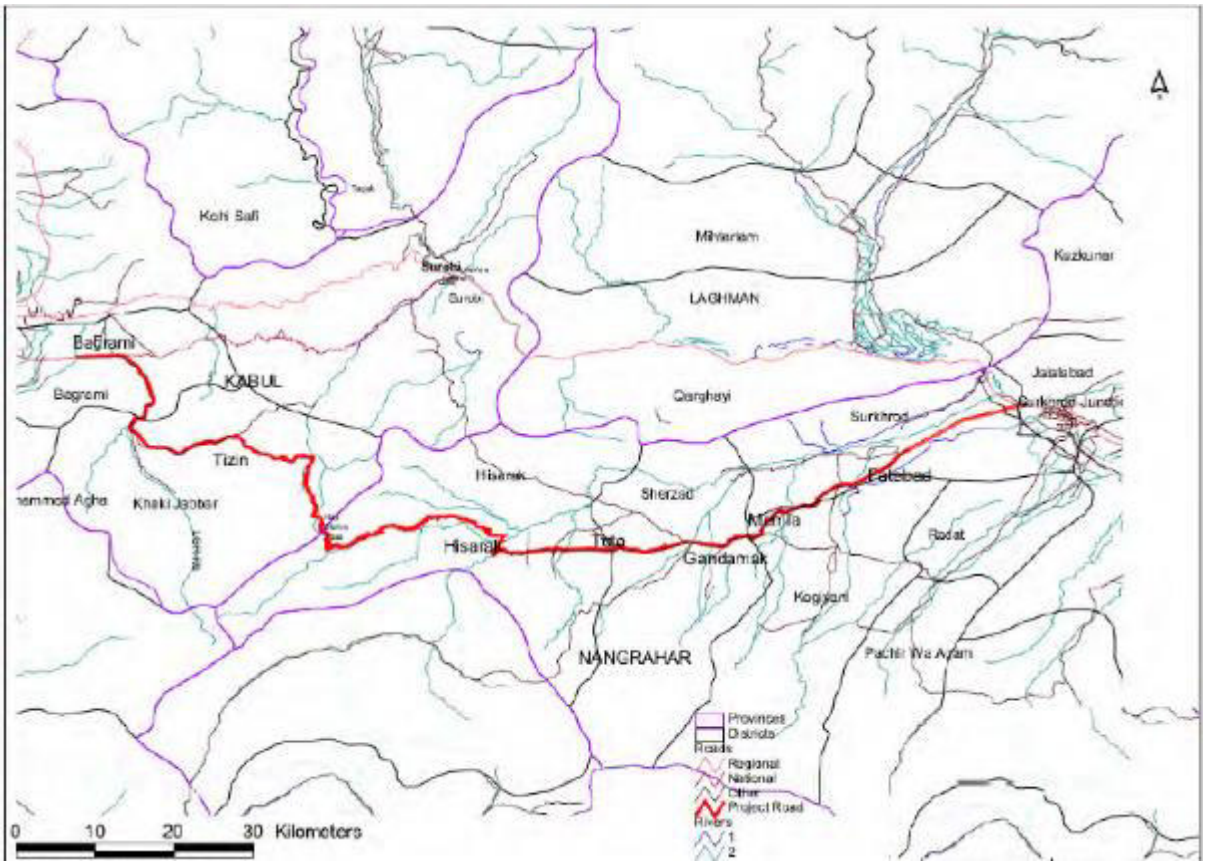

Figure 30: New under construction road from Kabul to Jalalabad (ADB, 2016).

5.3.4 Land use

132. The transmission line is a greenfield project. The project passes largely through rangeland and mountainous terrain. There are no cities or towns located along the route and the corridor is owned mostly by the government. Despite this fact, it is anticipated that some families can settle on the government land during implementation to receive compensations.

133. The transmission line crosses mountainous areas along the sealed road connecting Arghandeh in west Kabul to Jalalabad. Some 41.5% of the lands required for the towers is public unoccupied lands, while 58.5% - is privately owned by the people. The transmission line corridor comprises plain lands at either end (65 KM) within and adjacent to the municipal limits of Kabul and Jalalabad cities and mountainous terrain in the middle (86 KM).

134. The precise location of transmission towers will be ascertained at the detailed design stage by the contractor to be procured in 2018. It is pertinent to note that the location of 220-kV towers can safely be adjusted by 10 - 15 meters to minimize resettlement impact as the average distance between two transmission towers ranges from 200-225 meters. The project will affect a total of 374 AHs who will all lose land on permanent basis. In addition to land, some of these AHs will also lose trees, crops and structures (Please refer to LARP report of the project for further details).

135. DABS has proposed 500x500 m area at Shaikh Mesri of Surkhrod district for the construction substation. This land is the property of Afghan government allocated for the famous Farm-e-Hada Canal of Jalalabad. Hada Farm is one of the main olive producer in the Jalalabad city. The water supply to this farm is provided though water canal initiated from

Daronta dam. Based on the Jalalabad DABS director Mr. Omaid Sabah, currently they are in the process to officially allocate the land for the substation. And the delegation committee of the different ministries such as agriculture and urban development has decided in the favor of substation construction in the area. The land approval documents are currently under process at the ministry of agriculture.

5.3.5 Power Source and Transmission

136. There are 10 transmission line bays at the Arghandeh Substation which is the starting point of this 220 kV transmission line. The details of these transmission line are as below:

- Tow in coming 220 kV circuits from Chmtala Substation is feeding Arghandeh substation.
- The remaining eight 220 kV circuits are outgoing circuits from the Arghandeh substation. Two 220kV circuits have went to Logar, and two others have went towards Ghazni provinces. Two 220 kV circuits are in the plan to connect Arghandeh with Breshna Kot and the remaining two bays will feed this 220 kV transmission line towards Jalalabad.

137. There are currently three hydropower plants built on Kabul River, Mahipar (66 MW), Naghlu (100 MW) and Surobi (22 MW) these three plants are located in the Kabul province. Surobi and Mahipar is mainly providing electricity to Kabul while Naghlu provides electricity to both Kabul and Jalalabad cities. Furthermore, approximately 7 km west of Jalalabad on the Kabul River Daronta hydropower plant currently produce 11.5 MW energy to Jalalabad city. A 110 kV transmission line is connecting Naghlu Hydropower Plant (NPP) with Jalalabad city, built in 2011. And another 110 kV transmission line is connecting NPP with Kabul.

138. The proposed 220kV Arghandeh- Jalalabad line will cross over the 220 kV Arghandeh-Logar line at Gulbagh, Kabul region.

5.4 Social and Cultural Resources

5.4.1 Demography

139. Based on Afghanistan Central Statistics Organization (2017) the total population of the Kabul province is 4,679,648 and Nangarhar province - 1,573,973. The demographics of the project area is detailed in the below table::

Table 5: Details of population in the project area (Afghanistan Central Statistics Organization, 2017)

Province	Affected Districts	Male	Female	Total
Kabul	Paghman	62438	66405	128843
	Chaharasyab	18504	20172	38676
	Mosahi	11968	12700	24668
	Khak-e-Jabar	7279	7845	15124
	Bagrami	28377	30133	58510
Nangarhar	Surkhrod	61317	65744	127061
	Sherzad	34179	35736	69915

	Hesarak	15793	16685	32478
	Khogiani	66749	71018	137767
Total				633042

140. Some 86% of Nangarhar population lives in rural areas, while the remaining inhabit the urban areas, mainly Jalalabad city. The most populated districts of the Nangarhar province are Jalalabad, Behsood, Khogiani, Acheen and Surkhrod. In terms of ethnicity the main groups comprise Pashtuns (1st), Pashayee (2nd). Minority groups of Tajiks and Gujjars also live in this province. The province's major language is Pashto. Furthermore, during winter Nangarhar province witnesses more than 200,000 Kuchi migrants, and during summer this figure ranges from 50,000 to 100,000. It is worth mentioning that Nangarhar province is the key destination for returning refugees and internally displaced peoples (IDPs); Nangarhar is the destination of 19.6% (roughly 909,000 individuals) of the total returnees. It is also the largest and main hosting province for IDPs (nearly 69,000 individuals).

141. The Land Acquisition and Resettlement Plan (LARP) document which part of the tender package provides further socio-economic information about the project affected people and properties. The below figure shows the settlement along the proposed route from Bagrami to Surkhrod Jalalabad.

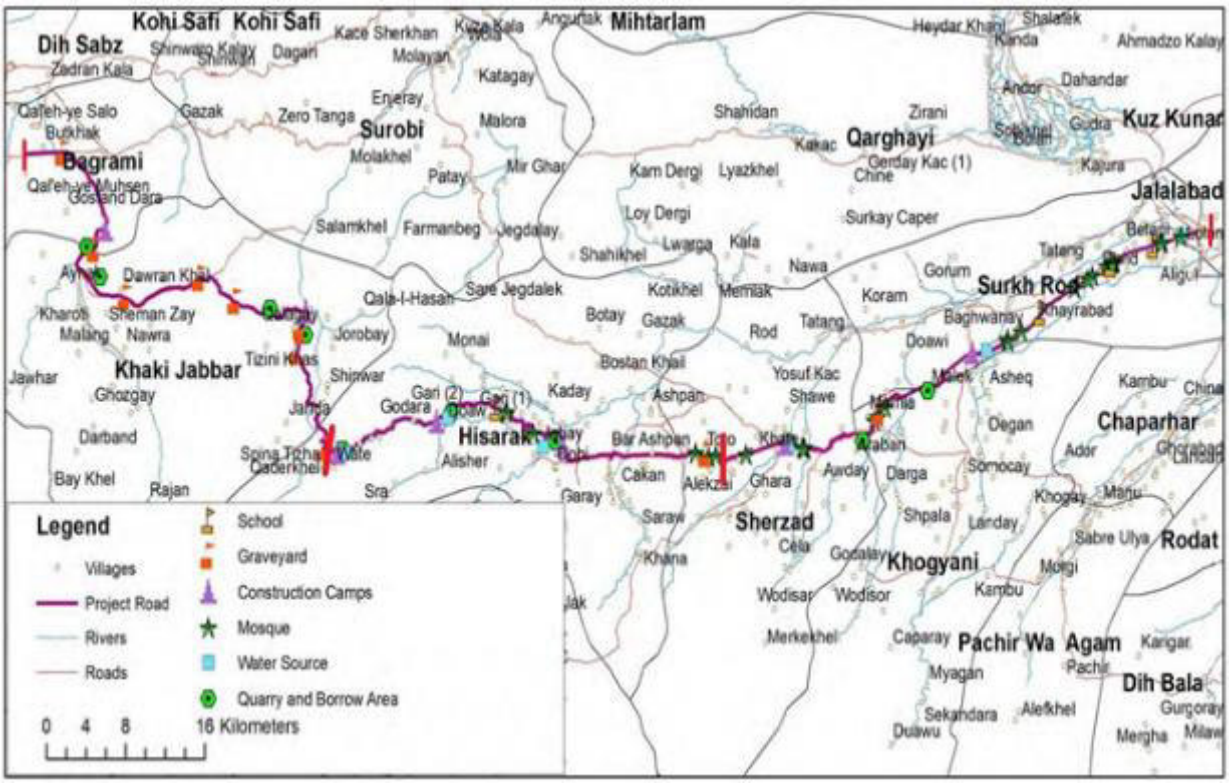

Figure 31 Settlement and villages detail along the line proposed path (ADB, 2012)

5.4.2 Health and Education Facilities

142. Kabul has 67 Basic Health Centers (BHC), 38 Comprehensive Health Centers (CHC), 6 District Hospitals (H3) and 7 Mobile Clinics (MOB) with some other health related facilities as shown with details in below figure.

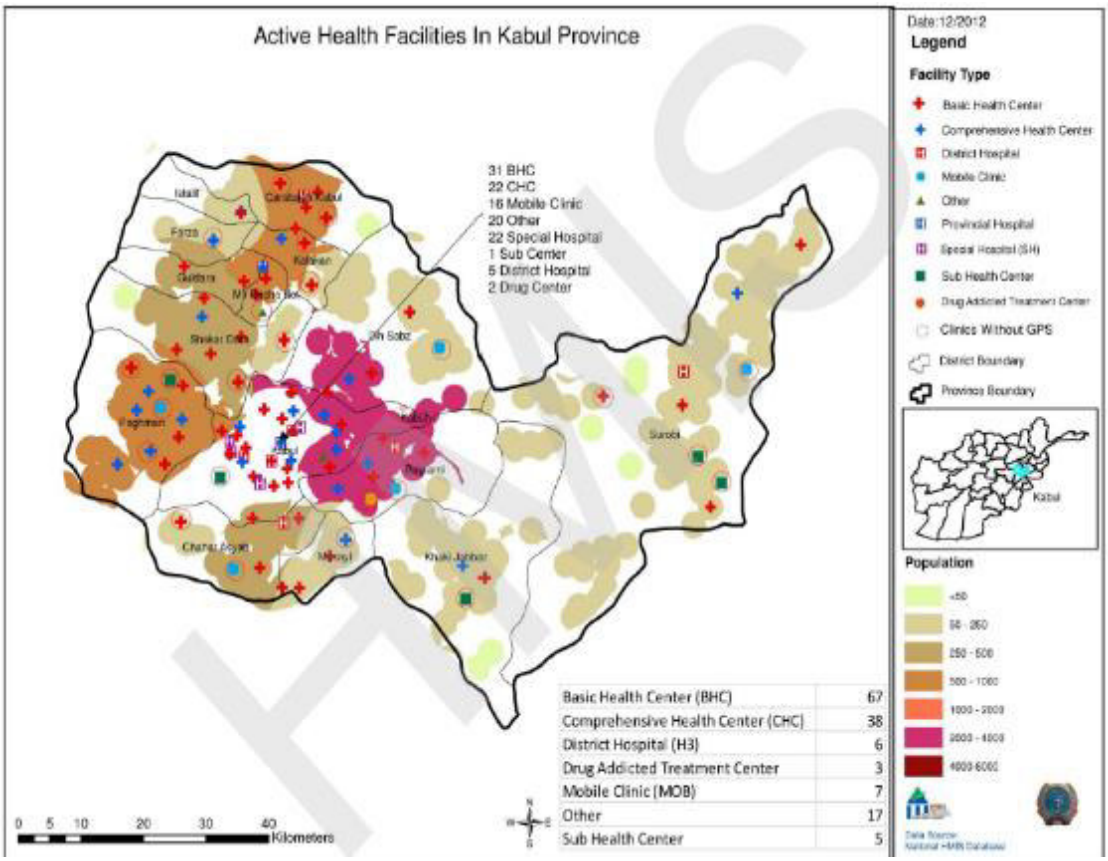

Figure 32 Kabul province active health facilities (MoPH, 2013)

143. Nangarhar province has 73 Basic Health Centers (BHC), 19 Comprehensive Health Centers (CHC), 3 District Hospitals (H3) and 3 Mobile Clinics (MOB) with some other health related facilities as shown with details in below figure.

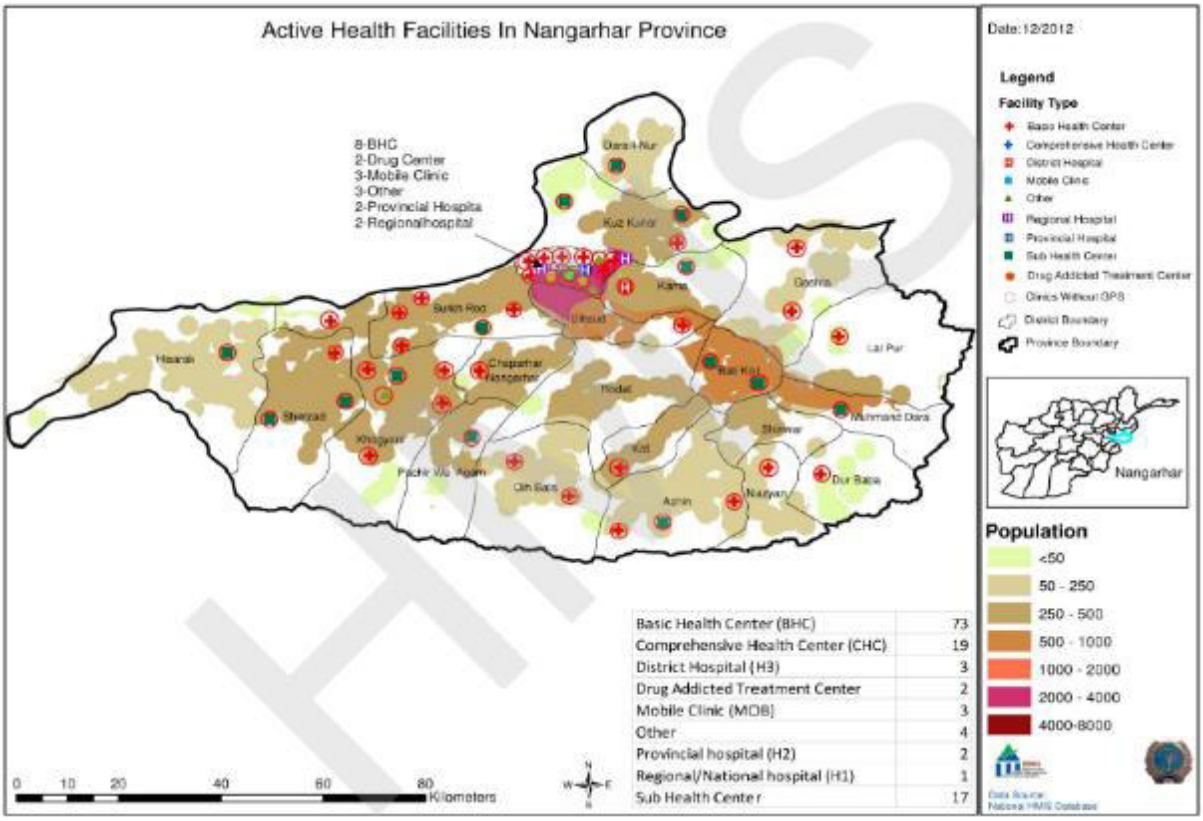

Figure 33 Nangarhar province active health facilities (MoPH, 2013)

144. The details of educational facilities in the project area are shown in the below figure:

District	Number of Primary School	Number of Secondary School	Number of Home based School	Pupils	
				Male	Female
Bagramy	5	9	1	6000	4000
Khakijabbar	1	4	0	400	0
Khogyani	4	34	4	15745	3013
Sherzad	2	11	1	7086	1101
Hisarak	1	14	3	4023	1505
Surkhrod	3	17	0	7537	3382
Total	16	89	9	40791	13001

Figure 34 Details of districts educational facilities in the project area

5.4.3 Socio-economic Conditions and Employment

145. The project main beneficiary is Nangarhar province which is located in eastern part of Afghanistan. More than half of province is mountainous (55%) while the rest is made up of flat or semi mountainous land. Nangarhar is also one of the Kuchi (nomadic herdsmen) destinations during different season (UCDAVIS, 2013).

