# Initial Environmental Examination

October 2016

# AFG: Energy Supply Improvement Investment Program–Tranche 2

Prepared by Da Afghanistan Breshna Sherkat of the Government of Afghanistan for the Asian Development Bank.

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# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ADB | Asian Development Bank |
| AERA | Afghanistan Energy Regulatory Authority |
| ANDS | Afghanistan National Development Strategy |
| AP | Affected Persons |
| AWEC | Afghanistan Wildlife Executive Committee |
| CEO | Chief Executive Officer |
| COI | Corridor of Influence |
| DABS | Da Afghanistan Breshna Sherkat (National Power Utility) |
| EA | Environmental Assessment |
| EHS | Environment, Health, and Safety |
| EIA | Environmental Impact Assessment |
| EMF | Electric and Magnetic Fields |
| EMP | Environmental Management Plan |
| GoA | Government of Afghanistan |
| GRM | Grievance Redress Mechanism |
| IA | Implementing Agency |
| ICIMOD | International Centre for Integrated Mountain Development |
| IEE | Initial Environmental Examination |
| IUCN | International Union for Conservation of Nature |
| kV | Kilovolt |
| LARP | Land Acquisition and Resettlement Plan |
| LARPF | Land Acquisition and Resettlement Policy Framework |
| MDG | Millennium Development Goal |
| MEW | Ministry of Energy and Water |
| MFF | Multi-Tranche Financing Facility |
| MoPH | Ministry of Public Health |
| MRRD | Ministry of Rural Rehabilitation and Development |
| NEPA | National Environmental Protection Agency |
| NGO | Non-Governmental Organization |
| OHL | Overhead Line |
| PIC | Project Implementation Consultant |
| PMO | Project Management Office |
| PMU | Project Management Unit |
| PUE | Transmission Line Standard for Soviet Union (*pravila ustroystva electrostanovok*) |

| | |
|---|---|
| ROW | Right of Way |
| SEA | Strategic Environmental Assessment |
| SPS | Safeguard Policy Statement |
| SS | Substation |
| STD | Sexually transmitted diseases |
| TL | Transmission Line |
| TOR | Terms Of Reference |
| UN | United Nations |
| UNEP | United Nations Environment Programme |
| USD | United States Dollar |
| WWF | World Wide Fund for Nature |

# 1. Executive Summary

Tranche 2 of the ADB's MFF-0090 (Multitranche Financing Facility) — Energy Sector Development Investment Program for the Islamic Republic of Afghanistan proposes to finance the construction of a 220 kV Overhead Transmission Line Doshi-Bamyan, a new 220/20 kV Bamyan Substation (S/S), the extension of the existing 220/20kV Doshi S/S, and a 500 MW Back to Back Converter Station in Dasht-e-Alwan.

This is assessed to be a Category B Project according to the ADB Safeguards Policy Statement (2009), for which an Initial Environmental Examination (IEE) is required, and is presented in this report. Within the scope of this IEE, FICHTNER investigated the potential environmental impacts of the construction and operation of the Project.

One basis for the study consisted of field surveys conducted by the national environmental and socio-economic experts in October 2014 and September 2016. Regarding the environment, a corridor of 500 m was investigated on either side of the planned transmission line. Socio-economic baseline surveys were carried out for sample populations settled along the corridor of influence (COI, 1-1.5 km). Additionally, an evaluation of possible ecological and social impacts was performed by interpretation of satellite maps and other available maps and data for the Investigation area.

The line routing was determined regarding technical and economical aspects as well as environmental and social aspects. The detailed design of the line and other Project components, including final land survey is shifted to the construction contractor and will be part of the tender documents.

The planned Project traverses the provinces of Bamyan and of Baghlan. It will cross narrow valleys in Talla, Barfak and Do-Ab-Mekh zarin Districts. Vegetation along project area comprises generally of agricultural crops (wheat, corn, beans), economic trees, grasses, and some occasional patches of remnant forests. No reserved forest exists in the Investigation area. Three Protected Areas are in the surroundings of the project area, but not touched or affected by it: Band I Amir National Park and Important Bird Area (IBA), Ajar Valley National Park, and Salang Kotal IBA.

As the transmission line corridor runs partly near to a branch of the Historic Silk Road, there are several cultural sites in the vicinity of the ROW: the 38 meters Bamyan Buddha (Shahmamah), the 58 meters Bamyan Buddha (Salsal), Shar –e- Gholghola (Ghoghola City), Khuaja Meer Hashame –e-Dawbandy Shrine, the third Buddha Niche & Defensive Tower Network, Historical Fortress A, Historical Fortress B, Woman garden, and Shar e zuhak - The Red City.

In summary, the results of the investigation demonstrate that the Project will have no high impacts but mostly low impacts on the environment if the proposed EMP is implemented and all proposed mitigation measures are accomplished. The following aspects decisively contribute to this assessment:

a) The landscape of the investigation area is mostly flat so that tower and access road construction do not pose a high risk regarding soil erosion and sand deflation.
b) The groundwater in the Investigation area is located relatively deep. The Project is situated in a (semi-) desert and woodlands are not crossed by the transmission line. Any occurring small sized trees do not necessarily need to be cut during the land survey and the stringing procedure.
c) The transmission line and substations are not located in a protected area or an area that is of outstanding importance for flora, fauna and biodiversity.

Some medium impacts remain in view of the line routing and the substations during the design phase.

Medium impacts will also be given during the construction phase regarding surface water, health & safety aspects, land acquisition, (involuntary) resettlement, gender aspects, and historical and cultural sites. Other medium impacts will occur during operation regarding visual impacts and health & safety aspects.

Following impacts have to be highlighted:

- Impacts on nationally and internationally cultural protected areas. The final design of the line shall be made in close cooperation with the cultural authorities which have a final saying regarding the measures to avoid or minimize impacts in these areas (physical and visual impacts).
- surface water pollution and riverbed destruction due to river crossings (to be avoided)
- impacts on workers' and community health & safety during construction and operation, (e.g. regarding work accidents, noise emissions, sanitary conditions, risks of electrocution, presence of landmines and natural disasters (management / clearance procedures to be established)
- damages to crops and trees during land survey, construction of access roads, construction of towers and conductor stringing (to be minimized)
- relocation of houses/ households from the new ROW including (to be avoided and minimized during design, remaining to be fully compensated)
- physical and visual impacts on cultural sites in the vicinity of the ROW
- impacts on unknown historical and cultural sites due to the presence of a near branch of the Historical Silk Road (Chance Find Procedure to be implemented)
- visual impacts on the landscape in scenic areas.