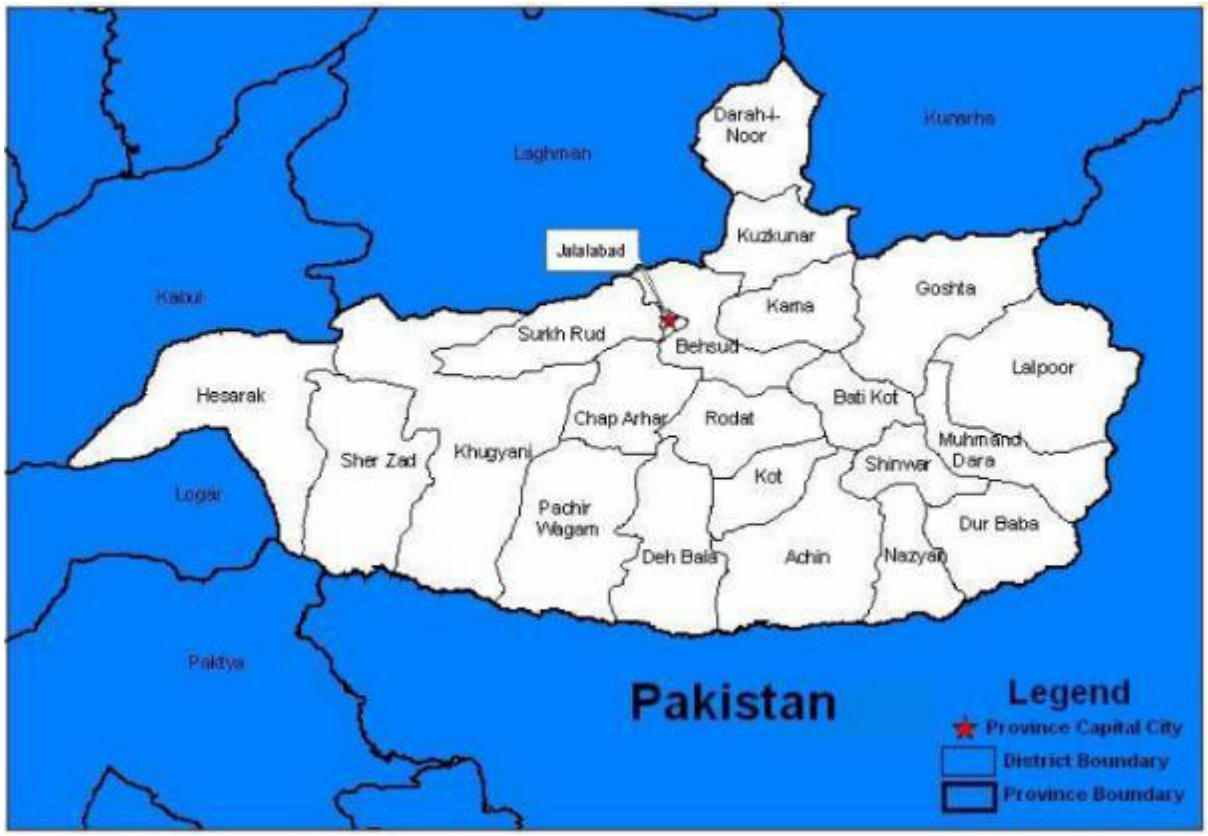

Figure 35 Nangarhar pronince with its districts (UCDAVIS, 2013)

146. The casual labor market system in Nangarhar province is under an extremely high degree of stress as the result of the rapid increase in supply of labor with only a modest increase in demand (mostly concentrated in construction and the sale of basic commodities). The average daily wage has fallen, since March 2016, by an average of 12% for unskilled and 20% for skilled labors across five key industries (agriculture, construction, loading and transport, small scale services, and skilled trades). In parallel, job seeking has become more challenging and competitive. The average labor reliant household reports finding an average of 13 days' work in March 2017, in comparison to 18 days in March 2016 (EMMA, 2017).

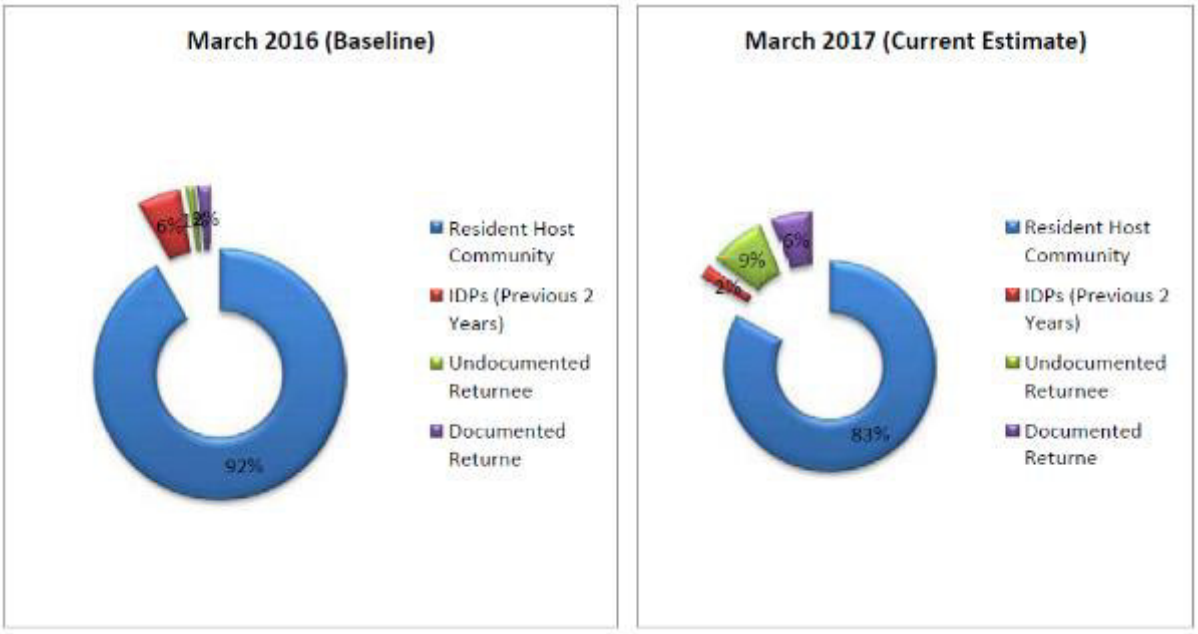

Figure 36 Nangarhar province demographics by status: baseline, current, and projection (EMMA, 2017)

147. Poverty rate in Nangarhar province is 33.0% and per capita monthly total consumption is 1,550 Afs. Literacy rate in this province is 22.8%. The Kuchi population in the province has particularly low levels of literacy with just 2.1% of men able to read and write. School enrolment is 49% in the province and child labor reaches 19.6% (UCDAVIS, 2013).

5.4.4 Tourism

148. The project route has a significant tourism potential due to its rich cultural, historical heritage and attractive views. The major tourist attraction in the project area is Memla gardens (also known as Nimla Bagh), a collection of gardens located in the village of Memla, Khogiani District. It is recognized to be the living legacy of centuries of refined and dedicated horticulture by Mughal emperors. The layout of this garden is a re-creation of Eden ('chahar bagh' in Persian) with four quadrants and four rivers. The traces of the gardens remain as cypresses and formal arrangement of flowerbeds and fountains. These gardens/nurseries were also used to grow orchard fruits. Another significant tourist attraction is the Moi Buharak Mosque located in the village of Sawati at 150 KM near Surkhrod. The mosque secures the Hair of the Prophet Mohammad (pbh). Furthermore, the National Museum of Afghanistan is located 3.5 KM far from the path of this line at Darul-Ama area.

5.4.5 Archeological and Historical Heritage

149. Based on (Neelis, 2011) reliquaries and other artifacts from stupas and monasteries clustered around Haḍda also called Ada-Akhundzada (at 6 KM of the new substation planned to be constructed) show that this area was an important center of artistic and textual production with immediate ties to Gandhāra. Buddhist stupas and monasteries at Chahar Bagh, and Haḍda were already recognized as major sources of coins deposited in reliquaries as well as Buddhist sculptures before preliminary surveys by French Archaeological Mission (DAFA) excavations undertaken at sites around Haḍda. But currently there is no sign of such artifacts in the Hadda area.

150. Ada-Akhundzada is an archeological site located in the Surkh Road district of Nangarhar located 6.8 KM from the proposed substation site. All the sculptures of the site have been looted during the war. Based on local people this site was one of the central place of the Gandhara civilization. Buddhism sculptures are also reported to be found in the Sherzad district at 8.4 KM distance from the line. It was reported that illegal excavations were done here few years back to dig various artifacts which include Buddhist icons, coins, jewelry and dishes. In Bar Ashpan, near Hesarak Buddhism sculptures relics can be seen located at 6.4 KM distance from the line route. There is no specific archeological site in this area and local people has found these artifacts after excavation and some cases unintentional. It is worth mentioning that the transmission line in these areas will follow the ROW of ADB funded under construction Kabul-Jalalabad new road and no such resources on the route were reported during the road construction. It is reported, however, that the area might have undiscovered underground heritage which is not known to the public

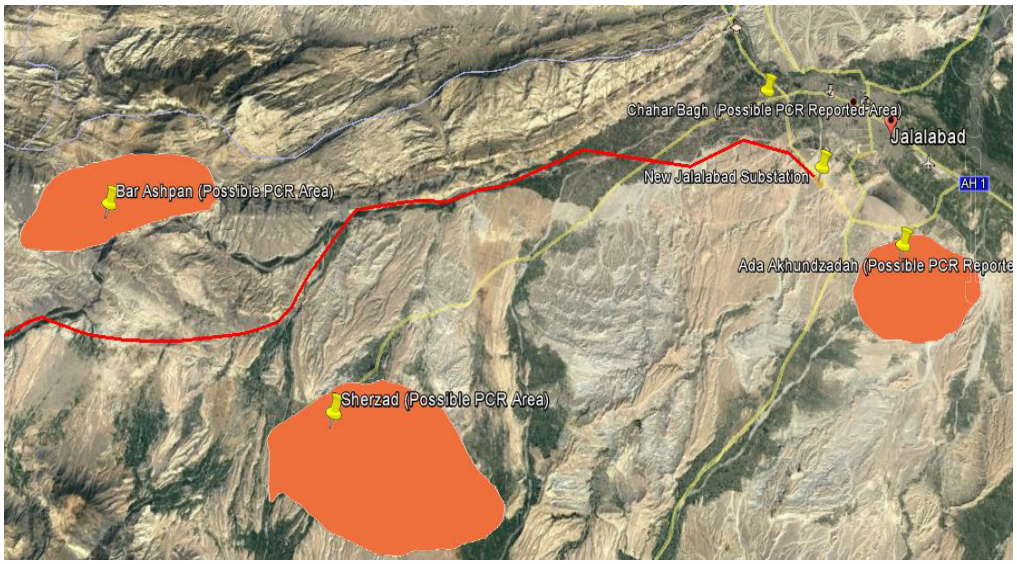

Figure 37 Possible PCR find areas in the project area.

6. Screening of Potential Environmental Impacts and Mitigation Measures

151. Anticipated impacts and mitigation measures have been discussed considering following four key phases of the project:

- Design phase
- Construction phase
- Operation phase
- Decommissioning phase

152. Each phase environmental screening has done in consideration of its impacts on physical environment, ecological environment, and socio-economic development.

6.1 Impacts and Mitigation Measures during the Design Phase

153. The transmission line site evaluation and design impacts such as line path survey site characterization, and monitoring are usually temporary and of relatively smaller magnitude.

These activities are performed at a less significant scale than those at the construction and operation stages. The impacts at this stage includes vehicular and pedestrian traffic, and drilling to characterize subsurface conditions.

154. The initial feasibility analysis is performed to make sure that an acceptable route exists for the ROW that:

- Presents minimal engineering challenges (e.g., avoids rock outcrops, steep slopes, water bodies and other similar features to the extent possible) and
- Results in the least impact to the existing public infrastructures and environment.

155. An ideal site selection for a project avoids or reduces major environmental impacts. Therefore, activities that could occur during the detailed design phase are field surveys for recording significant resources present in a potential project area (e.g., cultural resources, archaeological sites or wetlands). These surveys are typically of short duration and result in limited disturbance.

156. All the essential permits must be obtained and regulatory requirements must be achieved before detail design and construction can begin. The route is surveyed to establish the centerline and edges of the ROW. Generally, only small survey crews and survey equipment would be required. The below potential impacts might result from the project site evaluation activities.

6.1.1 Physical Environment

6.1.1.1 Impacts on Soils and Geologic Resources (including Seismicity and Natural Hazards) and Mitigation Measures

157. Surface disturbance and use of geologic materials are minimal during the site assessment phase, and soils and geologic resources are unlikely to be affected. Site geotechnical survey activities would also be unlikely to activate geological hazards or increase soil erosion.

i. Seismicity

158. As mentioned in section (5.4) the project area is in the earthquakes fault zones. Research shows that future large earthquakes, driven by ongoing active geologic processes in the region, will occur, with a consequent risk for casualties and damage. The seismic hazard must be considered in the design of this project facilities. As the transmission line goes through mountainous terrains therefor, the designer must keep in mind that large earthquakes can devastate unreinforced brick and stone buildings and trigger large landslides in mountainous terrain.

159. Medium to high risk seismicity level (Richter scale 6-7.5) is proposed to be taken into design consideration in the Detailed Design Report. This translates into peak ground acceleration of 2.4 to 3.2 m/s.

ii. Rock Fall and Flooding

160. As mentioned in the Section 4.4 the route has rock-fall prone areas. Therefore, tower construction in those areas should be avoided and rock fall protection measures need to be considered in the detail design in case the route cannot be diverted. Furthermore, flooding can devastate the substation infrastructure, and can cause short circuits in the underground feeders. Therefore, flooding assessment should also be considered in the detail design around

the substation area and towers erection in the potential flooding sites on the line route.

161. Overall Mitigation Measures: Siting and design considerations that mitigate impacts include:

- Identify soil properties, engineering constraints, corrosive potential, and facility design criteria.
- Avoid the floodways and rock fall areas for tower installation in the detail design phase.
- Identify and avoid areas with unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structure).
- Develop a site grading and management plan to identify areas of disturbance, areas of cut and fill, slope during and after grading, existing vegetation, and measures to protect slope, drainages, and existing vegetation in the project area.
- Develop an erosion control and re-vegetation plan to delineate measures to minimize soil loss and reduce sedimentation to protect water quality.
- Locate facility structures to comply with the setback requirements of the site grading and drainage plan to avoid disturbing natural watercourses.
- Design runoff control features to minimize soil erosion (TEEIC, 2017).

6.1.2 Health and Safety

162. Occupational and community health and safety risks normally associated with construction and outdoor activities exist, however, are very limited during the site assessment phase because of the limited range of activities. Siting and design considerations that mitigate impacts include:

- Conducting a safety assessment to describe potential safety issues (site access, construction, work practices, hazardous materials, security, transportation of heavy equipment, traffic management, emergency procedures, wildlife encounters, and fire control and management) and measures to mitigate them.
- Develop and implement a health and safety program for workers and the public, addressing all the safety issues identified in the assessment and all applicable safety standards.
- Address specific issues (e.g., school bus routes and stops) in a traffic management plan or in the health and safety program.
- Fence the site to prevent the public access (TEEIC, 2017).

6.1.3 Line Routing

163. Any overhead line will be a visual intrusion into the landscape through which it passes, and it is the dominant scale of towers which makes them difficult to absorb into the landscape. In selecting a route, it is recommended to reduce the visual effect of the line in terms of the number of people affected and the degree to which they are affected. The nature and topography of the landscape is considered and any statutory protection afforded to an area is also considered (Nationalgrid, 2008).

164. The current design of the transmission line routing is preliminary. The line has been routed considering technical and economic aspects along with social and environmental ones. However, not all impacts can be avoided, specifically:

- The line crosses Kabul River, Logar River, Kogdara River, Gandamak and Hasham Kale River
- Line will pose visual effects to some extent on topography of the area.
- Some land acquisition and resettlement activities are required in Kabul and Nangarhar areas.
- Crossover of the current 220kV line from already in place for Arghandeh to Logar 220kV lines at Gulbagh area of Kabul province.

Figure 38 Transmission line route showing the key crossing points

165. Adjustments to the route shall be considered during detailed design to minimize or avoid the above impacts. As the detailed design is the responsibility of the turnkey contractor, a careful monitoring will be necessary. Minimal ground clearance will be sufficient so that no negative interference with the traffic occurs in case of road crossings. Special towers should be considered for crossover of another transmission line, crossing rivers and highway (Kabul Gardez Highway).

6.2 Impacts and Mitigation Measures during the Construction Phase

166. The transmission line construction process includes the following steps:

- ❖ The ROW is cleared of vegetation, rocks (possibly requiring blasting), and other items that may prohibit construction. In addition to these activities, establishment of access roads would also necessitate grading and, possibly, excavation.
- ❖ Support structures are installed. A work area for placement and construction of the structural components of support structures would be established at each support structure location. Blasting may be required if bedrock occurs at structure locations or for breaking or moving large rocks that restrict construction equipment access. The support structure would be erected by a crane. Some support structures may require backfilling of the hole with concrete, concrete bases, or guy wires.
- ❖ Insulators are installed to the support structure cross-arms.
- ❖ Conductors and shield wires are strung. These are pulled through stringing blocks by tensioning equipment to keep them from coming in contact with the ground or other objects that could cause damage (TEEIC, 2017).

167. The activities during project's construction phase, potentially causing environmental impacts, include ground clearing and removal of vegetative cover, grading, excavation, blasting, drilling, vehicular and pedestrian traffic, noise, dust and project component construction and installation.

168. Environmental concerns of power transmission can include the following:

- Terrestrial habitat alteration (as this project does not cross any forest so this impact is negligible)
- Aquatic habitat alteration (due to seasonal water flow in the project area rives fishes and other habitat does not exist in these rivers therefore, this impact is also negligible in case of crossing rivers during dry season)
- Electric and magnetic fields
- Hazardous materials (IFC, 2007)

169. The following impacts, presented by resource, may result from this transmission line construction activities.

6.2.1 Physical Environment

6.2.1.1 Impacts on Topography and Mitigation Measures

170. Existing land use during construction would be affected by intrusive impacts such as ground clearing, increased traffic, noise, dust, and human activity, as well as by changes in the visual landscape. In particular, these impacts could affect sensitive receptors, such as schools or hospitals or recreationists seeking solitude or recreational opportunities in a relatively pristine landscape.

171. Vegetation removal and ground disturbance could result in visual impacts that produce contrasts of color, form, texture, and line. Excavation for foundations and ancillary structures; trenching for poles foundation; grading and surfacing roads; clearing and leveling staging areas; and stockpiling soil and spoils (if not removed) would (1) damage or remove vegetation, (2) expose bare soil, and (3) suspend dust. Soil scars and exposed slope faces would result from excavation, leveling, and equipment movement.

172. Specific mitigation measure recommended during the construction phase of the project are:

- Bring material from authorized sites.
- Avoid creating excessive slopes during excavation and blasting operations.
- Dispose of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials.
- Save topsoil removed during construction and use to reclaim disturbed areas.
- Stabilize soils during final landscaping of project site.

6.2.1.2 Impacts on Acoustics (Noise) Environment and Mitigation Measures

173. The sources of noise during construction would primarily occur from equipment (chainsaws, bulldozers, and diesel engines). The additional noise sources include vehicular traffic and blasting. In most cases this transmission line passes through terrain which are away from residence areas. In case if the line will pass near a residential area, noise levels from

blasting and some equipment operation could exceed the permissible noise levels indicated in the World Bank General EHS guidelines, but would be intermittent and extend for only a limited time. Based on the Guidelines the noise impacts should not exceed the levels presented in the below table or result in a maximum increase in background levels of 3 dB at the nearest receptor location off- site.

Table 6 community noise levels guidelines values for noise levels measured out of doors (IFC, 2007)

Receptor	One Hour L_{Aeq} (dBA)	
	Daytime (07:00-22:00)	Nighttime (22:00-07:00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70

i. Noise Impacts on Workers and Mitigation Measures

174. Nosie of construction and transportation will have negative impact on workers. Noise could cause hearing loss, impair the ability to communicate and hear high frequency sounds and even permanent hearing loss. During construction of the substation and pole foundation, there would be noise from construction equipment. The levels would range from about 70 decibels (dB) for a paving breaker to about 85 dB from large trucks. The noise must not exceed the OSHA all worker permissible exposure limit of 80 dBA for eight hours day. There are two main ways to reduce and control worker exposure to noise in workplace where the noise is excessive:

- Engineering Control: this involve replacing or modifying equipment, or bringing relevant changes at the source of noise or along the noise transmission path. The contractor must make sure that the low noise level machinery and tools are utilized. Maintain and lubricate equipment and machinery (oil bearings) in accordance to its respective manufacturer recommended periods. Place a noise barrier such as curtains and sound walls between the employees and noise source. And isolate or enclose the noise source.
- Administrative Control: this includes changes in the schedule or workplace that eliminate or minimize the labors exposure to noise. The contractor must schedule the noisy machinery operation when fewer workers are exposed in case possible, limit the time a worker spends near a noisy source, and provide a quiet area where employees can gain relief from noise sources. Furthermore, the control of the noise exposure through distance is often a simple, inexpensive and yet effective administrative noise control way. To be precise, for every double of the distance among the workers and noise source the noise could be reduced by 6 dBA (OSHA, 2017).

ii. Noise Impacts on Communities and Mitigation Measures

175. Work outside the usual working hours/day will have negative impacts in terms of noise and disturbances on communities. Therefore, it is recommended that no construction should be allowed during nighttime (22:00-07:00), particularly the construction material transportation or night construction work could be limited to relatively quiet activities, such as interior work. As this project does not require huge amount of construction work at a specific location except the Jalalabad Substation the impacts of noise will be minimal. However, if the noise still exceeds the allowable limits the above mentioned mitigation measures should be taken. In addition, vehicle traffic on unpaved roads should be avoided as far as possible. The contractor

must have sound level meter at site to continuously monitor the noise level.

176. Additional key mitigation practices for noise impacts that could apply to all phases of this transmission line and substation project include:

- Limit noisy activities to the least noise-sensitive times of the day (weekdays only between (07:00- 22:00).
- Whenever feasible, schedule different noisy activities (e.g., blasting and earthmoving) to occur at the same time, since additional sources of noise generally do not add a significant amount of noise. That is, less-frequent noisy activities would be less annoying than frequent less-noisy activities.
- Heavy duty equipment should have sound-control devices no less effective than those provided on the original equipment. Muffle and maintain all construction equipment used.
- Notify nearby residents in advance when noisy activities are required.
- To the extent feasible, route heavy truck traffic supporting construction activities away from residences and other sensitive receptors.
- Post warning signs in high-noise areas and implement a hearing protection program for work areas where noise exceeds 80 dBA.

iii. Blasting Operation

177. The blasting operations should be avoided to the extent possible. Blasting process is associated with the generation of ground vibrations, noise, dust, fumes and fly-rocks. The environmental impacts of ground vibrations, noise and fly-rock pose a great challenge to the safety of the nearby structures and the people. A proper blast design ensures effective utilization of the energy of the explosives and will mitigate the environmental impacts. Furthermore, blasting will be carried out using a pre-established schedule. Where possible blasting mats will be used to reduce noise levels when blasting is carried out. Nearby communities will be informed about the schedule of controlled blasting during the construction phase. Following mitigation measures are necessary to consider for blasting process:

- Develop a blasting management plan.
- Monitor ground heave, block movement.
- Closer holes spacing, use smaller diameter holes.
- Good perimeter control blasting to minimize over-break.
- Use blasting mats to contain the blast, prevent flying rocks and suppress dust.
- Observe geology, look for open seams.
- Videotape blast rounds and watch for little problems, to prevent bigger problems.
- Inform the near communities and security officials in advance.
- Provide safe area for the workers.

6.2.1.3 Impacts on Air Quality and Mitigation Measures

178. Emissions generated during the construction phase include diesel emissions from generators and large construction equipment; volatile organic compounds (VOCs), vehicle emissions; emissions from storage and transfer of fuels for construction equipment; small amounts of carbon monoxide, nitrogen oxides, and particulates from blasting activities; and fugitive dust from various sources such as disturbing and moving soils (grading, clearing,

excavating, backfilling, dumping, and truck and equipment traffic), mixing concrete, storage of un-vegetated soil piles, and drilling and pile driving. Air quality impacts could also occur if cleared vegetation is burned. Therefore, measures need to be taken to mitigate these emissions.

179. The construction work of the project generates particulate matter, which can be a significant pollutant particularly in any nearby areas such as residential areas. During the construction of project, fugitive dust comes from blowing exposed soil or other particles. Fugitive dust becomes an issue as the land is cleared and graded, and as delivery trucks and other vehicles and equipment travel on dirt or gravel roadways in the construction area. The dust becomes a nuisance in nearby neighborhoods, a face and lung irritant, or a visual obstacle in nearby streets. The dust must be suppressed, and this is usually done by spraying unpaved roads with water and stabilizing exposed soil areas.

180. Vehicle and diesel generator emission will have negative impact on environment. Therefore, vehicles and generators should be kept in good working condition and properly maintained, in order to minimize the exhaust emissions. The dust emissions should be minimized by methods, such as spraying water on soil, where required and removal of dirt and mud from vehicles wheels before leaving the project site and the loading plants. In addition, the vehicle should move in slow speed in the site and on unpaved roads to avoid excessive dust emissions. Attention should be given to conserve water during the construction. The construction and operation worker should be provided with liquefied petroleum gas (LPG) for cooking and heating if required, and the usage of fuel wood should not be allowed. Generators and vehicles used in this project should have exhaust mufflers to minimize the exhaust and noise.

181. The below mitigation measures are recommended in all phases of the project to control the air quality particularly during the construction phase:

- Use dust abatement techniques on unpaved surfaces to minimize dust and during earthmoving activities, prior to clearing, before excavating, backfilling, compacting, or grading, and during blasting.
- Introduce speed limits to reduce airborne fugitive dust from vehicular traffic.
- Limit access to the construction site and staging areas to authorized vehicles only through the designated treated roads.
- When possible, schedule construction activities during periods of low winds to reduce fugitive dust.
- Cover construction materials and stockpiled soils if they are a source of fugitive dust.
- Train workers to handle construction materials and debris during construction and dismantlement to reduce fugitive emissions.
- Keep soil moist while loading into dump trucks.
- Keep soil loads below the freeboard of the truck.
- Minimize drop heights when loaders dump soil into trucks.
- Tighten gate seals on dump trucks.
- Around the work area the NO_2 (annual average concentration) must not exceed 0.053 ppm and Sulphur Dioxide (SO_2) - 0.14 ppm.
- Cover dump trucks before traveling on public roads (TEEIC, 2017).

6.2.1.4 Impacts on Soils and Geologic Resources and Mitigation Measures

182. Surface disturbance, heavy equipment traffic, and changes to surface runoff patterns can cause soil erosion. Impacts of soil erosion include soil nutrient loss and reduced water quality in nearby surface water bodies. Sands, quarry stone and gravel would be excavated for use in the construction of access roads; concrete for foundations and ancillary structures; for improving ground surface for lay-down areas and crane staging areas.

183. Possible geological hazards (earthquakes, landslides) can be activated by excavation and blasting of raw materials, increasing slopes during site grading and construction of access roads, altering natural drainage patterns, and toe-cutting bases of slopes. Altering drainage patterns accelerates erosion and creates slope instability.

184. In some areas, the transmission line tower sides' soil needs to be protected from erosion through applying certain structures of metal mesh or stone masonry. Additionally, soil around the towers needs to be fully compacted to avoid potential erosion in future. The below figure shows a badly compacted existing tower foundation soil in the Arghandeh area.

Figure 39 Soil erosion protection retaining wall currently used for tower foundation at Arghandeh

Figure 40 Example of poorly compacted soil in tower foundation in the Arghandeh area

185. As the transmission line corridor is characterized as terrain with undulated semi-desert there is no major risk for erosion during construction of access roads, towers and substations.

General mitigation principles and practices that could mitigate this transmission line soil impacts include:

- Clean and maintain catch basins, drainage ditches, and culverts regularly.
- Obtain borrow material from authorized and permitted sites.
- Inspect and maintain project facilities regularly, including access roads, to ensure erosion levels remain the same or less than current conditions.
- Reclaim or apply protective covering on disturbed soils as quickly as possible.
- Apply erosion controls, such as jute netting, silt fences, and check dams.
- In areas of potential wind erosion, apply gravel to access road surfaces.
- Use special construction techniques in areas of steep slopes, erodible soils, and stream crossings.
- Maintain vegetative cover within the right-of-way (ROW) to prevent erosion and monitor periodically to assess erosion (TEEIC, 2017).

6.2.1.5 Impacts on Cultural and Historic Resources and Mitigation Measures

186. As mentioned in the Section 5.9.5 the line route can encroach on underground historical and archeological resources. It was reported that illegal excavations were done few years back to dig various artifacts which include Buddhist icons, coins, jewelry and dishes. Furthermore, some ancient structures are located at Kabul Paghman area near the proposed line route (coordinates: 34.48111, 68.98) as shown in below figure.

Figure 41 Ancient structure at Kabul area near the proposed line route

187. Direct physical disturbance through construction activities such as vegetation removal and earthmoving, or building renovation; indirect construction disturbance by blasting or vibration; increased human access; and operational impacts that include altering the amenity of a site or area by factors such as noise, vibration and reduction in scenic quality (ADB, 2012; Environment Safeguard a Good Practice Sourcebook).

188. Potential impacts to cultural resources include:

- Complete destruction of the resource if present in areas undergoing surface disturbance or excavation;

- Vandalism, theft and illegal export of movable Physical Cultural Resources (PCR), and of pieces of monumental PCR.
- Degradation or destruction of near-surface cultural resources on- and off-site resulting from changing the topography, changing the hydrological patterns, and soil movement (removal, erosion, sedimentation).
- Unauthorized removal of artifacts because of human access to previously inaccessible areas.
- Soil compaction, damaging buried PCR (archaeological and paleontological) on site.
- Vibration, air, soil and water pollution, leading to damage to natural and human-made PCR in the vicinity (ADB, 2012; Environment Safeguard a Good Practice Sourcebook).

189. To avoid adverse impacts to PCRs it is recommended to undertake the following mitigation measures:

- Conduct a records search to determine the presence of known archaeological sites and historic structures within the area of potential effect. Identify the need for an archaeological and/or architectural survey.
- Periodic monitoring of significant cultural resources near the development may be required to reduce the potential for looting and vandalism.
- An unexpected discovery of cultural resources during any phase of the project shall result in a work stoppage near the find until the resources can be evaluated by a professional archaeologist.
- Educate workers and the public on the consequences of unauthorized collection of artifacts.
- During all phases of the project, keep equipment and vehicles within the limits of the initially disturbed areas.
- Prepare and follow a cultural resources management plan, if cultural resources are present at the site or if areas with a high potential to contain cultural material have been identified.
- Use existing roads to the maximum extent feasible to avoid additional surface disturbance.

190. The line also passes near the local cemeteries in Kabul Sahak area at (34.45 and 69.22 Lat. /Lng.) and four other places on the route. It is important to divert the line route from such places. During all phases of the project the equipment and vehicles should be kept within the limits of the initially disturbed areas.

Figure 42 Cemetery on the line path at Kabul Chaharasyab area

i. PCR Chance Find Procedure

191. An unexpected discovery of cultural resources during any phase of the project shall result in a work stoppage near the find until the resources can be evaluated by a professional archaeologist. Chance finds must not be disturbed until avoidance, minimization or mitigating measures are developed by competent experts from Afghanistan Ministry of Information and Culture (MoIC). Workers should be educated on the consequences of unauthorized collection of artifacts.

192. The contractor must develop a cultural resources management plan. The plan should include.

- Definition of the PCR to which the procedure applies
- Ownership of the found artifacts: Ministry of Information and Culture
- Recognition procedure for identifying chance finds during project implementation
- Procedure upon discovery, a rapid response procedure to protect chance finds while minimizing disruption to project activities (i.e., stipulates the procedures for consultation with the authorities legally responsible for PCR, demarcation of the discovery site, chance finds report, arrival and actions of cultural authority, and suspension/non-suspension/further suspension of work) (ADB, 2012; Environment Safeguard a Good Practice Sourcebook).

ii. Removal

193. Most PCRs are best protected by conservation in situ, as removal is likely to result in permanent damage or destruction. The contractor and DABS must ensure that the project team does not remove any PCRs unless the following conditions are met:

- No alternatives to removal are available.
- The overall project benefits substantially outweigh the anticipated cultural heritage loss from removal.

- Removal is conducted in accordance with the relevant provisions of national laws, regulations, and protected area management plans and national obligations under international laws, and employs the best available techniques.

194. Prior to removal of the PCR, the contractor and DABS should consult the owners MoIC and take their views into consideration. Additionally, the removal technique proposed by the expert may be peer-reviewed by other qualified experts (ADB, 2012; Environment Safeguard a Good Practice Sourcebook).

6.2.1.6 Impacts on Water Quality and Mitigation Measures

195. Use of or spills of chemicals (for example, dust suppressants, dielectric fluids, herbicides) could result in contamination of surface or groundwater. There is always the risk of spill which could result in these chemicals leeching into the soil and contaminating water.

196. In addition, water would be required for making concrete, dust control and consumptive use by the construction workers. Depending on availability, it may be trucked in from off-site or obtained from local groundwater wells or nearby surface water bodies such as Kabul and Logar Rivers.

Water quality can be affected by:

- Activities that cause soil erosion;
- Weathering of newly exposed soils causing leaching and oxidation that can release chemicals into the water;
- Discharges of waste or sanitary water;
- Herbicide applications; and
- Contaminant spills, especially oil.

197. As the groundwater table in the transmission line corridor Arghandeh to Jalalabad can be observed at various depth from 20 to 100 meters, the risk of groundwater pollution is low even under sandy soils. Nevertheless, surface and groundwater flow systems could be affected by withdrawals made for water use, wastewater and storm-water discharges, and the diversion of surface water flow for access road construction or storm-water control systems.

198. Following mitigation measures are recommended to reduce the adverse impacts on water quality:

- Save topsoil removed during construction and use it to reclaim disturbed areas upon completion of construction activities.
- For in-stream construction, use isolation techniques such as diversion to limit the exposure of disturbed substrates to moving water.
- Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer.
- Obtain borrow material from authorized and permitted sites.
- Dispose of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials.
- Pollution of rivers by vehicles and waste shall be forbidden and controlled, (e.g. no car washing in the rivers, no oil spills, etc.).
- Where access roads would cross a dry wash, restrict the road gradient to 0% to avoid diverting surface waters from the channel specifically near Kabul River and other streams in the Bagrami to Surkhrod areas. (TEEIC, 2017).

6.2.1.7 Waste and Hazardous Material Management

199. Solid and industrial waste can be generated during construction activities. The solid wastes are expected to be nonhazardous and consist of mostly containers and packaging materials, miscellaneous wastes from equipment assembly and presence of construction crews (food wrappers and scraps). Industrial wastes would include minor amounts of paints, coatings, and spent solvents. Most of these materials would likely be transported off-site for disposal. Other hazardous materials would include dielectric fluids in electrical equipment used in substations and pump and compressor stations; lubricants and coolants added to prime mover equipment in pump and compressor stations; and compressed gases (for welding), solvents and cleaning agents, and corrosion control paints. Impacts could result if hazardous wastes were not properly handled and were released to the environment.

200. The secondary containment should be considered wherever liquid wastes are stored in volumes greater than 220 liters. The available volume of secondary containment should be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in that specific location. Provide adequate ventilation where volatile wastes are stored.

201. General mitigation practices and principles that could apply to all phases of this transmission line project include:

- Implement plans for hazardous materials management, waste management spill prevention and response, and storm-water management.
- Train employees to promptly contain, report, and/or clean up any oil or hazardous material spill.
- Provide secondary containment for all on-site hazardous materials and waste storage, including fuel.
- Containerize and periodically remove wastes for recycling or for disposal at appropriate off-site permitted disposal facilities.
- Provide portable spill containment and cleanup equipment in all vehicles.
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks.
- Document accidental releases as to cause, corrective actions taken, and resulting environmental or health and safety impacts.
- All measures for waste management, waste storage, transportation, etc. mentioned in the IFC general EHS (2007) guidelines must be followed.