Other impacts as employment of unskilled workers during construction process and a more reliable power supply for the national grid will be positive impacts. An indirect positive impact will be a better power supply in the rural areas in future when the corresponding distribution network is also rehabilitated.

The Environmental Management Plan (EMP) includes both an Environmental Mitigation Plan and a Monitoring Plan in tabular form for the design, construction, operation and decommissioning phases of the Project. Adequate mitigation measures and monitoring actions including action parties, costs, and dates for implication are given.

The Construction Contractor will have the responsibility to implement the EMP during the construction phase. A PIC (Project Implementation Consultant) will assist DABS-PMO (Project Management Office) in supervising the EMP implementation and compiling reports on environmental performance, as well as in conducting training.

Environmental monitoring during the operation phase will be performed by DABS.

At DABS there is no Social/Environmental Department. The creation of a Social/Environmental Department in DABS and training of qualified staff are therefore highly recommended.

A consultation process was carried out in September 2016 with the potentially displaced people/public for sharing of information related with the project planning and execution activities. All the people asked along the line corridor indicated that they would be happy to pay for electricity. Further details can be consulted in the Project's LARP.

An appropriate grievance mechanism shall be implemented. 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 grievance process. The constructor shall include the provisions for the grievance mechanism in his budget.

It is estimated that the implementation of the Environmental Management Plan will cost 341,000 USD. The costs for LARP implementation are separately calculated in the respective document.

It can be concluded that, if all proposed mitigation measures are implemented, the Transmission Line; Substations and Converter Station can be constructed/extended with little adverse effect.

# 2. Introduction

## 2.1 Project Background

The Asian Development Bank (ADB) has supported the Energy Sector of Afghanistan since 2001. In December 2015 ADB approved the Tranche 2 of the MFF-0090 (Multitranche Financing Facility) — Energy Sector Development Investment Program for the Islamic Republic of Afghanistan (Afghanistan). One important component under MFF - 0090 is the consultancy package for preparation of Subprojects. The Consultancy Contract includes Projects that have been selected for implementation within the next years. This selection is based on the Master Plan for Afghanistan financed by ADB and prepared by Fichtner.

The following sub-projects of Tranche 2 are object of the present report:

- 500 MW Back to Back Converter Station (CS) at Dasht-e-Alwan
- 220 kV Overhead Transmission Line (TL9 Doshi-Bamyan
- new 220/20 kV Bamyan S/S & extension 220/20kV Doshi S/S

The Project Executing Agency (EA) and Employer is Da Afghanistan Breshna Sherkat ("DABS"), Kabul. Fichtner has been selected as the Employers' Engineer.

This is assessed to be a Category B Project according to the ADB Environmental Assessment Guidelines (ADB, 2003), for which an Initial Environmental Examination (IEE) is required.

The main objective of this study is the identification of significant environmental and social concerns that may interfere with the planned project. The study was carried out in compliance with the environmental standards 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 taken into account when applicable.

A pre-design report has been prepared by FICHTNER in October 2016. The present IEE is based on the considerations of that report.

## 2.2 Scope of the Study

Within the scope of this IEE, FICHTNER investigated the potential environmental impacts of the construction and operation of the planned 220 kV transmission line from Doshi to Bamyan and the construction/rehabilitation and operation of the two respective substations and of the converter station. On the basis of the existing environmental situation in the Investigation area (Section 1) and the technical planning (Section 4.2), FICHTNER determined the potential environmental impacts of the proposed transmission line during design (Section 6.1), construction (Section 6.2), operation (Section 6.3) and decommissioning (Section 6.4). Alternative routings and options (Section 7), as well as appropriate mitigation and monitoring measures (see EMP on Section 10) were considered to reduce possible adverse impacts.

The planned transmission line traverses a semi-desert area characterized by cultivated lands, several houses, and settlements. The substations and converter station are/will be located in barren unused land. The ecological impacts of the transmission line are considered to be mostly low if the mitigation measures are correctly implemented. The socio-economic impacts will have to be precisely evaluated depending on the detailed line routing (see also LARP document).

During the investigation, the main focus was put on finding a line routing that is feasible from a technical point of view which a) avoids ecologically sensitive zones, b) avoids the need of resettlement actions to the greatest extent possible and c) prevents crossing of cultural and historical sites as much as possible. Wherever impacts cannot be avoided, mitigation measures are suggested. Their implementation will have to be closely monitored.

## 2.3 Methodology

For preparing this IEE study, FICHTNER has set up the following multi-disciplinary team:

- International Environmental and Ecological Expert
- National Environmental Expert and
- National Socio-Economic Expert.

One basis for the study consisted of field surveys conducted by the national environmental and socio-economic experts in October 2014 (for the CS) and September 2016 (for the TL and S/S).

Regarding the environment, a corridor of 500 m was investigated on either side of the planned transmission line during the field survey. Socio-economic baseline surveys were carried out for sample populations settled along the corridor of influence (COI, 1-1.5 km). Additionally, an evaluation of possible ecological and social impacts was performed by interpretation of satellite maps and other available maps and data for the Investigation area.

Due to the fact that there is no official international consensus on an agreed approach for assessing the significance of impacts on the environment, FICHTNER uses an own evaluation procedure. The focus of the used evaluation procedure is to decide whether the Project is likely to cause significant adverse environmental effects resulting from the design, construction, operation and decommissioning.

The evaluation scale applied is as follows: Extent of impact:

| | | |
|---|---|---|
| ■ ■ ■ | = | high |
| ■ ■ | = | medium |
| ■ | = | low |
| ○ | = | no impact |
| + | = | locally positive |
| ++ | = | regionally positive |

For the judgment, international standards like standards from the World Bank, World Health Organization (WHO) etc. are used supported by Afghan standards (see Chapter 3.1).

# 3. Institutional and Legislative Framework

## 3.1 Institutional Framework and National Requirements

### 3.1.1 Institutional Framework

Da Afghanistan Breshna Sherkat (DABS)
DABS is an independent and autonomous company established under "The Corporations and Limited Liabilities Law of the Islamic Republic of Afghanistan (IROA)". DABS is a limited liability company with all its equity shares owned by the Government of Afghanistan (GoA). The company was incorporated on 4th May 2008 (15 Saur 1387) and replaces Da Afghanistan Breshna Moassassa (DABM) as the national power utility. DABS will operate and manage electric power generation, import, transmission, and distribution throughout Afghanistan on a commercial basis. DABS is the Implementing Agency (IA) of the Project.