6.2.2 Ecological Environment (Flora and Fauna)

202. The likely biological adverse impacts of the project are minimal. Due to the location of the transmission line in open grasslands of mountainous and hilly areas with almost no forest cover, environmental impacts are much localized. Chopping of trees in the ROW is limited to some locations and soil sealing leading to a loss of vegetation and habitats is very limited. As the natural habitats are not very densely populated by plant and animal species, the impacts of the construction process on flora and fauna are not expected to be significant.

203. Agriculture can be affected, by the elimination of cropland, the temporary loss of crop production due to construction. 1523 m^2 wheat land and 2,115 fruit and non-fruit trees will be affected by this project.

204. Even though the transmission line will not cross any natural nationally important or protected natural sites, the construction process should be carried out with great care in order to limit damages to vegetation and habitats.

205. The substation site is located near the Farm-e-Hada - an agricultural farm which is not anticipated to be severely affected by this project. The Farm-e-Hada recreational park is located 1.8 KM away from the proposed substation. It is expected that only a few temporary acoustic and air quality impacts can degrade recreational experience of the visitors. Those can be reduced through mitigation measures discussed above. The area is owned by the government and is currently given as amortized land loan to a local farmer for agriculture purposes for cultivation of cotton and vegetables using some unsustainable irrigation methods of underground water extraction.

206. Dust settling on vegetation may alter or limit plants' abilities to photosynthesize and/or reproduce. Although the potential for an increase in the spread of invasive and noxious weeds would occur during the construction phase due to increasing traffic and human activity, the potential impacts could be partially reduced by interim reclamation and implementation of mitigation measures.

207. There are two major types of impacts on vegetation:

- Direct impacts: vegetation removal or damage during construction activities.
- Indirect impacts on vegetation from air pollution or surface water impacts caused by the power plant.

208. Ants and grasshoppers are observed at the site and they are commonly occur in the area. The ecological survey of the site confirmed lack of endangered and ecologically significant fauna and flora. Therefore, there are no serious biological concerns with the implementation of this project.

209. The following mitigation measures during construction are recommended to reduce the adverse impacts on environment:

- Use existing facilities and disturbed areas (e.g., access roads, graded areas) to the extent feasible to minimize the amount of disturbance.
- Conduct blasting for raw materials only within specified times and at specified distances from sensitive wildlife or surface waters as specified by IFC/NEPA.
- Design permanent facility structures to discourage their use by birds for perching or nesting.
- Refuel in a designated fueling area that includes a temporary berm to limit the spread of any spill. Use drip pans during refueling to contain accidental releases and under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.
- Retain all ground-level vegetation and stumps left after cutting, unless their removal is necessary to install support structures, or other ancillary facilities.
- Schedule construction activities to avoid important periods of wildlife courtship, breeding, nesting, lambing, or calving.
- Re-vegetation of disturbed areas with native plant species and unnecessary removal of plants should be avoided.
- Use dust abatement techniques on unpaved, un-vegetated surfaces to minimize airborne dust.
- If an endangered species is found during construction, work in the area will be stopped and NEPA and other relevant institutions should be immediately notified (TEEIC, 2017).

6.2.3 Socioeconomic Environment and Land Use

210. There are some people living near the project site, specifically in proximity to the proposed Shaikh Mesri substation where there is Sayaf town located at the north side of the facility. And, there are some resettlement concerns through transmission line highlighted with details in the project LARP document attached to this package. The details of the project land acquisition are highlighted in the below table.

Table 7 Land Acquisition on Permanent Basis for the Proposed Transmission Line project (LARP report)

Type of Tower	**No. of Towers**	**Affected Land**
		M^2
A	82	12,300
B	165	16,500
C	146	11,680
Total	**393**	40,480
Affected Households (Ahs)		
Total No. of AHs		374 AHs
No. of AHs losing land		374 AHs
No. of AHs losing crops in addition to land		110 AHs
No. of AHs losing trees in addition to land		78 AHs
No. of households losing structure		7 AHs
No. of Households needing relocation		7 AHs
Vulnerable AHs		135 AHs

Table 8: The affected agriculture corps details by the project

Impact Type	**Quantity (M^2)**
Private agricultural lands	39,535
Private residential lands	945
Loss of crops (Wheat)	1,523
Fruit and Non-fruit trees	2,115 pcs fruit trees, 2,986 pcs of non-fruit trees

211. The compensation must be considered for the above affected people, to minimize the adverse socio-economic impacts of the project.

212. DABS has proposed 500x500 m area at Shaikh Mesri of Surkhrod district for the construction of substation. This land is the property of Afghan government allocated for the famous Farm-e- Hada Canal of Jalalabad. Hada Farm is one of the main olive producer in the

Jalalabad city. The water supply to this farm is provided though water canal from Daronta dam. The land clearance is currently under process to officially allocate this land for the substation. And the delegation committee of the different ministries such as agriculture, DABS and urban development has decided in the favor of substation construction in the area. The land approval documents are currently under process at the Ministry of Agriculture. Therefore, it is important to ensure the land acquisition process is fully completed prior to construction.

Figure 43 Cotton plants in a portion of the proposed substation area

Figure 44 New substation proposed area at Jalalabad

213. The construction and operation of transmission lines will lead to limited land use changes in the transmission rights-of-way and on the grounds of associated facilities. Transportation can be affected by the placement of transmission lines and towers near roads, and waterways (Williams, 2003).

214. Impacts to land use could occur during construction if there were conflicts with existing land use plans and community goals; conflicts with existing recreational, educational or other use areas; or conversion or cessation of the existing commercial land use of the area (e.g.,

mineral extraction). During construction, most land use impacts would be temporary, such as removal of livestock from grazing areas during periods of blasting or heavy equipment operations; curtailing hunting near work crews; or temporary effects to the character of a recreation area because of construction noise, dust, and visual intrusions. Long-term land use impacts would occur if existing land uses are not compatible with the energy transmission project, such as remote recreational experiences. Within forested areas, ROW clearing could result in the long-term loss of timber production.

215. As the transmission line does not pass near any airport therefore, impacts to aviation will not occur. It is important to mention that the line passes on the south side of Rishkhoor Military Camp located at Kabul (refer to **figure** 9), therefore, impacts on military operations may occur in terms of military testing and training activities.

216. Siting and design considerations that mitigate impacts include:

- Consult with Department of Defense to identify and address any issues regarding the transmission project construction and military operations.
- Establish a reclamation plan to ensure that all temporary impact areas are restored.
- Consolidate infrastructure requirements (transmission, roads) for efficient use of land.
- Distribute a proposed schedule of construction activities to all potentially affected landowners and nearby residents so they know when they might experience construction-related disruptions.
- Minimize the amount of land disturbance, and develop and implement stringent erosion and dust control practices.
- Repair underground drainage tile damage on agricultural lands.
- Repair compacted or rutted agricultural lands.
- Dewater open trenches in a manner that does not damage adjacent agricultural land. If this cannot be done, compensate the landowner appropriately.
- Compensate farmers or ranchers for crop or forage losses and restore compacted soils.

217. Direct positive impacts would include creation of new jobs for construction workers and the associated income and taxes generated by the project. Indirect impacts would occur as a result of the new economic development, and would include new jobs at businesses that support the expanded workforce or provide project materials, and associated income and taxes. This project development activities could also potentially affect property values, either positively from increased employment effects or negatively from proximity to the substation and towers and any associated or perceived environmental effects (noise, visual, etc.). Local people hiring will have positive socio economic impacts on the community. It is therefore, recommended to hire local labor for the construction phase of this project.

218. During construction, lights might be needed for workdays or for second shift work. Light might be needed for equipment laydown areas, parking, construction roadways, and work areas used at night. Floodlights might be used, but they should be shielded and directed at the areas that need light and not allowed to spill off-site or shine into the sky.

6.2.4 Health and Safety

219. The workers and equipment safety risks are high during construction specifically during the tower climbing. To mitigate these impacts, the staff must have essential protective equipment (i.e. PPE) and must be provided with safety training.

220. All safety precautions should be taken into consideration during the construction phase of the project to minimize the safety hazards and risk of accidental electrocution. Standard

clearance distance of 7 meter from the live wires and buildings should be considered for the buildings trees, etc. in respect to the operational voltage range of 220 kV. Furthermore, all the equipment, particularly transformers considered for this solar project should meet the noise standards.

221. Potential impacts to worker and public health and safety from transmission project construction would be similar to those expected for any construction project with earthmoving, large equipment, transportation of oversized materials, and construction and installation of industrial facilities. In addition, health and safety issues include working in potential weather extremes, and possible contact with natural hazards, such as uneven terrain and dangerous plants, animals, or insects.

222. Mitigation measures specific to construction phase of this transmission project include:

- Hold contractor crew safety meetings at the start of each workday to go over potential safety issues and concerns.
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures.
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 meters above the working surface, but sometimes extended to 7 meters, depending on the activity).
- Installation of fixtures on tower components to facilitate the use of fall protection systems.
- Install grounding devices on all fences that cross or run parallel to a transmission line.
- Ensure that employees are trained, as necessary, in tower climbing, first aid, rescue techniques, and safety equipment inspection and use.
- Secure construction sites at the end of the workday to protect the equipment and the general public.
- Safety belts should be of not less than 16 millimeters (mm) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident.
- When operating power tools at height, workers should use a second (backup) safety strap (IFC, 2007).
- Health and safety supervisor must always available at construction work site.

6.3 Impacts and Mitigation Measures during Operation Phase

223. In addition to energy transmission, other activities occur during the operational phase of the project. Most of these activities, listed below, are done to maintain the safety and integrity of the project. Typical activities during the operation and maintenance phase include: operation of compressor stations or pump stations, ROW inspections, ROW vegetation clearing, and maintenance and replacement of facility components.

224. Transmission Lines Line inspections are conducted periodically to determine if there are areas where trees may be approaching minimum clearances before the next scheduled vegetation maintenance period.

225. Vegetation management within the ROW is needed to prevent tall-growing vegetation from contacting the conductors. Danger trees adjacent to the ROW that could come in contact with conductors are removed or trimmed. Maintenance clearing is generally performed on a 3- to 6-year cycle using hand and mechanical vegetation cutting. Cleaning or other maintenance of the transmission line components is done on an as-needed basis.

226. Environmental impacts that could occur during the operation and maintenance phase would mostly occur from long-term habitat change within the ROW, maintenance activities (e.g., ROW vegetation clearing and facility component maintenance or replacement), noise (e.g., compressor station, corona discharge), the presence of workers, and potential spills (e.g., oil spills).

227. The following potential impacts may result from the operation and maintenance of this transmission project.

6.3.1 Physical Environment

6.3.1.1 Impacts on Acoustics Environment and Mitigation Measures

228. Sources of noise during the operation and maintenance phase can include compressor or pump stations, transformer and switchgear at substations, corona discharge from transmission lines, vehicles and machinery. The primary impacts from noise can be localized disturbance to wildlife and recreationists.

229. High voltage overhead lines and substations will generate noise, the level of which depends mainly on the voltage of the overhead line or substation, which is 220 kV for this project. Noise from energized overhead lines is produced by “corona discharge” (a limited electrical breakdown of the air). While conductors are designed and constructed to minimize corona discharge, surface irregularities caused by damage, insects, raindrops or pollution may locally enhance the electric field strength sufficiently for corona discharges to occur. This can be audible in certain conditions as a “crackling” sound, occasionally accompanied by a low frequency hum. The noise level generated by a high voltage overhead line is weather-related, with highest noise levels occurring during damp conditions. Overhead lines are normally quiet during dry weather, except during long, dry spells when airborne debris adheres to the conductors.

230. Any noise disappears when sufficient rain falls to wash the debris away. The transformers installed at the substation, will generate low frequency hum. It is recommended to install low noise level transformers (IFC, 2007; Nationalgrid, 2008). Measures to mitigate this impact should be addressed during project planning stages to locate rights-of-way away from human receptors, to the extent possible. Use of noise barriers or noise canceling acoustic devices should be considered as necessary (IFC, 2007).

6.3.1.2 Impacts on Air Quality and Mitigation Measures

231. Currently majority of the Nangarhar and the east region as whole use diesel generator as their energy source for households and industries which is not environment friendly. Therefore, this project will provide relatively cheap and clean energy hence, the project will have positive results on air quality.

232. Vehicular traffic and machinery would continue to produce small amounts of fugitive dust and exhaust emissions during the operation and maintenance phase. These emissions would not likely cause an exceedance of air quality standards nor have any impact on climate change. Trace amounts of ozone would be produced by corona effects from transmission lines (e.g., less than 1.0 part per billion which is considerably less than air quality standards). Therefore, the project impacts during operation on air quality is low.

233. Enacting fugitive dust and vehicle emission controls policies and speed limits in the site will reduce the air quality impacts.

Sulfur Hexafluoride (SF6):

234. Sulfur hexafluoride is an effective gaseous dielectric that allows the safe transmission and distribution of electricity. SF_6 provides excellent insulation and arc quenching performance. The gas itself is an inert gas which has no influence on humans, animals or plants. However, the use of SF_6, a greenhouse gas with a significantly higher global warming potential (GWP) than CO_2, should be minimized (IFC, 2007). On the other hand, SF_6 is a very highly effective and persistent greenhouse gas and has to be handled properly following guidelines such as:

- IEC (DIN EN)1 60376 "Specification and acceptance of new sulfur hexafluoride"
- IEC (DIN EN) 60480 "Guide to the checking of sulfur hexafluoride (SF6) taken from electrical equipment"
- IEC 61634 "High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride (SF6) in high-voltage switchgear and Control gear".

235. Following these guidelines and considering the recommendations of the IFC General EHS Guidelines ad CIGRE Guide for SF6 Gas Mixtures-EPA will ensure that the amount of released SF6 into the atmosphere is reduced to an absolute minimum.

6.3.1.3 Impacts on Soils and Geologic Resources and Mitigation Measures

236. Following construction, disturbed portions of the site would be re-vegetated and the soil and geologic conditions would stabilize. Impacts during the operation phase would be limited largely to soil erosion impacts caused by vehicular traffic and machinery operation during maintenance activities. Except in the case of a large oil spill, soil contamination would be localized and limited in extent and magnitude. Procedures for prevention and control of hazards associated with spill prevention, emergency response, clean-up, and contaminated soil remediation should be addressed in the spill prevention plan.

6.3.1.4 Impacts on Water Resources and Mitigation Measures

237. Impacts to water resources during the operation and maintenance phase would be limited to possible minor degradation of water quality resulting from vehicular traffic and machinery operation during maintenance (e.g., erosion and sedimentation) or herbicide contamination during vegetation management (e.g., from accidental spills) and wastewater disposal. Following mitigation measure will help reduce the impact of the operation on water resources:

- Ensure that vegetative cover is maintained within the right-of-way and regularly monitor for indications of erosion.
- Maintain equipment and vehicles to minimize the risk of accidental fuel spillage.
- The substation must have appropriate sewage handling system. Septic tanks or Decentralized Wastewater Treatment System (DEWATS) systems need to be constructed to accommodate the waste water generated by the station operation staff. The treated water can also be reused as a water source for the site.
- Apply erosion controls relative to possible soil erosion from vehicular traffic and during construction activities (e.g., jute netting, silt fences, and check dams). Regularly monitor access roads, and other project areas for indications of erosion.

- Reclaim protective covering (e.g., vegetative cover) on disturbed soils as quickly as possible.
- Clean and maintain catch basins, drainage ditches, and culverts regularly.
- Refuel in a designated fueling area that includes a temporary berm to limit the spread of any spill.
- Use drip pans during refueling to contain accidental releases and under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the project site.
- The herbicide/pesticide must not be allowed to use for this project.
- Keep all equipment and vehicles within the limits of the previously disturbed areas.

6.3.1.5 Visual Impacts

238. The aboveground portions of energy transmission projects would be highly visible in rural or natural landscapes, many of which have few other comparable structures. Visual evidence of these projects cannot be completely avoided, reduced, or concealed. Additional visual impacts would occur during maintenance from vehicular traffic, and workers. Maintenance, replacement, or upgrades of project components would repeat the initial visual impacts of the construction phase, although at a more localized scale (TEEIC, 2017).

239. Landscaping, both through the modification of ground form and by planting, can help to mitigate the visual impact of a substation. Where new development is proposed in the vicinity of existing substations, the layout and design of the development can be planned to keep the adverse visual impact of the substation to a minimum (Nationalgrid, 2008).

240. General mitigation practices that could apply to all phases of this transmission project include:

- Siting power lines, and designing substations, with due consideration to landscape views and important environmental and community features.
- Location of high-voltage transmission and distribution lines in less populated areas, where possible. This has done during the concept design stage but the detail design must look for further improvement in this aspect.
- Consider site-specific landscaping in selected areas to provide screening for year-round residents whose property abuts the project.
- Maintain the right-of-way with low-growing natural vegetation that requires minimal maintenance and is consistent with local vegetation.
- Keep areas around support towers, and other facilities clean and free of debris.
- Do not apply paint or permanent discoloring agents to rocks or vegetation to indicate survey or construction activity limits. Use survey markers, flagging, or other suitable materials to delineate limits (IFC, 2007).

6.3.1.6 Hazardous Materials and Waste Management

241. Industrial wastes are generated during routine operations (e.g., lubricating oils, hydraulic fluids, coolants, solvents, and cleaning agents). These wastes be stored in proper containers, characterized and labeled, possibly stored briefly, and transported by a licensed hauler to an appropriate permitted off-site disposal facility as a standard practice. Impacts could result if wastes were not properly handled and were released to the environment. Environmental contamination could occur from accidental spills of herbicides or, more significantly, equipment's oils (TEEIC, 2017).

242. The waste oils and chemicals should be disposed in accordance with their respective Material Safety Data Sheet (MSDS). The MSDS sheets must be available at the site for all chemicals and oils used in the site. DABS as the operation responsible of the facilities must

develop a final set of mitigation measures for the project in consultation with the appropriate government resource management agencies and stakeholders such as Jalalabad municipality and specify a safe procedure for industrial waste management and removal (Ahmadzai, 2017).

243. The recyclable and unrecyclable waste from the site should be separated and transferred to the recycling plants. No open burning should be allowed at the site. In addition, the hazardous and toxic waste such as batteries acid contaminated rags, soil contaminated by the oil/chemical, oil contaminated rags and etc. should be stored separately, and handled according to MSDS.

244. Oil and chemical leakage pose negative impacts on the environment. Therefore, plant must have channels and drainage points to collect any leaked oil from the transformers and other apparatus. Any soil contaminated by the oil/chemical spillage will be removed and disposed appropriately in accordance to the MSDS of the spilled oil/chemical.