Ministry of Energy and Water (MEW)
In supporting the socio-economic growth of Afghanistan, the MEW is responsible for preparing and managing national policies of the energy sector with the exception of 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.

National Environmental Protection Agency (NEPA)
NEPA's goal is "to protect the environmental integrity of Afghanistan and support sustainable development of its natural resources through the provision of effective environmental policies, regulatory frameworks and management services that are also in line with the Afghanistan Millennium Development Goals (MDGs)".

Other Central Government institutions potentially linked to the Project and the implementation of the EMP include the following:

- Ministry of Rural Rehabilitation and Development, Ministry of Agriculture, Irrigation and Livestock, Ministry of Energy and Water
- Ministry of Information and Culture
- Ministry of Mines and Industry
- Ministry of Frontiers and Tribal Affairs
- Afghanistan National Disaster Management Authority, Central Statistics Office
- Department of Meteorology.

Province administration of Baghlan and Bamyian Provinces
Under the provinces (*wolayat*) there are:

- districts (*uluswali*) – with each province containing between five and 20 districts
- provincial municipalities (*sharwali wolayat*) – with each province in principle containing one provincial municipality and two rural municipalities (*sharwali uluswali*) and with each district containing at most one rural municipality, but some with none.

Although provinces and districts are legally recognized units of sub-national administration, they are not intended to be autonomous in their policy decisions other than through some flexibility in implementing centrally determined programs (source: DPADM / UN (2006): Public Administration Country Profile).

Civil Society Organizations
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).

### 3.1.2 National Legal Framework

Table 3-1 lists all relevant national acts/ laws to the Project:

**Table 3-1: National acts/laws of Afghanistan**

| 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. |

| Act/ Law | Date | Key areas |
|---|---|---|
| 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 itswater 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 kaerez 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. |

Relevant regulations, guidelines and policies are named in Table 3-2 on the basis of ADB's Environmental Assessment and Review Framework (EARF), prepared by DABS, July 2008 and updated by Fichtner in August 2012.

**Table 3-2: NEPA's National regulations, guidelines and policies**

| Regulation/ Guideline/ Policy | Date | Key areas |
|---|---|---|
| Interim Environmental Impact Assessment Regulations | Draft 2.3 | These regulations govern the process of environmental impact assessment in Afghanistan on an interim basis pending the establishment of the EIA Board of Expert in terms of Article 20 of the Environmental Law and issuing of final regulations. These regulations provide the detailed process of EIA and list the projects into category A and B based on potential impacts. |
| Administrative Guidelines for the Preparation of Environmental Impact Assessments | Draft 2 March 2007 | These guidelines are in draft form and have been prepared by NEPA in coordination with UNEP. The purpose of guidelines is to provide guidance to proponents while undertaking a development project that may have a potential impact on the environment. The guidelines also provide guidance on how public should be consulted and defines the roles and responsibilities of various stakeholders in the process. |
| 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. |

Framework for EIA (Environmental Act):

The Government's regulation on environmental impact assessment is based on the Environmental Act of Islamic Republic of Afghanistan (Gazette No. 912) dated 23 Jadi, 1384 (25 January, 2007). 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.

Article 16 and 17 of Chapter 3 of the Environmental Act describes the process of preparing a preliminary assessment, an environmental impact statement and a comprehensive mitigation plan to be conducted by the proponent of each project.

Article 21 mentions public consultation is required for all the projects.

Article 18 describes the approval procedure of environmental impact assessment. The NEPA will appoint an EIA Board of Experts to review, assess and consider applications and documents submitted by the proponent. Acting on the advice of the EIA Board of Experts, NEPA shall either grant or refuse to a grant permit in respect of the project. A permit granted will lapse in the event that the proponent fails to implement the project within three years of the date of which the permit was granted.

Article 19 describes the appeal procedure. Any person may, within thirty (30) days of the granting or refusal of a permit, appeal the decision to the Director-General of the NEPA. The Director-General shall review the appeal application and thereafter make an appropriate decision. Should the appellant wish to appeal the Director-General's final decision, the matter shall be referred to the relevant court.

Land Code

The legal framework governing land rights is a collection of laws including formal (constitutional and civil law), religious and customary law. However, the government is making progress toward creating a cohesive framework. The 2004 Constitution of Afghanistan provides that property shall be safe from violation, no one shall be forbidden from owning and acquiring property except by law, and private property can only be confiscated by legal order.

In 2007, the Cabinet of Ministers approved a new Land Policy that allows for the formalization of land rights in informal settlements, and addresses bottlenecks in land rights administration as well as the overlap in different institutions‟ authority over questions of land rights (Alden Wiley, 2003; GIRoA, 2004; Gebremedhin, 2007; EMG, 2010).

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. The law recognizes Shari ‟a, and defers to applicable principles of Shari‟ain some areas (GIRoA 2008b). Issues that are not covered by the Law on Managing Land Affairs are governed by the country‟s Civil Code, which in large measure reflects the Hanafi school of Islamic law (Shari‟a). Islamic law governs when the Civil Code is silent on an issue (Alden Wiley 2003; Gebremedhin 2006).

Customary law dominates in Afghanistan, and the Civil Code recognizes the application of customary law with regard to land rights. The Ministry of Justice estimates that, due to lack of trust and confidence in formal judicial institutions, 90 % of Afghans rely solely on customary law.

National Environment Strategic Documents
Afghanistan's national environmental strategies are contained within a fabric of four interlocking national-level planning documents:

1. the Millennium Development Goals: Vision 2020,
2. the Afghanistan Compact,
3. the Afghanistan National Development Strategy(ANDS 2008-2013) and
4. the National Environment Strategy.

## 3.2 International Agreements

Afghanistan has ratified a number of international agreements and conventions relating to the protection of the environment and biodiversity.

### 3.2.1 International Agreements ratified by the Islamic Republic of Afghanistan

The Ramsar Convention on Wetlands, signed in Ramsar, Iran in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Afghanistan is currently not a Contracting Party to the Ramsar Convention.

The World Heritage Convention (WHC) is an international agreement that was adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1972. It is based on the premise that certain places on earth are of outstanding universal value and should therefore form part of the common heritage of mankind. The Convention seeks to identify and safeguard the world's most outstanding natural and cultural heritage. Afghanistan became a Party to the Convention in March 1979.