245. Many electrical properties contain mineral oil and other fluids for the purpose of insulation and heat extraction. Electrical transformers are a major source of used mineral oil. The main types of transformers and oil filled equipment are:

- Power transformers
- Voltage transformers (VTs) and Current transformers (CTs)
- Capacitor voltage transformers (CVTs)
- Circuit breakers (CBs)
- Switchgear
- Capacitors
- High voltage bushings

246. During the operation of the transformer the oil go through electrical stress and eventually wears out. The life expectancy of it can be as long as 30+ years in some cases and mostly reusable. Transformer oil disposal therefore need not occur in locations where the used oil is destroyed, because in most cases it can be recovered. Except for oil highly concentrated with PCB (which should not be used in this project), used transformer oil can avoid disposal in favor of reuse.

247. PCBs are persistent organic pollutants (POPs), i.e. chemical substances that are persistent, bio-accumulate and adversely affect human health and the environment (UNEP1, 2002). Therefore, PCB containing equipment are not allowed to use in the project based on the ADB's Prohibited Investment Activities List.

248. Environment unfriendly industrial waste accumulation risk is exist in the operation period. The preventive maintenance of the plant might require the replacement of some equipment parts, and lubricants which results in creation of used spare parts such as batteries and used lube oil. These kind of solid and liquid waste, must be treated in accordance to the government rules. This practice must not create any environmental impact on the local people and areas.

249. Following general mitigation measures will help minimize the waste impacts of the project.

- Implement plans for hazardous materials management, waste management spill prevention and response, storm-water management. Train employees to promptly contain, report, and/or clean up any oil or hazardous material spill.

- Provide secondary containment for all on-site hazardous materials and waste storage, including fuel.
- Containerize and periodically remove wastes for recycling or for disposal at appropriate off-site permitted disposal facilities.
- Provide portable spill containment and cleanup equipment in all vehicles.
- Keep vehicles and equipment in good working order to prevent oil and fuel leaks.

6.3.1.7 Natural Disasters Mitigation Measures

A. Floods

250. As the transmission line route is passing mountainous terrain which contains several flooding runoffs therefore, it is important for turnkey contractor to prepare a detail survey report with consideration of storms water analysis. The towers must not be placed on any flood runoffs.

251. There are flood runoff signs in the proposed substation area at Shaikh Mesri, therefore, a flood assessment is required prior to the substation construction.

Figure 45 Flood runoff at the east side of the proposed substation area

252. The contractor should make its own hydrological study to verify and assume the results for project design. A storm water management plan (SWMP) report will be prepared and shall contain a summary of hydrogeological, and regulatory data related to this site. The report will also contain a description of proposed activities and an operations timeline. Additionally, the SWMP will include following points:

- A site vicinity map
- Drainage lines, pooling areas and storm water drainage flow of entire site
- Recommendation plan about water drainage system
- Drainage pooling areas
- Illustration of erosion/sedimentation controls
- Storm water outfall structures

B. Mudflows

253. The soil erosion and mudflow risks are high due to flooding. It is recommended to

construct drainage channels and retaining walls along the flood runoffs and the loose topsoil areas to minimize the risks of mudflow and erosion (Saadatullah, 2017). A geotechnical investigation needs to be conducted to determine soil characteristics and strength for substation, towers, drainages and building. This will reduce the impacts associated with mudflow and soil erosion.

254. Drainage and storm water management system for the entire substation land will be necessary since storm water erosion and watercourses are observed at the site. There are storm water canals already exist under the Jalalabad Ring Road located at the south side of the substation.

255. Following mitigation measures could help reduce the mudflows impacts:

- Plant ground cover on slopes, or build retaining walls.
- Reinforce the foundation and walls of the facilities.
- Install flexible rather than stiff pipe fittings to avoid gas or water leaks in the event of a mudflow or landslide.
- Construct channels or reinforced walls to direct the mudflows around the project facility and buildings. Clear obstructions from waterways.

C. Seismic

256. Sands, gravels, and quarry stone would be excavated for constructing access roads; making concrete for foundations and ancillary structures; and improving ground surface for lay-down areas and crane staging areas. Possible geological hazards (earthquakes, landslides) could be activated by excavation and blasting for raw materials, increasing slopes during site grading and construction of access roads, altering natural drainage patterns, and toe-cutting bases of slopes. Altering drainage patterns could also accelerate erosion and create slope instability.

257. The buildings constructed in seismically active areas such as this project, during settlement term of operation should observe the requirements of seismic stability (grade VIII (8) points) and provide safe stay of the people, safety of designs with earthquakes of calculated intensity.

6.3.2 Ecological Environment

6.3.2.1 Impacts on Fauna, Flora and Mitigation Measures

258. During operations and maintenance, adverse impacts to ecological resources could occur from:

- Disturbance of wildlife from noise and human activity;
- ROW maintenance (e.g., vegetation removal);
- Exposure of biota to contaminants; and
- Mortality of biota from colliding with transmission lines or other components.

259. As there are few trees growing in the transmission line corridor, it is fairly easy to keep the minimum safety clearance between vegetation and the conductor lines (7 m for 220 kV line). Most of the land within the ROW is grassland, sand desert or agricultural land that can be cultivated as before, except for the tower sites. Herbicides shall not be used for corridor clearance. Therefore, the impacts on flora is low.

260. Ecological resources may continue to be affected by the reduction in habitat quality

associated with habitat fragmentation due to the presence of the ROW, support facilities, and access roads. In addition, the presence of an energy transmission line and its associated access roads may increase human use of surrounding areas, which in turn could impact ecological resources in the surrounding areas through:

- Introduction and spread of invasive nonnative vegetation,
- Fragmentation of habitat,
- Disturbance of biota,
- Collision and/or electrocution of birds, and
- Increased potential for fire.

i. **Avifauna:**

261. It must be pointed out, that some power poles pose a higher risk for a number of large birds, than all road traffic. These dangerous structures must not be considered in this project for bird safety. Above-ground power lines pose three main risks or perils to birds:

- Risk of electrocution: Birds sitting on transmission line poles and lines will be killed if they cause short circuits (short circuit between phases, or short-to-ground). In particular, wrongly engineered power pole constructions has resulted in an enormous risk for numerous medium-sized and large birds, which use power poles as perching, roosting, and even nesting sites.
- Risk of collision: In flight, birds can collide into the cables of power lines, because the cables are difficult to perceive as obstacles. In most cases the impact of collision leads to immediate death or to fatal injuries and mutilations, which cannot be survived.
- Risks and loss of habitat quality in staging and wintering areas: mainly when aboveground power lines cut across open landscapes and habitats (wetlands, steppe, etc.) (Haas et al. 2005; Flynn and Nairn, 2012).

262. As this transmission line does not pass directly through any protected area (including IBAs) or on the bird's migration path this impact is considered as low. However, as mentioned in Section 5.7.1.1 the line passes at (6 and 9.5 KM) distance from Kole Hashmat Khan and Safed Koh IBAs respectively. Therefore, for the minimization of fatal bird collision with power lines, the following measures must be applied to the power line to possible extent:

- DABS environmental team should survey the transmission line corridor ROW once in the first year of its operation to look for any bird's mortality because of the line. In case mortality was noticed the bird flapper and diverter installation must be considered.
- Constructions shall obstruct only a minimum of air space in vertical direction: Single-level arrangement of conductor cables; no neutral cable above the conductor cables in case possible.
- Infrastructures shall be bundled, where possible, e.g. power lines to be routed along roads, in order to maintain open un-fragmented landscapes.
- Installing visibility enhancement objects such as firefly bird flapper, marker balls, and bird diverters in Reshkhoor, Tezin, Totu, Hesarak, Khak-e-Jabar, Kabul Gardez Highway and rivers crossing, and other potential birds passing areas. In total approximately 300 firefly bird flapper/diverter must be installed in 50 to 80 m spacing.
- Birds are most vulnerable to collisions with wires during sunset and sunrise hours, especially during bad weather. Therefore, these bird diverters must have visible light up during dark light.
- Attachment of well-visible black-and-white markers on cables posing a high collision risk, in particular the neutral cable of high-voltage power lines.

- Careful preparatory investigations of different routing alternatives: bird migration often follows local or regional flyways determined by topology, shorelines, etc. Prior to detail design of the transmission line, such investigations are needed and must comprise bird migration at day and night time and other seasonal phenomena.
- Edison Electric Institute guideline for Reducing Avian Collisions with Power Lines is recommended to be followed (aplic.org, 2012).

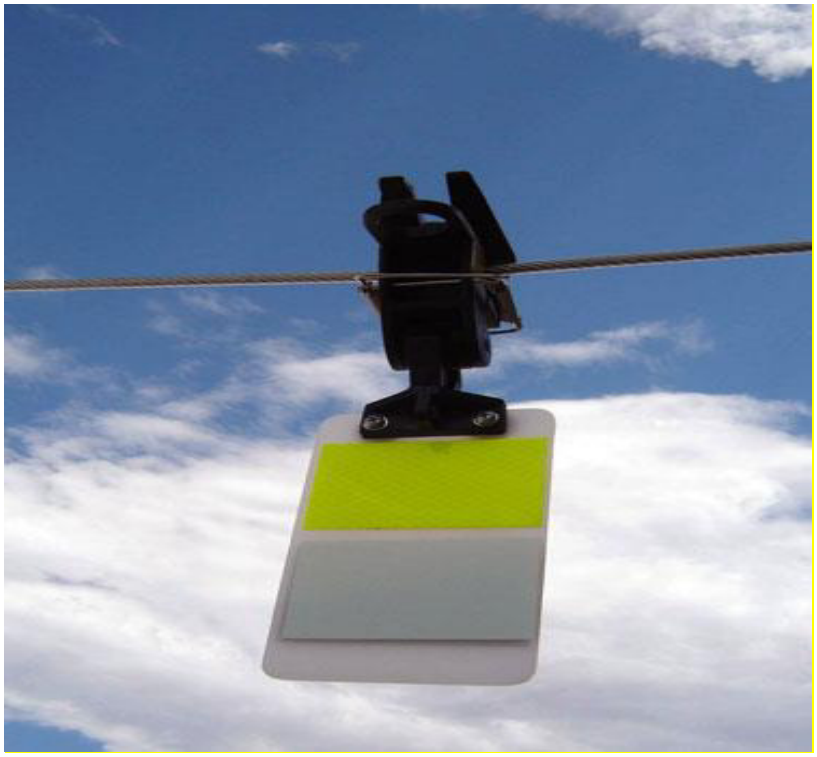

Figure 46 firefly bird flapper/diverter recommended (or equivalent) for this transmission line (Birdbusters, 2017)

ii. Right-of-Way Maintenance

263. Regular maintenance of vegetation within the rights-of-way is necessary to avoid disruption to overhead power lines and towers. Unchecked growth of tall trees and accumulation of vegetation within rights-of-way may result in a number of impacts, including power outages through contact of branches and trees with transmission lines and towers.

264. Excessive vegetation maintenance may remove unnecessary amounts of vegetation resulting in the continual replacement of successional species and an increased likelihood of the establishment of invasive species.

265. Recommended measures to prevent and control impacts from ROW vegetation maintenance include:

- Implementation of an integrated vegetation management approach (IVM). The selective removal of tall-growing tree species and the encouragement of low-growing grasses and shrubs is the common approach to vegetation management in transmission line ROW.
- Removal of invasive plant species, whenever possible, cultivating native plant species.
- Scheduling activities to avoid breeding and nesting seasons.

- Observing manufacturer machinery and equipment guidelines, procedures with regard to noise, and oil spill prevention and emergency response (IFC, 2007)

6.3.3 Socioeconomics Environment

266. Direct impacts would include the creation of new jobs for operation and maintenance workers and the associated income and taxes paid. Indirect impacts are those impacts that would occur as a result of the new economic development and would include things such as new jobs at businesses that support the expanded workforce or that provide project materials, and associated income and taxes. Furthermore, this project will provide reliable and relatively cheaper energy to businesses and factories there in Jalalabad which will subsequently have positive social and economic impacts on communities. The number of project personnel required during the operation and maintenance phase would be about an order of magnitude less than during construction. Therefore, socioeconomic impacts related directly to jobs would be minimal. Potential impacts on the value of residential properties located adjacent to an energy transmission project would continue during this phase.

6.3.4 Health and Safety

267. Possible impacts to health and safety during operations include exposures to electromagnetic fields (EMF), accidental injury or death to workers during operation and maintenance activities, and accidental injury or death to the public (e.g., from off-highway vehicle (OHV) collisions with project components or from airplane collisions with transmission lines). In addition, health and safety issues include working at heights, working around energized equipment, working in potential weather extremes, and possible contact with natural hazards, such as uneven terrain and dangerous animals, or insects. There is an increased potential for fires from electrical discharges from energized equipment.

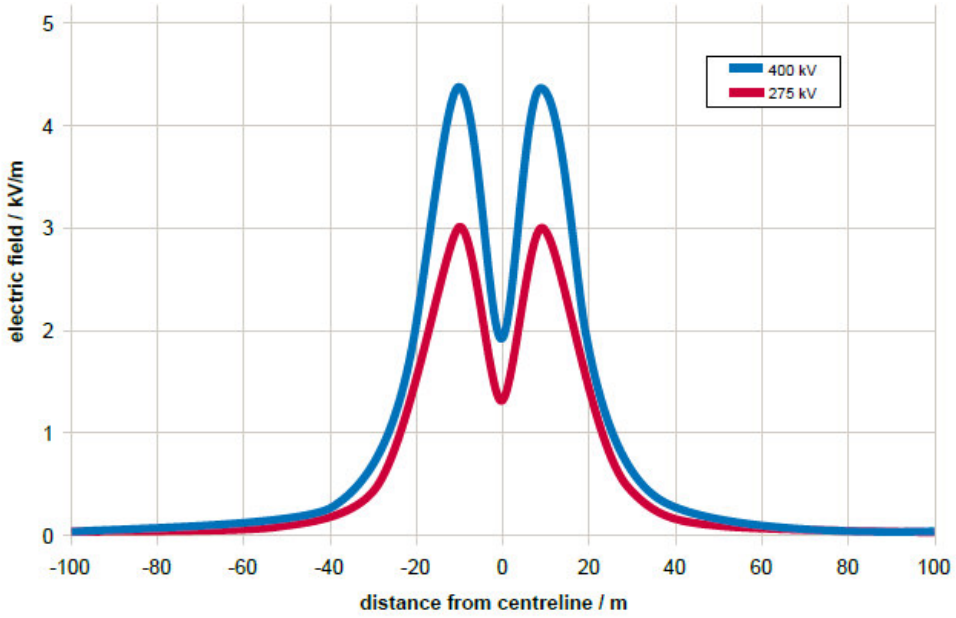

Figure 47 Overhead line typical electric fields (Nationalgrid, 2008)

268. To mitigate these impacts, the operation and maintenance (O&M) staffs must have essential protective equipment and must be provided with safety training. There must be fire

extinguishers in place in a variety of places that are at risk of material fires and flammable liquid fires. The foam extinguishers contain is nonconductive of electricity (must be nonconductive), so it reduces the risk of electric shock if the fire contains electrical equipment. The site must be equipped with first aid kits. The fire exits and alarms must be clearly identified in the site. In addition, the site must have clearly identified fire assembly areas.

269. Personal electrocution risk is high in case if the safety procedures are not followed. To mitigate the risks the metal frames of all the equipment should be grounded for the personal safety measures. Public awareness practices should be implemented to let them know the risks of electrocution, clearance distance and illegal connections. In addition, the following safety procedures should be followed before doing the maintenance of the energized equipment:

- Only allow trained and certified workers to install, maintain, or repair electrical equipment.
- De-energize the equipment which needs repairing or maintenance.
- Perform the circuit switching and isolation of the equipment.
- At point of isolation, the rack must be locked off and breakers must be tagged. The tag and safety lock should be placed at points of isolation.
- Discharge equipment to be worked on and place safety grounds to protect personnel.
- On completion of the work and prior to return of system to normal, remove safety grounds and make sure: that equipment is in a safe condition to energize, and, personnel have been informed that equipment is going to be energized.
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines.

270. The site must have a comprehensive range of substation and plant safety equipment including insulating matting, lifesaving kits & rescue rods, voltage detectors, insulated gloves, arc flash clothing (suite), protective gear, etc.

271. The Emergency Response Plan (ERP) should be made available at the substation. The team must be provided with safety trainings and there must always be an occupational safety supervisor available at the site to make sure the safety precautions are always adhered by the workers. The safety and security precaution signs must be installed in all danger places of the solar plant. The health and safety measures discussed in the construction phase for working at height on poles and structures should be followed in the operation stage as well.

6.4 Impacts and Mitigation Measures during Decommissioning Phase

272. Decommissioning tasks that may cause environmental impacts include removal of project components, land re-vegetation and re-contouring. Following decommissioning, the ROW may be restored to resemble its original condition or reclaimed to some standard that results in stable environmental conditions. Potential impacts from these activities are presented below, by the type of affected resource.

273. The following potential impacts may result from decommissioning and site reclamation of this power transmission project.

6.4.1 Physical Environment

6.4.1.1 Impacts and Mitigation Measures on Soil and Topography

274. Soil erosion impacts include soil nutrient loss and reduced water quality in nearby surface water bodies. Upon completion of decommissioning, disturbed areas would be contoured and re-vegetated, which would minimize the potential for soil erosion. Impacts to geologic resources are expected to happen. No permanent land use impacts would occur during this phase. For the mitigation purposes the measures used to minimize impacts to soils and geologic resources during construction must be applied at this stage as well.

6.4.1.2 Impacts on Acoustics Environment and Mitigation Measures

275. Sources of noise during decommissioning would be similar to those during construction and would be caused primarily by construction equipment and vehicular traffic. Near residential areas, noise levels could exceed OSHA guidelines but would be intermittent and extend for only a limited time. Repeat the mitigation measures mentioned during construction phase to minimize noise impacts in the decommissioning process.

6.4.1.3 Hazardous Materials and Waste Management

276. Similar to operation phase waste management procedures must be applied to mitigate the adverse impacts of the industrial waste of the decommissioning phase.

6.4.2 Ecological Environment

6.4.2.1 Impacts on Fauna, Flora and Mitigation Measures

277. Impacts to ecological resources from decommissioning and reclamation activities would be similar in nature to the impacts that occur during construction, but of a reduced magnitude. Following mitigation measure will help reduce the adverse impacts on flora and fauna at this stage:

- Salvage topsoil from all decommissioning activities and reapply during final reclamation.
- Repeat mitigation measures used to minimize impacts to ecological resources during construction for the decommissioning phase.
- Monitor all disturbed areas for restoration and re-vegetation success.

6.4.3 Human Health and Safety

278. Potential impacts to worker and public health and safety during decommissioning and site reclamation would be similar to those during construction. The health and safety measure mentioned for the construction and operation phase must be strictly followed to minimize the adverse impacts.

7. Analysis of Alternatives

7.1 No Project Alternative

279. Unavailability of electrical energy constrains growth opportunities in the east; creates

disparities in the country's economic development; and fuels ethnic and regional tensions, insecurity, and discontent. The proposed tranche will extend the national grid into eastern provinces with a population of nearly 2 million, and will allow evacuation of indigenous generation as well as extension of TUTAP power interconnection towards Pakistan. The proposed transmission line would provide significant value addition to (i) evacuate power from multiple photovoltaic solar projects (under implementation and planned) in the region, (ii) provide sustainable power to two industrial parks in eastern Afghanistan, and (iii) strengthen supplies from 100 MW Naghlu hydropower plant, and (iv) enable grid stability by interconnection with transmission lines in adjoining provinces. Therefore, currently this project is the only quick way to provide electricity to much needed people and industries of Nangarhar and the whole eastern region.

280. As sustainable alternative projects can be the construction of Kama Hydro Power Plant, the possibility of construction of several other hydro power plant on nearby Kunar River with over 1000 MW electricity production capacity. It is important to note that these projects will take on average 6-10 years to become operational on the other hand these rivers have trans-boundary water sharing conflicts which resolution is also a time-consuming process. Therefore, no project alternative is not a viable one.

7.2 Transmission Line Route

281. For the line routing the new Kabul Jalalabad road is considered the best option. As this path already have accessible road through which the transmission line equipment can easily be transported. And the route land is mostly owned by government so have less land acquisition and resettlement concerns.

282. From Arghandeh to Bagrami (50 KM) portion of the project is located in the Kabul main city where most of the land is heavily populated. Therefore, the consultant team has analyzed two line routes as shown in the below map. The option 1 (yellow line) route has been selected as the final route for this transmission line, this option has less land resettlement and environmental concerns compared to the option 2. Furthermore, the option 1 route already has access road available and is 6 KM shorter than the 2nd option. The option 2 (red line) route doesn't have access road at 20 KM length. In addition the option 1 line will only cross the existing Logar 220 kV transmission line, while the option 2 needs two crossovers one at the 5 KM distance from Arghandeh with Ghazni transmission line and one from the Logar line.

283. In addition there is another alternative possible route exist which is from Bagrami to Surobi and then to Jalalabad. But because of the following constraints this route has not considered:

- This route already contains two 110 kV transmission lines (Naghlu-Kabul and Surobi-Kabul). Addition of this third transmission was highly challenging in terms of routing. Furthermore, it had the reliability concern as an unexpected natural hazard can cause the outage of all the three transmission lines. In addition, it had a possible crossover with the 110 kV Naghlu-Jalalabad transmission line and with further visual impacts.
- This route needs much more resettlement and compensation concerns in the Surobi and Jalalabad areas.
- The route mostly follows Kabul River Gorge for 64 kilometers and crosses the Kabul, Kunar, Surkhrod Rivers and near Surobi and Daronta dams, so possible impacts to

Kabul main basin water resources were higher.

- The route from Bagrami to Surobi is highly mountainous with multiple floodways.
- The line route length on this path was 168 KM which is higher than the proposed route of 151 KM, hence economically unfavorable.

Figure 48 Line routing alternative option

7.3 Tower Design

284. Two types of high voltage transmission lines tower have been analyzed Tubular Steel and Lattice Tower.

A. Tubular steel

285. Poles made of tubular steel are generally assembled at the factory and placed on the ROW afterward. Because of its easy manufacturing, installation and durability, many utilities in recent years prefer the use tubular towers over lattice steel for new power lines and tower replacements.

286. However, as this transmission line goes through mountainous terrain the transportation of these towers were challenging. Furthermore, as these towers don't manufacture here in Afghanistan and import from abroad was costly. Therefore, this type of tower has not considered for this project.

B. Lattice Tower

287. This type of tower is made of steel or aluminum sections the form of framework construction. Lattice towers are the most common type for high-voltage transmission lines and can be used for all types of voltages. These types of tower are usually made of galvanized steel. Aluminum is also used for reduced weight, such as in mountainous areas where the access is not easy. Aluminum is also used in steel corrosive prone environments. The additional material cost of aluminum towers will be offset by lower installation cost. Design of aluminum lattice towers is similar to that for steel, but must take into account aluminum's lower Young's modulus, also recognized as the elastic modulus, which is a measure of the stiffness of a solid material.

288. The lattice tower is commonly assembled at the erection location. This makes very tall towers possible, up to 100 m (and in special cases even higher, which will be required at Logar Transmission line crossing point). Assembly of lattice steel towers can be done using a crane. Lattice steel towers are generally made of angle-profiled steel beams (L- or T-beams).

289. As this type of transmission line towers can be transported easily than the other types and can be assembled at the site therefore, this type of towers have been considered for this project.

290. In this transmission line four main types of lattice steel tower (or pylon) will be used which are:

- Suspension towers which support the conductors on straight stretches of line;
- Deviation towers or tension towers at points where the route changes direction; and
- Terminal towers where lines terminate at substations or are connected to underground cables.
- Special Towers for line or river crossovers

8. Public Consultation and Information Disclosure

291. Consultation meeting were held with the potentially affected people along the transmission line route from Arghandeh to Jalalabad. The objectives of the meetings were to share the project relevant information with communities and understand their concerns. The information shared included project activities and their expected impacts on the physical, biological and socio-economic conditions. In coordination with LARP experts the concerns of the affected population associated with the project were documented and understood.

292. The public consultations conducted in September and October, 2017 included meeting with stakeholders and focused group discussions with local communities. Comprehensive consultation will be undertaken at the time of detailed design of the Project.

293. All the participants expressed their willingness to cooperate in the implementation of this project. When asked who should organize the valuation of losses, fix the compensation, and conciliate in case of grievances, most people favored either the traditional (tribal) Jarga or the government established institutions. Furthermore, the Community Development Councils (CDC) were also mentioned. Some community elders at Chaharasyab District expressed their concerns regarding the compensation payments and mentioned that the compensation money would not cover losses adequately. The project LARP expert assured them about the fair and transparent procedures. Further details can be found in the LARP document.

294. The predominant concern with the participant was that the future supply would not be fair (i.e. that their village would not be not be given electricity grid connection). Therefore, it is recommended to provide electricity to communities living near the TL specifically the Nangarhar Surkhrod and Khogiani districts, as they can be fed from the new proposed substation at Jalalabad. Furthermore, a relatively high number of very poor and vulnerable people are reported to be living between Hesarak district and Khogiani district of Nangarhar province, and between Sorkhtapa and Butkhak area of Kabul provinces which will not be affected by the project.

295. Following tables provide further details for the consultation meetings:

Table 9 Chaharasyab Kabul community consulatoin meeting details

DATE/TIME	**OCTOBER, 8, 2017/ 10:00 AM**	
LOCATION	**CHAHARASYAB DISTRICT**	
PARTICIPANTS DETAILS		
NO	Name	Occupation
1	Abdul Khalil Muqsit	District Governor
2	Mohammad Salim	District Social Affairs Officer
3	Qazi Mahmood	District Admin Officer
4	Sayed Ashraf	Development Council Head
5	Wali Jan	Community Elder
6	Ghulam Muhayuddin	Community Elder
7	Merajuddin	Community Elder
8	Malik Muhammad	Community Elder
9	Merajuddin	Community Elder
10	Mohammad Afzal Khan	District Agriculture Officer
11	Mohammad Hamid	District Officer

Table 10 Stakeholder and community consultation at Nangarhar Province

DATE/TIME	OCTOBER, 04, 2017/ 1:00 PM	
LOCATION	SURKHROD DISTRICT, JALALABAD	
PARTICIPANTS DETAILS		
NO	Name	Occupation
1	Eng. Nazim Zakhilwal	Nangarhar DABS Planning Manager
2	Abdullah	Community Elder
3	Omid Saba	Nangarhar DABS director
4	Nasir Quraishi	DABS Planning Engineer
5	Qari Abdullah Noori	Community Elder
6	Dr. Attaullah	Community Elder
7	Haji Noor Jan	Community Elder
8	Qari Ahmad Gul	Community Elder

9. Institutional Requirements and Environmental Monitoring Plan

9.1 Institutional Requirements

296. Institutions responsible for executing and monitoring the environmental aspects of this project are:

- DABS is responsible for planning, constructing, operating and maintaining regional, national and provincial roads in Afghanistan. The Project Management Office (PMO) will be in charge of project management to ensure that the contract provisions are properly maintained. The supervision consultants under the PMO are responsible for environmental monitoring and management of project implementation.
- DABS official and its provincial authorities will undertake routine and random monitoring of specific environmental management plans (EMP) addressed in this IEE.
- The PMO may hire a supervision consultant (SC) to help ensure the implementation of environmental management practices at each stage of the construction.
- National Environmental Protection Agency (NEPA) of Afghanistan will be consulted if complicated issues arise during construction and operation stages.

297. Implementation of mitigation measures presented in the EMP (Appendix A) during the construction stage will be the responsibility of the Contractor. The representative of MPW and environmental specialists of SC will supervise the monitoring of implementing mitigation measures during the construction stage. The domestic environmental specialist will coordinate with the international environmental specialist for resolving complicated issues that arise in the field and to provide continuously updated information in order to submit reports to PMU and ADB.

298. After project completion, DABS will be in charge of the operation and maintenance of

the project. PMO in cooperation with the district/provincial administration will undertake routine and random monitoring and analyze samples scheduled in the monitoring plan (Appendix B).

299. The following measures will be taken to provide an environmental compliance monitoring program during project implementation:

- The tender and contract documents will clearly set out the contractor's obligations to undertake environmental mitigation measures set out in the EMP (appended to Contract Specifications).
- The recommended environmental mitigation cost should be included as an item in the Bills of Quantities. This will ensure that there is specific environmental mitigation budget and will be implemented as required. During the procurement, contractors will be encouraged to include these costs in their rates and present the mitigation cost as a line item in the Bills of Quantities. There will be an identified extra payment in the contract to ensure measures are calculated and carried out.
- Each contractor will recruit an environmental, health and safety manager, who will be responsible for implementing the contractors' environmental responsibilities, and liaising with PMO. The manager will also be responsible for health and safety aspects of work sites (ADB, 2012).

9.2 Environmental Monitoring Program

300. Environmental monitoring is a very important component of environmental management during construction and operation stages of the project to safeguard the protection of environment. During construction, environmental monitoring will ensure the protection of landslide, side slopes, and embankment from potential soil erosion, borrow pits restoration, quarry activities, sitting of work sites and material storages, sitting of batch, preservation of religiously sensitive locations, community relations, and safety provisions. During operation, air, noise, and surface water quality monitoring and greening and landscaping of project will be important parameter of the monitoring program.

301. In response to environmental impacts identified during study, an environmental monitoring plan has been developed and is presented in Appendix B. The contract documents will contain a listing of all required mitigation measures (Appendix A) and a time frame for the compliance monitoring of these activities. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction and the executing agency during the operation of the project.

302. The SC in cooperation with DABS–PMO and NEPA during the project implementation will be required to:

- Develop an environmental auditing protocol for the construction period, and formulate a detailed monitoring and management plan; and
- Supervise the environmental monitoring regularly, and submit quarterly reports based on the monitoring data and laboratory analysis report: the main parameters to be monitored by the contractor are outlined in Appendix B.
- The contractor will be responsible for subcontracting data collection of environmental monitoring to a recognized organization. The cost for this monitoring is included in the environmental mitigation budget in Table 8.

303. The DABS–PMO shall submit the following environmental reporting documentation to

the Government of Afghanistan and ADB:

- Baseline Monitoring Report: The Baseline Monitoring Report shall be submitted to the Government of Afghanistan and ADB prior to commencement of civil works and will include a detailed environmental management and monitoring plan (including data collection locations, parameters and frequency), baseline environmental data, relevant standards and data collection responsibilities.
- Environmental Monitoring Reports: The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analyses of monitoring results, recommended mitigation measures, environmental training conducted, and environmental regulatory violations. The environmental monitoring reports will be submitted to the Government of Afghanistan twice annually during the construction period and annually for three years after completion of construction.
- Project Completion Environmental Monitoring Report: Three years after completion of construction, the DABS–PMO shall submit a Project Completion Environmental Monitoring Report to Government of Afghanistan and ADB which will summarize the overall environmental impacts from the Project (ADB, 2012).

9.3 Environmental and Social Management Capacity Building

304. DABS doesn't have operational environmental safeguard department yet. The creation of a Social Environmental Department in DABS and training of qualified staff are therefore highly recommended. Staff needs to be trained regarding projects environmental concerns and how to mitigate these concerns. Furthermore, DABS needs to assign specific team for the project Environmental Management Plan follow-up. Environment and social department should also deal with social issues and shall be responsible for monitoring during the operation phase.

305. In general, the Environment, Health, and Safety (EHS) staff of DABS shall be trained "on-the-job" how to implement the EMP during mitigation and monitoring actions performed by internationally experienced experts. Training on how to use an EMF meter and how to interpret the results shall also be given to DABS staff. Trainings should focus on the application of ADB Safeguard Policy and monitoring procedures.

9.4 Estimated EMP Costs Summary

306. A preliminary cost estimate of the implementation of the EMP is given in Table 10. The costs for LARP implementation are separately calculated in the respective document. The turnkey contractor must done its own cost calculation as this cost has considered operation phase costs as well which is not part of the contractor responsibility.

Table 11 Estimated costs for EMP implementation

Project Stage	Details	Estimated Cost (USD)
Design	As stated in the project IEE	6,000

Site office Establishment and Operation	As stated in the project IEE	5,000
Birds flapper/diverter (200 each)	As stated in the project IEE	4,500
Construction Phase	As stated in the project IEE	12,000
Operation and Maintenance Phase	As stated in the project IEE	8,000
Miscellaneous	As stated in the project IEE	5,000
Decommissioning Phase	As stated in the project IEE	10,000
Capacity building training	As stated in the project IEE	8,000
EMP Monitoring [6]	Detailed in EMP	300,000
Contingency	Contingency	5,000
Total	**363,500**	

10. Grievance Redress Mechanism (GRM)

307. A mechanism to receive and facilitate resolution of concerns, complaints, and grievances about the project's environmental performance will be established. It will address Aggrieved Person (AP) concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. Systems and institutions for grievance redress available to affected persons is shown in below figure.

[6] An environmental monitoring specialist has been considered for all the duration of the plant lifecycle (30 Years) with approximate 1000 USD/Month cost.

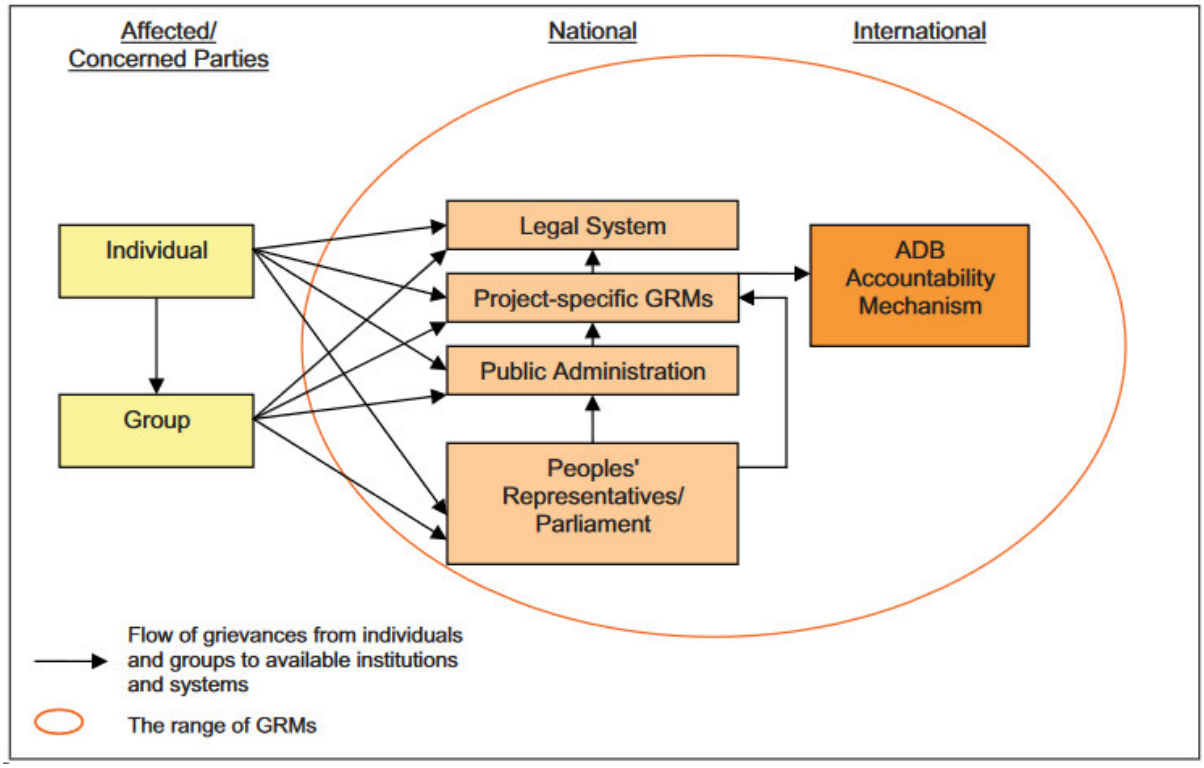

Figure 49 Systems and Institutions for Grievance Redress Available to Affected Persons (ADB, 2010)

308. In the course of the construction process, people affected by the project may suffer from accidental negative impacts or feel treated unjustly. This might happen for various reasons: the contractor does not adhere to sound construction principles, health hazards were incidentally produced, working conditions are found unacceptable, unexpected downstream impacts / environmental pollution were incidentally produced, damages to individual property are not paid for or misunderstandings have arisen and so forth.

309. In the case of individual grievances or disagreement with procedures of consultation, notification or valuation, people are encouraged to lodge their complaints with the responsible grievance redress mechanism within the Implementing Agency (DABS-PMO). In case of accidental environmental pollution the local / national environmental authority will have to be directly informed and legal procedures will undertake.

310. The rationale behind is that people can get their problems solved and grievances redressed in a timely and effective manner without directly addressing the court. During consultation procedure the AP shall be notified orally or in a written form about their rights and the procedure of complaints introduction. The grievance mechanism has to be locally implemented at the level of village institutions and municipality. Distribution of leaflets as well as putting up information boards are an effective way of distributing information including contact addresses and telephone numbers to be contacted.