The objective of the Convention to Combat Desertification (UNCCD, Paris, 1994) is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/ or desertification. Afghanistan signed the UNCCD in 1995 and the Convention entered into force in December 1996.

The United Nations Framework Convention on Climate Change (UNFCCC) sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. Afghanistan signed the UNFCCC in June 1992. The Transitional Authority ratified the Convention in September 2002 and the Convention entered into force in December 2002. The Kyoto Protocol is an extension to the Convention adopted in 1997 that outlines legally binding commitments to emission cuts. Afghanistan has yet to accede to the Kyoto Protocol.

The Convention on International Trade in Endangered Species (CITES) is an international agreement between governments which came into force in 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Afghanistan acceded to CITES on 30 October 1986 but has not been actively implementing the Convention.

Afghanistan signed the Convention on Biological diversity (CBD) in 1992 and ratified it in 2002. Afghanistan submitted the Fourth National Report to the CBD Secretariat in 2009.

Afghanistan is not a Party to the Cartagena Protocol on Biosafety, a supplementary agreement to the CBD. Afghanistan does not currently consider bio-safety to be a significant issue relative to others challenges facing the country (source: Fourth National Report to the CBD Secretariat, 2009).

## 3.3 International Requirements

### 3.3.1 ADB Safeguards

The Environmental Policy of the Asian Development Bank (ADB) is grounded in ADB's poverty reduction strategy and long-term strategic framework. The poverty reduction strategy recognizes that environmental sustainability is a prerequisite for economic growth and efforts to reduce poverty. In this context, environmental sustainability is one core issue of ADB's environmental policy.

The ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediation loans, and private sector investment operations. Environmental assessment is a process rather than a one-time report, and includes necessary environmental analyses and environmental management planning that take place throughout the project cycle.

This IEE was carried out in accordance with the following relevant ADB Guidelines:

- Safeguard Policy Statement (SPS), June 2009, effective since January 2010
- Environmental Assessment and Review Framework (EARF), prepared by DABS in July 2008 and updated in October 2015
- Operations Manual (OM) with relevant Bank Policies (BP), March 2010.

### 3.3.2 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)
- CIGRE 1998: High Voltage Overhead Lines – Environmental Concerns, Procedures, Impacts & Mitigation.

## 3.4 Gap Analysis

The legal framework of the Islamic Republic of Afghanistan does in the essence correspond with the international regulations and safeguards. Gaps however do exist in enforcement of the regulations. There is still a considerable lack of institutional capacities for implementation, monitoring and evaluation.

There is a lack of specific Social and Environmental (S&E) qualification of staff and a specific S&E department does not exist within the implementing institution (DABS), partly the existing structures are overloaded with work and staff is not sufficiently remunerated. To some extent, the number of highly qualified staff is not sufficient to cope with the amount of work to guarantee an effective enforcement of the regulations.

The lack of access to legal support and lack of trust in the institutions, especially for weaker sections of the society may create further gaps concerning implementation of compensation and resettlement.

Additional training would be a necessary component to improve implementation and monitoring performance. Compliance with international safeguards could be increased with independent monitoring by internationally experienced auditors/ consultants.

Putting environmental and social compliance under the responsibility of the construction contractor should be clearly defined in contractor's Terms of Reference (ToR) and credible monitoring measures should be implemented.

The international EHS guidelines for Electrical Power Transmission and Distribution [1] will be used during project pre-construction, construction, and post construction stages covering (i) Construction site waste generation; (ii) Soil erosion and sediment control from materials sourcing areas and site preparation activities; (iii) Fugitive dust and other emissions (e.g. from vehicle traffic, land clearing activities, and materials stockpiles); (iv) Noise from heavy equipment and truck traffic; and (v) Potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities.

Environmental issues during the construction phase of power transmission and distribution will include the following: (i) Terrestrial habitat alteration;

[1] World Bank Group, 2007. Environmental, Health, and Safety General Guidelines. Washington, DC.

(ii) Aquatic habitat alteration, (iii) Electric and magnetic fields, (iv) Hazardous materials

Noise level guidelines will comprise

| Receptor | Day Time (0700-2200) | Night Time (2200-0700) |
|---|---|---|
| Residential, Institutional and Educational | 55 | 45 |
| Industrial and Commercial | 70 | 70 |

Air Quality WHO Guidelines

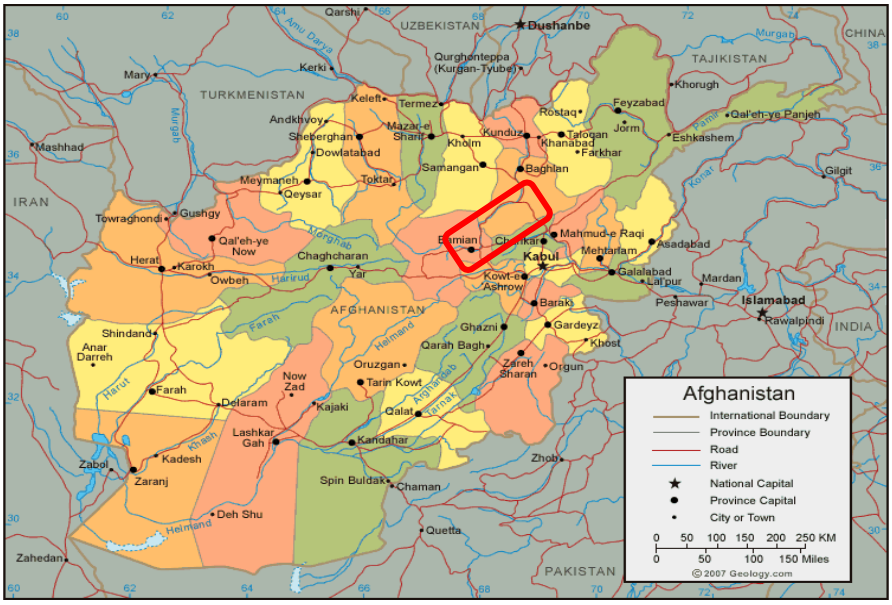
| | Average Period | Guidelines Value |
|---|---|---|
| Sulphur Dioxide (SO2) | 24-hour<br><br><br>10 minute | 125 (Interim target-1)<br>50 (Interim target-2)<br>20 (guideline)<br>500 (guideline) |
| Nitrogen Dioxide (NO2) | 1 year<br>1 hour | 40 (guideline)<br>200 (guideline) |
| Particulate Matter PM10 | 1 year<br><br><br><br>24 hour | 70 (Interim target-1)<br>50 (Interim target-2)<br>30 (Interim target-3)<br>20 (guideline)<br>150 (Interim target-1)<br>100 (Interim target-2)<br>75 (Interim target-3)<br>50 (guideline) |
| Ozone | 8 hour daily maximum | 160 (Interim target-1)<br>100 guideline |

Power frequency EMF typically has a frequency in the range of 50 – 60 Hertz (Hz), and is considered Extremely Low Frequency (ELF). 14 Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment.15 However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern. If EMF levels are confirmed or expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include: (i) Shielding with specific metal alloys, (ii) Burying transmission lines, (iii) Increasing height of transmission towers, (iv) Modifications to size, spacing, and configuration of conductors

# 4. Description of the Project

## 4.1 Investigation Area

The Investigation area covers the transmission line corridor of the planned TL and its perimeter of influence in the provinces of Bamyan and Baghlan of Afghanistan. This includes the cities Doshi and Bamyan, as well as several small settlements between them. Included are as well the location of the future CS and the S/S. The Investigation area is shown in Figure 4-1.




**Energy Supply Improvement Investment Program**
**Project Map for Tranche 2**

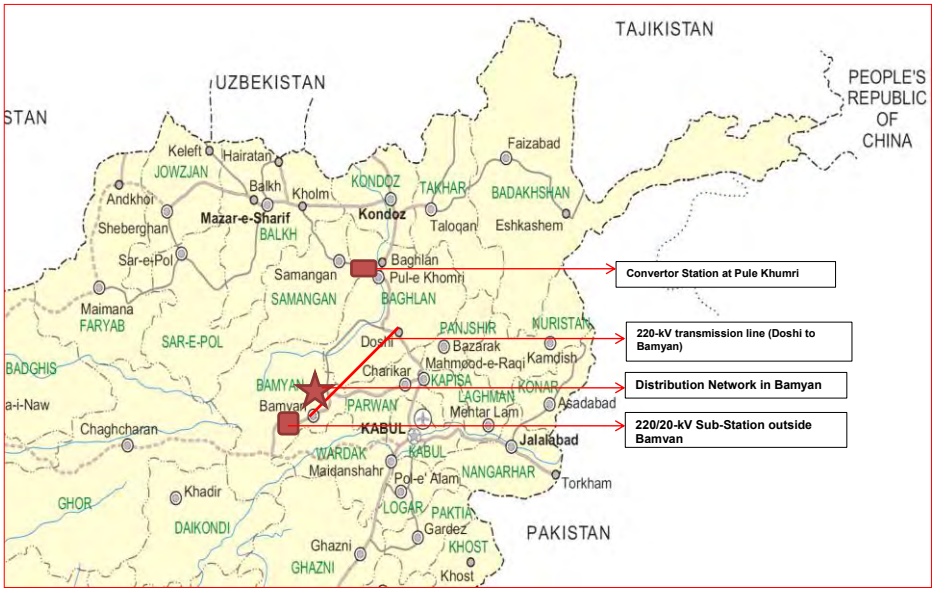



**Figure 4-1: Investigation Area**

The terrain is from mild to highly mountainous, mostly rocky and barren. The line is in close proximity to the highway from Doshi Bridge to the existing substation in Khinjan. In Doshi bi-way the line turns south and follows the road from Doshi to Bamyan crossing the Bamyan center, Shibar, Saighan and Kahmard of Bamyan, as well as the Tala-Barfak and Doshi districts of Baghlan. Most of the tower locations are across the road.

The line generally takes four directions: from Khinjan SS to the Doshi bridge, it runs north; from Doshi bi-way to Kahmard, it runs north-east to south-west; from Sang Safid to Saigan, it run north to south-east; and from Shiabar pass to Bamyan center it runs from east to west.

From where the line turns towards south up to Sang Safid (about 70 km), it passes a mix of agriculture land, rocky hills of high slope, rivers and residential areas. This is a mix of mildly mountainous and highly hilly area which ends with a highly mountainous terrain. This is located in the south east areas of Kahmard district belonging to Bamyan province. This area also passes in the vicinity (2 km) of the biggest coal mine in Baghlan.

The third part starting from the center of the Kahmard district is a very mountainous area, with high slopes, cuts of rocky hills and a river. This is a very difficult terrain in terms of access, erection of towers, and will maybe pose difficulties to the maintenance works. Although the towers will be placed close to the road, the river crossing during construction and tower erection may imply a temporary road construction or installation of a temporary bridge.

## 4.2 Technical Description

The required load transfer can be accommodated by a double circuit 220 kV **overhead line** connecting Doshi and the Bamyan substations. The proposed line will be approximately 178 km long. It generally bypasses inhabited zones, except on the approach to Bamyan. There is a good network of regional and country roads which should enable relatively easy access to the line. Its main characteristics are presented as follows:

- Line length: 178 km
- Nominal span: 250 m
- Est. number of towers: 750
- Voltage level: 220 kV
- Number of circuits: 2
- Phase configuration: 2 x ACSR158 (Wolf)
- Earthwire: 1 ACS 75mm$^2$<br>1 OPGW48
- Insulator: Composite, alternatively cap and pin toughened glass or porcelain;
- Type of tower: Steel lattice, self supported, 3 pairs of cross-arms, 2 EW supports at top
- Foundations: Concrete, cast in-situ, concrete shaft or pad

| | |
|---|---|
| | and chimney; or concrete cap with rock anchors for firm rock sub-base |
| • Altitudes: | Av. 1500m, min. 1000m, max. 2000m |
| • Right of Way: | 40 m |
| • Soil types: | Silty, fine sands; deleterious, dusty,<br>Deleterious rock, rocky, gravelly, sandy tills (mountainous area)<br>Silty clay (farmland) |
| • Design Code: | EN 50341-1:2012; relevant IEC standards |

The line routing was determined regarding technical and economical aspects as well as environmental and social aspects. Considered environmental and social aspects are:

- avoiding traversing or close by-passing of urban areas, densely populated areas, settlements, schools, public buildings and market places
- avoiding traversing or close bypassing of shrine, historical places, national parks and protected areas
- avoiding traversing of forest and water catchment zones
- keep electrical field, magnetic field, audible noise and TV interference as far as possible below national/ international accepted levels
- keep impact on flora, fauna, nesting places, animal trails, migration zones and sensitive ecological areas to a minimum
- apply selected bush clearing, minimize access tracks.