311. A professional attitude to accept complaints in a friendly manner and offering all possible help is a crucial qualification for the staff charged with grievance collection. Lodging complaints and grievance resolution must be cost free for APs. In a first step complaints resolution will be attempted at the community level in a negotiation procedure with an informal mediator and community authorities. If the grievance persists, a grievance form can be submitted at the responsible committee under the responsibility of the authorized body /

DABS. The committee then decides whether to settle or go to court. The decision has to be taken within 15 days. In case of failure of the grievance redress system, the APs can submit their case to the appropriate court of law.

312. Members of the grievance committee will be the contractor, DABS-PMO, local administration, the environmental authority in charge, a lawyer and NGO representatives in case applicable. The contractor is obliged to carry out the work in accordance with the contractual requirements that include:

- a provisional sum for grievance redress
- a person of staff responsible for grievance procedure (including first contact, periodical site visiting of mitigation measure to be implemented by contractor, record keeping of filed complaints and follow up, periodic reporting)
- a telephone line, e-mail address and contact name on project information boards
- communication of contacts and grievance procedure to all affected Villages.

313. There must be a record book at the site to record and register all complains and its remedial actions. The record book will include a narrative on the actual process undertaken to mitigate these grievances. The constructor, together with the Implementing Agency (IA), will be responsible to include a social and gender specialist to:

- coordinate the grievance redress procedure
- arbitrate grievances with contractor, AP and local administration /Community leader
- liaison with DABS
- liaison with court
- documentation of all grievances and resolution procedures.

314. Community leaders will act as informal mediators in case of complaints. However, APs have the option to choose a different representative or directly liaison with the IA staff designated for grievance redress. All grievances and their resolution process shall be documented. The AP is encouraged to proceed in the following way (Figure 25):

- contact the constructor's designated grievance staff /committee representative during periodical site visits in person or via designated telephone number or via the community leader or NGO staff
- lodge the complaint and provide information on the case
- agree with the construction contractor on specific mitigation measures
- agree with the contractor on a time limit for the grievance settlement
- grievances have to be settled within two weeks, or as otherwise specified in scheduled agreement
- sign if the mitigation measure has been implemented as agreed
- seek redress from DABS if not satisfied with above mentioned procedure
- involve appropriate local authorities to liaison with DABS and constructor
- involve NGOs or the construction supervision consultant to liaison with DABS and the constructor
- seek redress from ADB if not satisfied with response by DABS
- Seek redress from court if all other ways has failed.

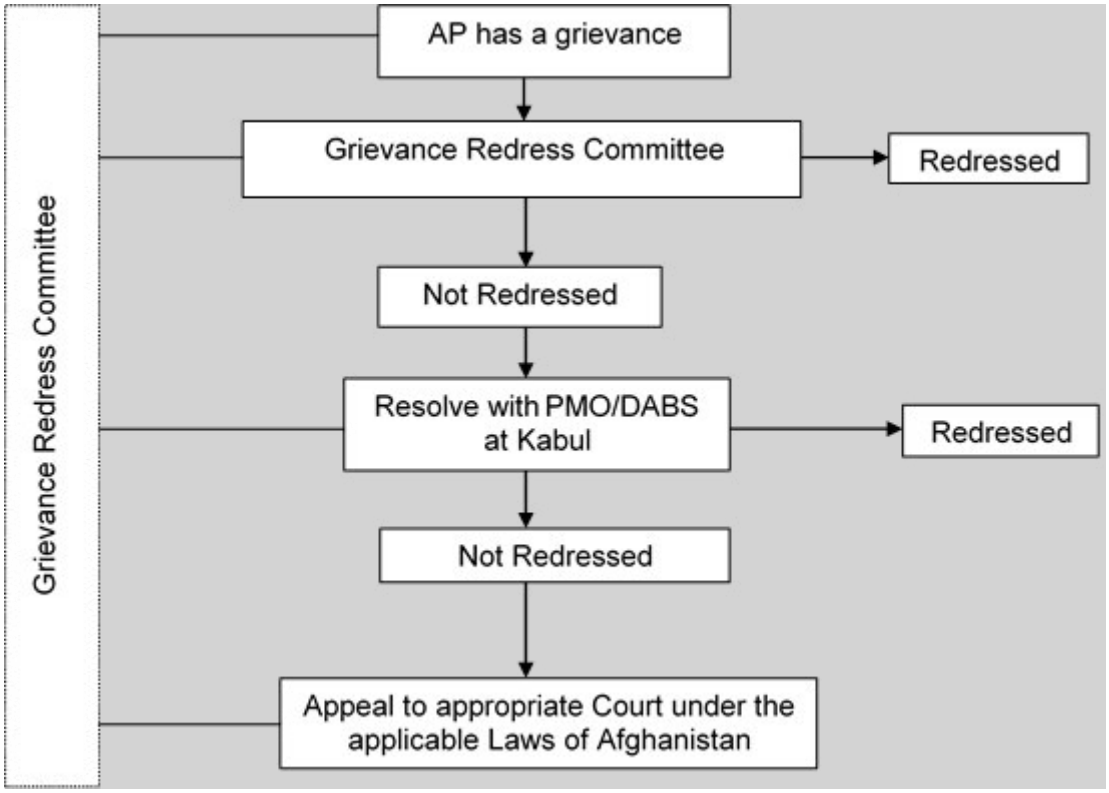

Figure 50 Grievances Redress Chart

315. The grievance mechanism is designed to avoid lengthy court procedures, but does not limit the citizen's right to submit the case straight to the court of law just in the first stage of the grievance process. The Asian Development Bank (ADB) is not directly a part of the Grievance procedure, but shall receive reports on which complaints were received and how they have been followed up/mitigated.

316. The grievance mechanism shall be implemented by the PMO in cooperation with the contractor. The PMO shall ensure the availability of GRM staff and make information about GRM (telephone number, contact persons etc. publicly available and free of charge.

11. Findings and Recommendations

317. This IEE reveals that there will be both positive and negative impacts due to the construction activities and normal operations after the proposed construction. Mitigation measures have been discussed to mitigate the expected negative impacts. The major positive impact of the project will be economic and access to energy. The industry will grow and will create short and long term job opportunities for people.

318. The study results suggest that the project will overall have minimal environmental impacts if the proposed mitigation measures and EMP are implemented properly. The transmission line site evaluation and design impacts such as site characterization, line route survey and monitoring are generally temporary and of relatively lesser magnitude. The possible impacts includes ground clearing (removal of vegetative cover), vehicular and pedestrian traffic, borings for geotechnical surveys, and drilling to characterize subsurface conditions (e.g., soils, depth to groundwater). In some places the excavation or access road

construction is necessary at this stage, impacts to resources would be similar in character, but lesser in magnitude, to those for the construction phase. The mitigation measures mentioned in the report will help reduce and avoid these negative impacts.

319. Impacts to ecological resources (wildlife, vegetation, aquatic biota, special status species, and their habitats) will be minimal and localized in all phases of the project because the line doesn't pass through ecological environmentally sensitive areas. The introduction or spread of some nonnative invasive vegetation could occur as a result of vehicular traffic, but this would be relatively limited in extent. It is worth mentioning that above-ground power lines pose three main risks to birds: risk of electrocution; risk of collision and risks and loss of habitat quality in staging and wintering areas. However, as this transmission line does not not pass through a protected area or on the bird's migration path this impacts on bird safety is considered as low. But for the safety of air traffic and for the minimization of fatal bird collision on power lines, the mentioned mitigation measures must be applied to the power lines to possible extent.

320. Careful line routing during the detailed design will help to minimize resettlement needs. Involuntary displacement and relocation shall be mitigated to an absolute minimum. If the priority to avoid involuntary displacement is respected by the construction contractor and bypasses are carefully designed, involuntary displacement is likely to be totally avoided. As the line route passes through areas which might contain Buddhism sculptures such as the Sherzad district with various artifacts which include Buddhist icons, coins, jewelry and dishes. The accumulation of sediment mentioned above could serve to protect some buried resources by increasing the amount of protective cover. It is therefore recommended that following mitigation measures needs to be followed in order to avoid adverse impacts to these resources. Follow guidance in the cultural resources management plan. For example:

- Conduct a records search to determine the presence of known archaeological sites and historic structures within the area of potential effect. Identify the need for an archaeological and/or architectural survey.
- Periodic monitoring of significant cultural resources in the vicinity of the development may be required to reduce the potential for looting and vandalism.
- An unexpected discovery of cultural resources during any phase of the project shall result in a work stoppage in the vicinity of the find until the resources can be evaluated by a professional archaeologist.
- Educate workers and the public on the consequences of unauthorized collection of artifacts.
- During all phases of the project, keep equipment and vehicles within the limits of the initially disturbed areas.
- Prepare and follow a cultural resources management plan, if cultural resources are present at the site or if areas with a high potential to contain cultural material have been identified.
- Use existing roads to the maximum extent feasible to avoid additional surface disturbance.

321. DABS has proposed 500x500 m^2 area at Shaikh Mesri of Surkhrod district for the construction of substation. This land is the property of Afghan government allocated for the famous Farm-e- Hada Canal of Jalalabad. The land clearance is currently under process to officially allocate this land for the substation. And the delegation committee of the different ministries such as agriculture, DABS and urban development has decided in the favor of substation construction in the area. The land approval documents are currently under process at the ministry of agriculture. Therefore, it is important to ensure the land acquisition process

is fully resolved before starting the construction.

322. The proposed transmission line including the suggested bypasses will not cross Natural Protected Areas. At river crossings special care must be taken in order to avoid water pollution and river bank erosion. Within DABS an Environmental and Social Department currently does not exist. It is recommended to implement such a department and train the staff regarding all health, safety and environmental aspects, including social aspects that will invariably arise during construction and operation of overhead lines and their associated substations.

323. The current design of the transmission line routing is preliminary. The line route has determined considering technical and economic aspects as well as social and environmental aspects. However, not all impacts can be avoided:

- In two places the line passes Kabul and Logar Rivers.
- Line will pose visual effects to some extent on topography of the area.
- Some land acquisition and resettlement activities are required in Kabul and Nangarhar areas.
- Crossover of the current 220kV line from already in place Arghandeh Logar 220kV lines at Gulbagh area of Kabul province.

324. Adjustments to the route shall be considered during the detailed design to minimize or avoid the impacts listed above.

11.1 Recommendations

- As the land acquisition for the Shaikh Mesri Substation area is under process by DABS Nangarhar, therefore, it is important to ensure that the land acquisition process is fully resolved before starting the construction.
- To make sure that the proposed mitigation measures are implemented and negative impacts are avoided, the measures should be included in the contract specification of the project.
- As the line will crossover the existing 220kV Arghandeh-Logar line at Gulbagh area of Kabul province, therefore, it is important to consider the clearance, special towers, and electromagnetic effects of the line on each other.
- An unexpected discovery of cultural resources during any phase of the project shall result in a work stoppage in the vicinity of the find until the resources can be evaluated by a professional archaeologist.
- Educate workers and the public on the consequences of unauthorized collection of artifacts
- For increasing the project socioeconomic positive impacts, it is recommended that the first priority to be given for the recruitment of local people to work in the project.

12. Conclusion

325. The project will have both positive and negative environmental impacts. Implementation of appropriate mitigation measures during design, construction, and operation phases will minimize the negative impacts of the project to acceptable levels. To ensure that these mitigation measures are implemented and negative impacts are avoided, the measures will be included in the contract specification of the project.

326. After analysis of all environmental and social aspects of the project it can be concluded that the project will not have adverse environmental impacts in case all the mitigation measures mentioned in this IEE have taken into the consideration.

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14. Appendices

14.1 Appendix A

14.1.1 Environmental Management Plan (EMP)

327. This section covers the set of management and mitigation measures to be taken during project implementation to avoid, mitigate, reduce, or compensate for adverse environmental impacts (ADB, 2009). Environmental risks and impacts need to be analyzed for all the project cycle stages, including construction, operations, decommissioning, and closure. The objectives of the EMP is to provide the delivery method to address the negative environmental impacts of this project during its implementation.

Table 12: EMP for the Design Phase

Issue	Section Explained	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
Line routing	6.1.3	➢ Physical and Economical Resettlement ➢ Crossing of rivers	Low	• Adjustments to the route shall be considered during detailed design to minimize or avoid the impacts. • Place access roads to follow natural topography, and avoid or minimize side hill cuts. New roads should avoid going straight up grades in excess of 10%. Design roads with eventual reclamation in mind. • Minimize the amount of land disturbed as much as possible by using existing roads, and disturbed areas. Minimize unnecessary vegetation removal. • The IEE/EMP will be updated based on the detailed design	Turnkey Contractor	During final design

Seismicity, mud flow and rock fall Consideratoin	6.1.1.1	➢ Destructive earthquakes ➢ Damge to towers	Medium	• Medium to high risk seismicity level (Richter scale 6-7.5) is proposed to be taken into design consideration in design stage. • Avoide rock fall spots for tower installation.	Turnkey Contractor	During final design

Table 13: EMP for the Construction Phase

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
Acoustics (Noise)	6.2.1.2	➢ Disturbance to communities ➢ Noise could cause hearing loss, impair the ability to communicate and hear high frequency sounds and even permanent hearing loss ➢ Generation of ground vibrations, noise, dust, fumes and fly-	Medium	• The application of Engineering and Admiistrative methods for noice control • Noisy construction activities should not be allowed during night time (5PM to 6AM) particularly near the community areas • The blasting operations should be avoided to the extent possible • Develop a blasting management plan • Use blasting mats to contain the blast, prevent flying rocks and suppress dust • Inform the near communities and security officials in advance • Limit noisy activities (including blasting) to the least noise-sensitive times of day (weekdays	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
		rocks due to blasting		only between 8 a.m. and 6 p.m.) and inform the nearby resident in advance.		
Air Quality	6.2.1.3	➢ Emissions ➢ Fugitive dust	Low	• Use dust abatement techniques on unpaved, un-vegetated surfaces to minimize airborne dust and during earthmoving activities, prior to clearing, before excavating, backfilling, compacting, or grading, and during blasting. • Post and enforce speed limits to reduce airborne fugitive dust from vehicular traffic. • When possible, schedule construction activities during periods of low winds to reduce fugitive dust. • Cover construction materials and stockpiled soils if they are a source of fugitive dust. • Cover dump trucks before traveling on public roads. • When feasible, shut down idling construction equipment	Turnkey Contractor	During construction
Impacts on Soils and Geologic Resources	6.2.1.4	➢ Soil erosion ➢ Soil nutrient loss and reduced water quality in nearby	Medium	• Obtain borrow material from authorized and permitted sites. • Inspect and maintain project facilities regularly, including access roads, to ensure erosion	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
		surface water bodies ➢ Altering drainage patterns accelerates erosion and creates slope instability		levels remain the same or less than current conditions. • Reclaim or apply protective covering on disturbed soils as quickly as possible. • Apply erosion controls, such as jute netting, silt fences, and check dams. • In areas of potential wind erosion, apply gravel to access road surfaces. • Maintain vegetative cover within the right-of-way (ROW) to prevent erosion and monitor periodically to assess erosion		
Impacts on Water Quality	6.2.1.6	➢ Spills of chemicals (for example, dust suppressants, dielectric fluids) could result in contamination of surface or groundwater ➢ Discharges of waste or sanitary water; ➢ Herbicide applications; and	Low	• Save topsoil removed during construction and use it to reclaim disturbed areas upon completion of construction activities. • Avoid creating excessive slopes during excavation and blasting operations. • For in-stream construction, use isolation techniques such as diversion to limit the exposure of disturbed substrates to moving water. • Closely monitor construction near aquifer recharge areas to reduce	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
		➢ Contaminant spills, especially oil.		potential contamination of the aquifer. • Pollution of rivers by vehicles and waste shall be forbidden and controlled, (e.g. no car washing in the rivers, no oil spills, etc.). • Where access roads would cross a dry wash, restrict the road gradient to 0% to avoid diverting surface waters from the channel specifically near Kabul River and other streams in the Bagrami to Surkhrod areas.		
Natural Disasters	6.3.1.7	➢ Floods ➢ Mudflows ➢ Seismic	Medium	• The contractor should make its own hydrological study to verify and assume the results for project design. • A storm water management plan (SWMP) report will be prepared and shall contain a summary of hydrogeological, and regulatory data related to this site. • Construction of storm water outfall structures • Plant ground cover on slopes, or build retaining walls. • Reinforce the foundation and walls of the facilities. • Install flexible rather than stiff pipe fittings to avoid gas or water leaks	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
				in the event of a mudflow or landslide. • Construct channels or reinforced walls to direct the mudflows around the project facility and buildings. Clear obstructions from waterways. • Construction should observe the requirements of seismic stability (grade VIII (8) points) and provide safe stay of the people, safety of designs with earthquakes of calculated intensity		
Cultural and Historic Resources; PCR Chance Find	6.2.1.5	➢ Complete destruction of the resource if present in areas undergoing surface disturbance or excavation ➢ Degradation or destruction of near-surface cultural resources on- and off-site resulting from	Low	• Conduct a records search to determine the presence of known archaeological sites and historic structures within the area of potential effect. • Periodic monitoring of significant cultural resources in the vicinity of the development may be required to reduce the potential for looting and vandalism. • An unexpected discovery of cultural resources during any phase of the project shall result in a work stoppage in the vicinity of the find until the resources can be evaluated by a professional archaeologist.	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
		changing the topography, changing the hydrological patterns, and soil movement (removal, erosion, sedimentation) ➢ Unauthorized removal of artifacts or vandalism as a result of human access to previously inaccessible areas		• Educate workers and the public on the consequences of unauthorized collection of artifacts. • During all phases of the project, keep equipment and vehicles within the limits of the initially disturbed areas. • Devlop a PCR chance find procedure.		
Ecological Environment (Flora and Fauna)	6.2.2	➢ Damages to vegetation and habitats ➢ Dust settling on vegetation	Low	• Use existing facilities and disturbed areas (e.g., access roads, graded areas) to the extent feasible to minimize the amount of disturbance. • Design permanent facility structures to discourage their use by birds for perching or nesting. • Retain all ground-level vegetation and stumps left after cutting, unless there removal is necessary to install support structures, or other ancillary facilities.	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
				• Initiate habitat restoration activities as soon as possible after construction activities are completed within a given area. • Use dust abatement techniques on unpaved, un-vegetated surfaces to minimize airborne dust.		
Human Health and Safety	6.2.4	➢ The workers and equipment safety risks ➢ Loss of workers ➢ Working in potential weather extremes, and possible contact with natural hazards	Low	• Everyone in the workign area should be equipped with the PPE • Hold contractor crew safety meetings at the start of each workday to go over potential safety issues and concerns. • Install grounding devices on all fences that cross or run parallel to a transmission line. • Ensure that employees are trained, as necessary, in tower climbing, cardiopulmonary resuscitation, first aid, rescue techniques, and safety equipment inspection and use. • Secure construction sites at the end of the workday to protect the equipment and the general public.	Turnkey Contractor	During construction

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
Land Acquisition and Resettlement	6.2.3	➢ Crops loss, houses and economic trees, Loss of land (see LARP Document)	Low	• Avoid and minimize land acquisition and related impacts wherever possible and compensate affected persons (APs) for impacts that cannot be avoided (see LARP document)	DABS LARP coordinator/facilitator	During and before construction

Table 14: EMP for the Operation Phase

Issue	Reference Heading No.	Potential Impacts	Severity	Mitigation Measures	Implementing Agency	Time for Implementation
Impacts on Acoustics Environment	6.3.1.1	➢ Noise from compressor or pump stations, transformer and switchgear at substations, corona discharge from transmission lines, vehicles and machinery	Low	• Install low noise level transformers exhaust silencers, quieter cooling fans and etc.	DABS	During Operation
Air Quality	6.3.1.2	➢ Fugitive dust and exhaust emissions	Low	• Enacting fugitive dust and vehicle emission controls policies and speed limits in the site will reduce the air quality impacts.	DABS	During Operation

Water Resources	6.3.1.4	➢ Pollution of soil and water through oil leakage in the substation ➢ Degradation of water quality resulting from vehicular traffic and machinery operation during maintenance (e.g., erosion and sedimentation) or herbicide contamination during vegetation management (e.g., from accidental spills) and wastewater disposal	Low	• Ensure that vegetative cover is maintained within the right-of-way • Maintain equipment and vehicles to minimize the risk of accidental fuel spillage. • The substation must have appropriate sewage handling system. • Apply erosion controls relative to possible soil erosion from vehicular traffic and during construction activities • Reclaim or apply protective covering (e.g., vegetative cover) on disturbed soils as quickly as possible. • Refuel in a designated fueling area that includes a temporary berm to limit the spread of any spill. • The herbicide/pesticide must not be used.	DABS	During Operation
Visual Impacts	6.3.1.5	➢ Visual impacts of substation and towers	Low	• Planting trees/ bushes around the new substation • Consider site-specific landscaping in selected areas to provide screening for year-round residents whose property abuts the project.	Turnkey Contractor and DABS	During Operation

				• Maintain the right-of-way with low-growing natural vegetation that requires minimal maintenance and is consistent with local vegetation. • Keep areas around support towers, and other facilities clean and free of debris. • Do not apply paint or permanent discoloring agents to rocks or vegetation to indicate survey or construction activity limits.		
Hazardous Materials and Waste Management	6.3.1.6	➢ Industrial wastes are generated during routine operations (e.g., lubricating oils, hydraulic fluids, coolants, solvents, and cleaning agents) ➢ Environmental contamination	Medium	• The waste oils and chemicals should be disposed in accordance with their respective Material Safety Data Sheet (MSDS). • PCB containing equipment are not allowed to use in the project • Implement plans for hazardous materials management, waste management spill prevention and response, and storm-water management. Train employees to promptly contain, report, and/or clean up any oil or hazardous material spill. • Provide secondary containment for all on-site		

				hazardous materials and waste storage, including fuel. • Containerize and periodically remove wastes for recycling or for disposal at appropriate off-site permitted disposal facilities. • Provide portable spill containment and cleanup equipment in all vehicles. • Keep vehicles and equipment in good working order to prevent oil and fuel leaks.		
Flora	6.3.2	➢ ROW maintenance (e.g., vegetation removal) ➢ Clearance during maintenance works	Low	• Herbicides shall not be used for corridor clearance • Monitor the right-of-way (ROW), access roads, and ancillary facilities regularly for invasive nonnative plant species establishment, and initiate weed control measures immediately upon evidence of invasive species introduction or spread.	DABS	During maintenance
Fauna and Avifauna	6.3.2	➢ Disturbance of wildlife from noise and human activity; ➢ Exposure of biota to contaminants; and ➢ Mortality of biota from colliding with	Low	• Careful preparatory investigations of different routing alternatives: bird migration often follows local or regional flyways determined by topology, shorelines, etc. Prior to final	DABS and contractor	Design and during and before operation

		transmission lines or other components. ➢ Collision and/or electrocution of birds		planning of the power lines, such investigations are needed and must comprise bird migration at day and night time and other seasonal phenomena. • Installation of bird diverters in case needed. • Edison Electric Institute guideline for Reducing Avian Collisions with Power Lines is recommended to be followed.		
Human Health and Safety	6.3.4	➢ Workers electrocution and fires ➢ Avoidable damage and injuries of workers ➢ Exposures to electromagnetic fields, accidental injury or death to workers during operation and maintenance activities, and accidental injury or death to the public	Low	• Staffs must have essential protective equipment and must be provided with safety training. • There must be fire extinguishers in place in a variety of places that are at risk of material fires and flammable liquid fires. • Public awareness of the risks of illegal connections • Fire protection measures that follow international requirements • De-energize the equipment which needs repairing or maintenance and completely isolated them • At point of isolation, the rack must be locked off and breakers must be tagged.	DABS	During Operation and Maintenance

				The tag and safety lock should be placed at points of isolation. • Discharge equipment to be worked on and place safety grounds to protect personnel. • On completion of the work and prior to return of system to normal, remove safety grounds and make sure: that equipment is in a safe condition to energize, and, personnel have been informed that equipment is going to be energized.		

14.2 Appendix B

14.2.1 Environmental Monitoring Plan

Table 15: Monitoring Plan for Design and Construction Phase

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Noise	➢ Noise level in dBA	• Vehicles exhaust mufflers and silencers availabilit. • Vehicle speed near the communities. • Nighttime (22:00-07:00) work. • Noise barriers installation around the noisy equipment	Near residents and inside construction site	Average of 15 minutes measurement of noise level in dBA	Daily	PMO and Contractor	Construction
Line Routing	➢ Compliance with ADB SPS, ➢ Minimization of resettlement needs, ➢ Avoidance of cultural sites, ➢ Compensation payments (see LARP),	• Avoidance of environmental and social impacts during line routing, • Avoidance of resettlement requirements • Towers shall not be located near river banks and flooding areas	Entire line corridor	Visual control (Field visit) of final line routing	One time, before start of physical works	PMO and contractor	During design phase, before the start of physical work

	➢ Access road design, ➢ Design of river crossings ➢ Special tower consideration for the line crossover	• Towers shall be located with minimum local environmental impact • Construction activities shall be restricted to as small an area as possible (incl. access roads).					
Soil and Erosion	➢ Construction standards of access roads, ➢ Temporary bridges, ➢ Re-planting activities	• Control of low impact construction standards • Visual control of river crossings • Visual control of re-planting activities	Entire line corridor	Visual control of record keeping of length built and length rehabilitated	Periodically during construction	PMO, Contractor	During construction
Land Acquisition and Resettlement	➢ Compensation payments, ➢ Resettlement actions (see LARP)	• Visual control and photo-documentation of resettlement activities and re-installation including GPS data (See LARPF).	Entire line corridor and substation site	Visual control, records, survey	After final design	DABS LARP coordinator/facilitator (see LARP document)	Before construction
Air Pollution	➢ CO, NOx, Dust ➢ Construction standards	• Monitoring of good construction standards; • Monitoring of correct implementation of construction manual,	Work areas	Laboratory measurements of air samples Visual control	Periodically during construction	Contractor and PMO	During construction

		especially related to vehicle use and maintenance					
Pollution of Surface Water	➢ Good construction principles at river crossings ➢ Location of towers no closer than 50 m to flooding areas ➢ No pollution sources near rivers	• Visual control of downstream water quality (turbidity), • Regular measurements of up/downstream basic parameters, • Plan for detailed analysis (e.g. for hydrocarbons) if pollution/ spills are suspected. • Visual control that any temporary bridges are properly constructed, do not cause deterioration of river bed and are dismantled after completion • Control of Implementation of EMP measures	Line sections with river crossings, substation sites	Visual Control, Measurements and Analysis of basic surface water parameters (ph, COD, BOD, oil grease etc.) , sampling upstream and downstream of river crossings and substation sites	Periodically during construction	EHS Auditor, PMO	During Construction
Pollution of Groundwater	➢ Appropriate sewage treatment of workers camps ➢ Appropriate groundwater protection measures	• Visual inspection of pollution sources • Visual control of oil absorbers at substation and good construction practices during	Substations, tower sites, work camps	Visual control, water analysis in wells	Periodically during construction	EHS Auditor, PMO and Contractor	During construction

		stringing, tower construction and substation construction • Analysis and measurements of basic groundwater parameters.					
Flora and Fauna	➢ Respect of minimal ground clearance (7 m for 220 kV lines) in design ➢ Extent of lay down areas and routing of new access roads ➢ Implementation of Avifauna protection measures	• Monitoring of final design, including specifications of tower locations and height of towers, location and length of access roads, • Monitoring of tree cutting, enforcement of prohibition, • Monitoring of implementation of bird flappers/ markers. • Monitor birds mortality rate under the corridor	Entire line ROW	Regular visual inspection during construction Complete line survey after construction	Periodically during construction General survey after construction	EHS Auditor, PMO and Contractor	During construction
Waste	➢ Implementation of Sewerage and waste Management Plan ➢ Septic tanks at each	• Visual control of construction sites and workers camps, especially sanitary facilities, • Waste Management Plan and	Work camp sites; Substations; Lay-down Areas	Design compliance, Visual control	Regular monitoring during construction process; EHS Audit	EHS Auditor, Contractor and PMO	During construction

	construction campsite ➢ Measures to prevent spills of liquid wastes (i.e oil change of construction vehicles)	Sewerage Management Plan facilities					
Health and Safety	➢ Compliance with EHS Plan (Work Safety / Sanitation, Noise)	• Construction Site/ EHS Audit. • Monitoring of noise level, protective equipment, workers camp sanitation, safe • handling of hazardous materials (explosives at quarries etc.) and electrical accidents prevention, prevention of work accidents etc. during construction	All work areas, Workers camps, Substation sites	Visual Control of EHS Management Plan implementation	Yearly during construction	EHS Auditor, Contractor and PMO	During construction
Physical Cultural Resources	➢ Implementation of chance find procedure	• Photo-documentation of key sites close to alignment before start and after completion of construction, • Visual control that sensitive areas	All work areas	Visual Control, Records	Monthly during construction	EHS Auditor, Contractor and PMO	Before, during and after construction

		are fenced off and secured against unintended damage during construction.					
Grievance Mechanism	➢ Implementation of an accessible grievance mechanism for APs to address complaints at the local level	• Social survey by independent expert to find out if grievances have been settled.	Community level in both provinces	Survey	3 times during construction process	EHS Auditor, Contractor and PMO	During Construction

Table 16: Monitoring Plan for the Operation and Decommissioning Phases

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Soil and Water Resources	➢ Removal of temporary infrastructure ➢ Replanting of unneeded access roads, lay down areas, and other work sites ➢ Fitting transformers with oil pits connected to a secure drainage system. ➢ Provision of separate storage tanks for further treatment of oily wastewater at substation.	• Visual control of downstream water quality (turbidity), • Regular measurements of upstream / downstream basic water parameters, • Plan for detailed analysis (e.g. for hydrocarbons) if pollution / spills are suspected. • Visual control that any temporary bridges are properly constructed, do not cause deterioration of river bed and are dismantled after completion.	All work areas	Visual inspection	Once after construction	DABS NEPA	After construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Landscape and Visual Impacts	➢ Complete dismantling of the old TL and substation after its useful life ➢ Planting trees/ bushes around the new substation	• Visual Inspection Control of planning and implementation of re-plantation at sites	All work areas	Visual inspection	Once after construction	DABS Environment Department (ED)	After construction
Flora	➢ No use of herbicides for ROW clearing	• Supervision of maintenance procedures	Entire ROW	Periodical Inspection	Yearly during operation	DABS Environment Department / NEPA	During operation
Fauna	➢ Disturbance of animals during maintenance work ➢ Prohibition of hunting	• Supervision of maintenance procedures	Entire ROW	Periodical Inspection	Yearly during operation	DABS ED / NEPA	During operation

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Waste Management	➢ Development of a Waste Management Plan ➢ Reduction of waste quantity, recycling as much as possible. ➢ Proper dumping of remaining waste. ➢ Regular sewage treatment.	• Monitoring of Waste Management Plan and control of implementation	Substation Sites	Periodical Inspection	Yearly during operation	DABS	During operation
Health and Safety	➢ EHS Management System/ Plan development and implementation during Substation operation ➢ Electric and Magnetic fields	• Monitoring of Implementation of EHS Management Plan • Regular EMF measurements (after purchase of EMF meters and related training for handlers)	Substation Sites, Maintenance locations	Periodical Inspection, Regular EHS Audits	Yearly during operation	DABS, EHS Auditor	During operation

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Land Use ROW clearing and maintenance	➢ Further agricultural land use in the ROW, Use rights and use practices ➢ Compensation payment for damaged crops during maintenance. ➢ No use of herbicides for ROW clearing	• Monitoring of land use possibilities, compensation payments, grievance mechanism	Entire line ROW	Periodical Survey	Yearly during operation	DABS	During operation

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Monitoring and Reporting Responsibility	Project Phase
Decommissioning	➢ Repeat of mitigation measures used in construction stage to minimize impacts to on environment during construction ➢ Use topsoil removed during the beginning of the project or during decommissioning activities to reclaim disturbed areas. ➢ Reestablish the original grade and drainage pattern to the extent practicable. ➢ Stabilize all areas of disturbed land using weed-free native shrubs, grasses, and forbs.	• Visual control that all project related infrastructure is deconstructed, metal parts are recycled, wastes disposed and hazardous materials treated according to national and international best practices	entire line ROW, all substation sites	visual control, review of records	One time after life span of the project (50 years)	DABS	After life span of the project

14.3 Appendix C

14.3.1 Project Site Visit Photos

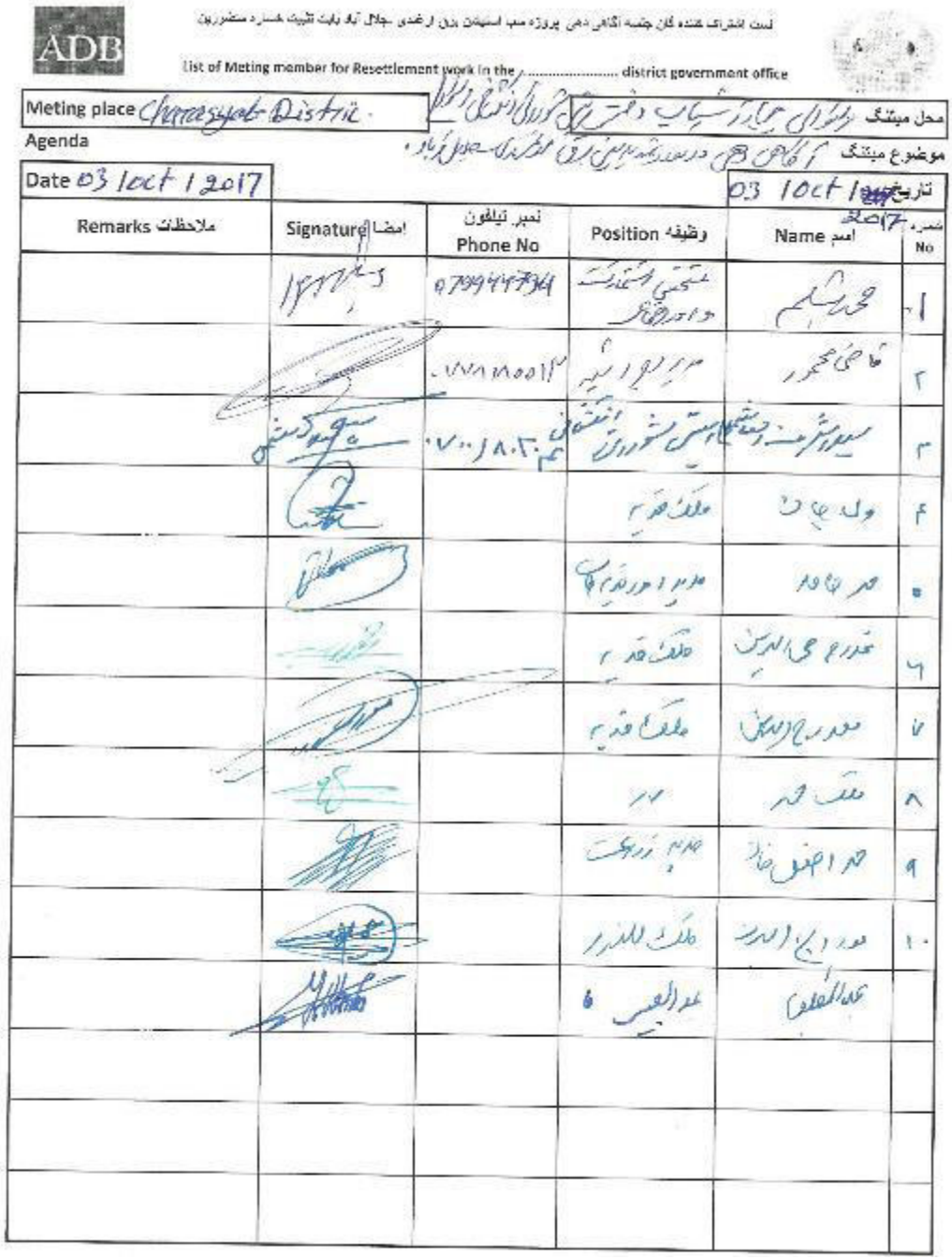
Figure 51 Environmental team during substation site examination

Figure 52 Cotton and vegetable cultivation at a portion of proposed substation area in Jalalabad

Figure 53 under construction Arghandeh Substation at Kabul from where this 220kV line will initiate

Figure 54 Cemetery on the line route at Chaharasyab District

Figure 55 Community consultation at Chaharasyab District in the presence of district governor



ADB

لست اشتراک هنده گان جلسه آگاهی دهی پروژه سب اسپیدن برق از غندی جلال آباد بابت تثبیت خسارد متضررین

List of Meting member for Resettlement work in the ..... district government office

Meting place Chaharasyab District

محل میتنگ

Agenda

موضوع میتنگ

Date 03 Oct 2017

تاریخ 03 Oct 2017

No شماره	Name اسم	Position وظیفه	Phone No نمبر تیلفون	Signature امضا	Remarks ملاحظات
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Figure 56 Community consultation record sample with Chaharasyab District