The detailed design including final land survey is shifted to the construction contractor and will be part of the tender documents. The final location of the towers will be fixed by the constructing contractor after conducting the final land survey.

The source substation for the 220 kV double circuit transmission line to Bamyan is the **Doshi 220/20 kV AIS substation**. Doshi 220/20 kV substation is located at 35°35'47.08"N, 68°49'59.99"E. Space for the extension is currently available in Doshi 220/20 kV AIS switchyard for the two additional line bays required for the double circuit OHL feeders to Bamyan.

The **Bamyan 220/20 kV AIS substation** is to be located at 34°49'13.2"N 67°52'47.0"E. Bamyan 220/20 kV substation will be sized for the load of Bamyan city which will require two power transformers.

The **Back to Back Converter Station** (including the HVDC Converter and the necessary switchyards to connect the 500 kV systems) will be integrated into the Dasht-e-Alwan Substation. The Dasht-e-Alwan Substation is currently a greenfield location (approx. 300 x 1,400 m) and is located approx. 25 km north of Pul-e-Khumri, Baghlan Province, Afghanistan along the ring road connecting Kabul with Mazar-e-Sharif. At this location a 500/220 kV substation is currently under procurement.

### 4.2.1 Right of way and clearance

Regarding the planned 220 kV line, the Right of Way (ROW) is calculated to be 40 m (20 m on both sides of the centre line) on the basis of the span-width, the proposed 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.

Complete clearing of the ROW would be required in the centre strip of 25 m (12.5 meters on both sides) allowing for stringing of conductors. Outside this strip but still inside the ROW vegetation above 7 m height needs to be cleared, including possible tall danger trees outside but nearby the ROW corridor.

Concerning ground clearance, Table 4-1 shows the transmission line standards for the Soviet Union (PUE) which are applicable to the Project.

**Table 4-1: Clearance as per PUE for 220 kV transmission lines**

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

# 5. Description of the Environment

## 5.1 Geography

The planned project traverses the provinces of Bamyan and of Baghlan. It will cross narrow valleys in Talla, Barfak and Do-Ab-Mekh zarin Districts.

The Bamyan Province is situated in the central part of Afghanistan, bordering with Baghlan in the north, with Kabul, Wardak and Ghazni in the east, with Daykond in the south, and with Sar pul and Badghis in the west.

The Investigation Area is located in the mountainous zones of the two provinces. There are high hills and mountains in the line corridor. The Bamyan SS will be located at 2,000 masl; the Doshi SS is located at 1,000 masl.

The main features of the Investigation area are:

- high hills in Bamyan
- road in different places
- settlements in Doshi
- settlements in Bamyan
- rivers (crossed by the TL in ca. 130 locations)
- cultural villages and assets.

## 5.2 Topography

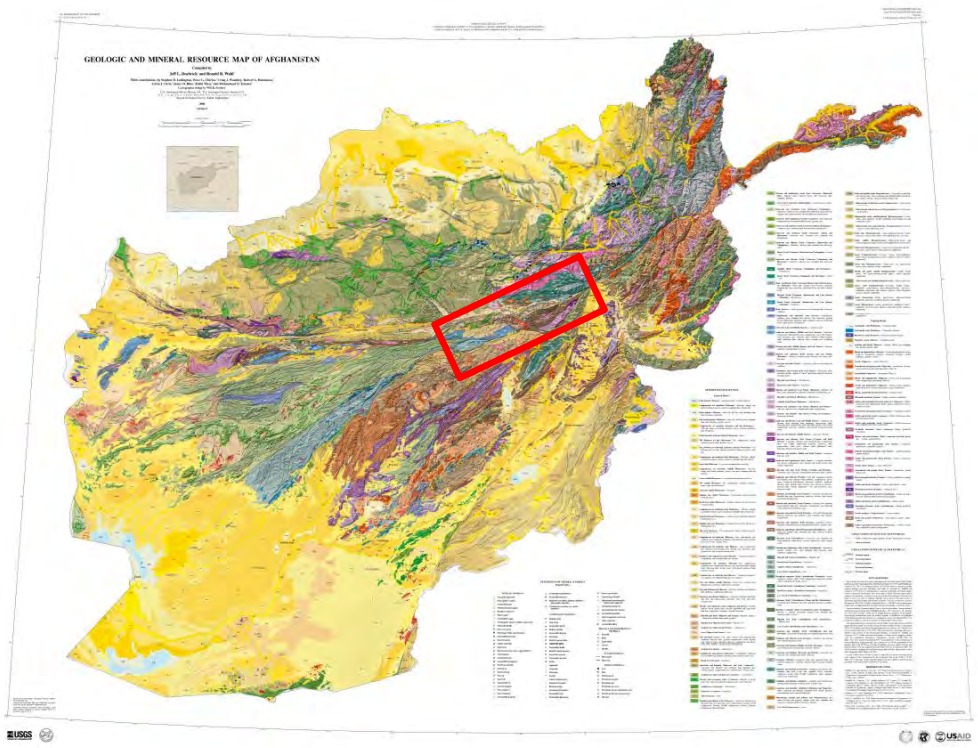
The general topography of the central-eastern region immediately on the southern side of Hindu Kosh is alpine with mountains ranging from 1,800 to 4,700 masl, dissected by numerous ravines and gullies and separated by intermountain basins (500-1,800 masl). The intermountain basins have nearly flat bottoms dissected by a network of rivers and irrigation canals. The upper and middle slopes ranges are steep while the lower slopes are generally flat. The north faces of some mountains (over 3,500 m) have small glaciers and permanent snowcaps.

North and east of Bamyan the river system forms part of the Sistan catchment area with all drainage north of Bamyan flowing into the Halmand River south and west of the Bamyan lake of Sistan, on the southwestern border with Iran.

## 5.3 Geology and Soil

### 5.3.1 Geology

Afghanistan has some of the most complex and varied geology in the world (Figure 5-1). The oldest rocks are Archean succeeded by rocks from the Proterozoic and every Phanerozoic system up to the present day. The country also has a long and complicated tectonic history, partly related to its position at the western end of the Himalaya. This diverse geological foundation has resulted in a significant mineral heritage with over 1,400 mineral occurrences recorded to date.




Source: United States Geological Survey (1997)

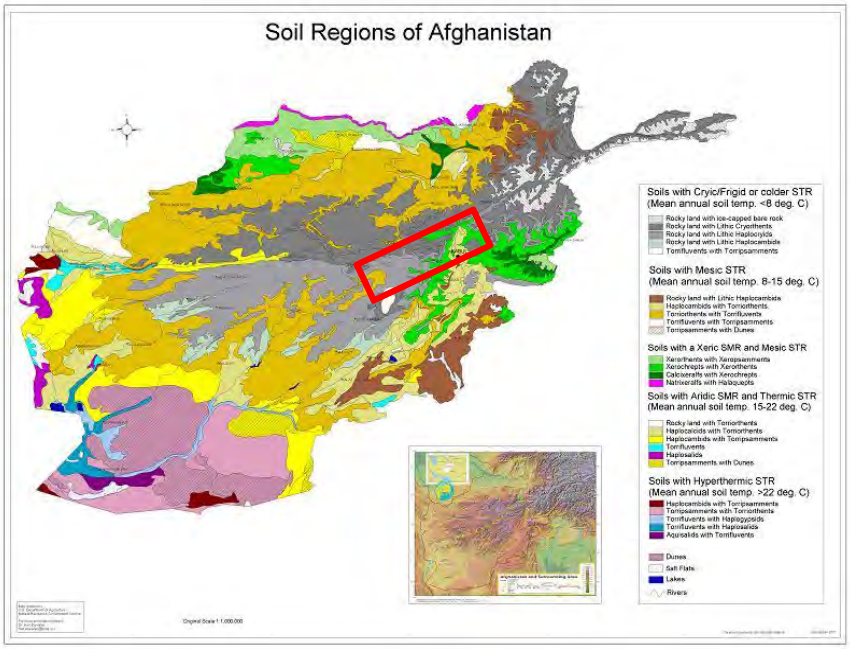
**Figure 5-1: Geological and Mineral Resources Map of Afghanistan (with Investigation area)**

The Tadjik block of northern Afghanistan formed the southern margin of the Eurasian continental plate during Permo-Triassic times. The Palaeozoic basement was intruded by Triassic granitoids as a result of subduction related to the first stages of the closure of the Tethys Ocean during the Cimmeride Orogeny. Subsequent to this, a Jurassic clastic sequence was deposited, which changes upwards to Cretaceous carbonate platform sedimentation. This area is now the prime target for hydrocarbon exploration, although the exposed granitoids in the northeast of the block are prospective particularly for precious (and base) metal mineralization.

The geological situation of the Investigation area is marked by quaternary sediments, quaternary sands and dunes.

## 5.3.2 Soil

The soil in the mountains is rubble and loam rubble and sandy loam 0.5-5 thick and underline by rock. The soil in the intermountain basins is loam and sandy loam. In the river valleys, sand and gravel exists (Figure 5-2).




Soils with a Xeric SMR and Mesic STR

- Xerorthents with Xeropsamments
- Xerochrepts with Xerorthents
- Calcixeralfs with Xerochrepts
- Natrixeralfs with Halaquepts

**Soils with Mesic STR** (mean annual soil temp. 8-15°C)

- Torripsamments with Dunes

**Soils with Aridic SMR and Thermic STR** (mean annual soil temp. 15-22°C)

- Torripsamments with Dunes

**Figure 5-2: Soil Regions of Afghanistan (Map with Investigation area)**

Areas with gentle slopes bear their primary soils, which are course textured admixed without stones. Valleys contain alluvial soils, mixed with gravels and pebbles deposited by storm water channels and drains. These soils are of generally coarse nature. They are moderately to strongly calcareous and well drained. The soils occupying plains to gentle slopes are from pediment materials with medium to textured structure (very fine sand and very fine sandy loam). Soils of these plain areas having access to water are fertile and suited for agriculture. Other plain areas are rain fed. The semi-desert areas are characterized by moving sands.

### 5.3.3 Mineral resources

Afghanistan's mineral sector has been identified as a significant potential source of growth for the country's economy. Coal, gemstones, and quarry materials are often produced outside the control of the central government and the government has not received royalties for the exploitation of the mineral resources. Almost all of Afghanistan's minerals have been extracted by artisanal and small-scale operations. The country has little experience with commercial mining industry and lacks the mining infrastructure necessary for the exploration and exploitation of its mineral resources. The government has recently undertaken efforts to capture the potential for economic growth in the mineral sector by revising the legal framework– including adopting a new Minerals Law in 2010 – to attract private investment and strengthen mining institutions. The discovery of the enormous extent of Afghanistan's mineral resources will put pressure on the country to move quickly to develop the sector. The country will be challenged to make use of its vast mineral wealth in a manner that promotes transparency and ensures that social and environmental objectives are met (Risen 2010; World Bank 2006).

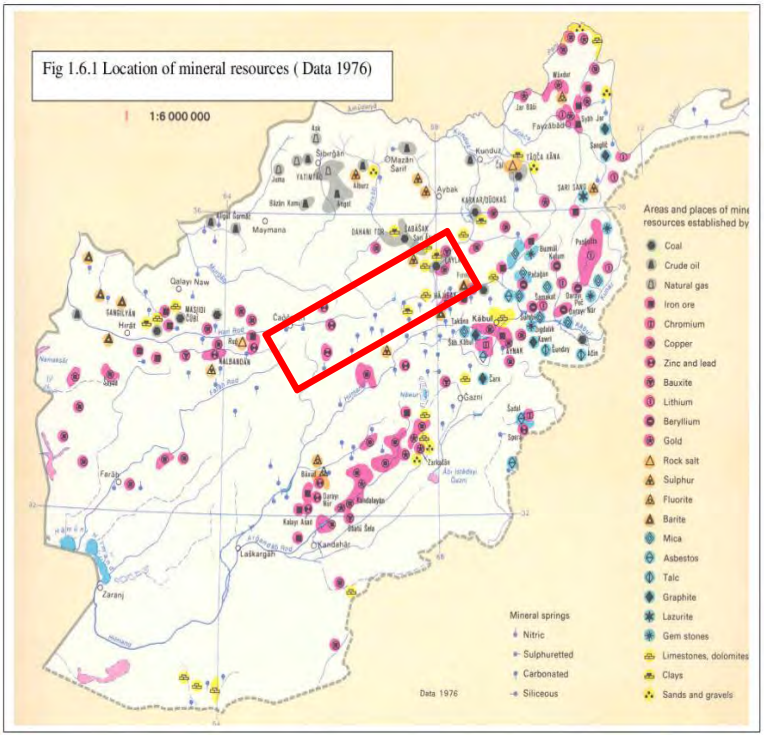



**Figure 5-3: Mineral Resources of Afghanistan (Map with Investigation area)**

In the Investigation area, there are important iron and coal reserves as well as sulphur, sand and gravel deposits.

## 5.4 Seismicity

Afghanistan lies on the southern fringe of the Eurasian plate, subject to collision with the Arabian plate to the south and trans-pressure with the Indian plate to the south-east at rates of approximately 30 mm/year and 40 mm/year respectively. These rates are based on plate velocities averaged for the past few million years unconstrained by local geodetic measurement. Figure 5-3 shows the seismic hazard map for Afghanistan.

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

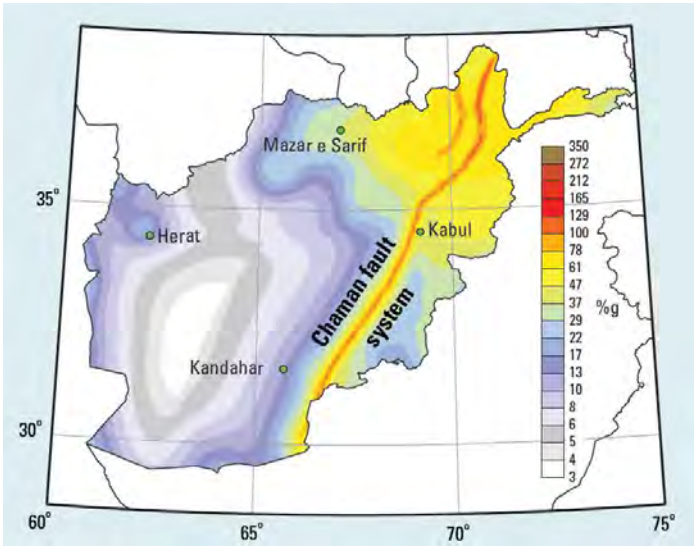



**Figure 5-3: Generalized seismic-hazard map of Afghanistan (USGS, 2007)**

## 5.5 Ecological Resources

75 km to the north-west of the old city of Bamyan, adjacent to the Bamyan to Wardak highway the Band I Amer National Park, composed of six lakes, is located. The site has great recreational value for Sar e Pul residents and is important for migrating and wintering birds. The project will not interfere with these lakes.

Vegetation along the Bamyan valley east west of Bamyan to Shash Pul and Shahidan comprises of gricultural crops (wheat, corn, beans) and grasses. East of Bamyan toward Doshi minimal natural vegetation in the mountains arise. Occasional patches of remnant forests occur including poplar, maple, and willow, depending on the elevation. Natural vegetation on the lower mountainsides and intermountain basins consists of drought resistant grasses (sagebrush, needle grass) with patches of sparse shrubs (locoweed, holy, clover) containing occasional and wild pistachio.

Wherever possible, arable lands are ploughed and planted with wheat, corn, beans and vegetables. Currently extensive poppy cultivation has also been noted, particularly along the Bamyan River valley between Bamyan and Kandoz. Orchards and vineyards occur near the towns.

## 5.6 Landscape

Afghanistan is an arid country, much of which is mountainous or of desert land. Agricultural land accounts for 58 % of the total land area, but only 12% is useable farmland, with the balance pastureland, which supports the country's large nomadic and semi-nomadic population and its livestock. Forests make up 1.3% of the country's total land area. Deforestation is occurring at a rate of 3% per year. Roughly 0.3% of the total land area is designated as protected (source: USAID Country Profile).

The landscape of the Investigation area is marked by the general features of the Afghan semi-desert and grass steppe. The river valleys are characterized by settlements and agricultural fields. The vegetation varies according to the fertility by mineral content of the local soil and rainfall pattern. Generally, vegetation is sparse in the Investigation area. Near Bamyian and the other villages and around the perennial/seasonal rivers the vegetation is fairly dense of cultivations, some plantations, few trees, bushes and grassland. Further north across the plains and from Bamyan province in the northern direction, the bush and cultivation thins out to grassland savannah and sandy desert without vegetation.

Figures 5-4 to 5-7 show some features of the Investigation Area.

**Figure 5-4: Cultivated fields in the Investigation Area**

**Figure 5-5: Barren land, trees, hills and pastures in the Investigation Area**

**Figure 5-6: Barren land, trees, hills and pastures in the Investigation Area (2)**

**Figure 5-7: Small water course at the side of a road in the Investigation Area**

## 5.7 Climate and Air

### 5.7.1 Climate

The climate in the central-eastern part of Afghanistan is dry continental and varies according to the elevation from moderately warm in the valleys, to cold at elevations above 3,000 m. The winter season lasts from December through February. In the valleys it is mild, and the clear weather predominates. Spring season lasts from March to April in the valleys and basins, and from May to mid June in the mountains. Spring weather is typically unstable and wet with most of the annual precipitation in the form of brief heavy rain. During this period days could be described as warm and nights as cold. Summer in the valleys lasts from May through September and the temperature ranges between 24 and 30°C. The weather is clear and dry. In the mountains, the summer season lasts from mid-June to August. Temperature ranges from 10 to 15°C during the day time, and there is a possibility of snow in the mountains. Autumn season begins dry but turns relatively wet. Prevailing winds are predominantly southern and northern throughout the year.

Bamyan has a mid-latitude desert/arid cool climate. The mean annual temperature in Bamyan is 6.9°C and the average monthly temperatures vary by 24.8°C. Total annual precipitation averages 133mm. Figure 5-8 shows a precipitation map for Afghanistan.


**Figure 5-8: Precipitation on the territory of Afghanistan (map with Investigation area)**

### 5.7.2 Air quality and noise

Air pollution is evident in Afghanistan's urban centers. The main causes are dust and vehicle emissions. During autumn and winter, the air quality is reportedly worsened due to the domestic emissions from an increased use of ovens, stoves and open fires. Electricity shortages and lack of fuel-wood result in households burning packaging materials, which causes toxic fumes emission.

A combination of drought and loss of vegetation along with a rapidly growing vehicle density are contributing to a worsening of the air quality in the country. Furthermore, in rural Afghanistan the roads are frequently degraded or unsealed which gives rise to a significant dust nuisance form passing traffic. Not only does the dust affect the air quality of rural communities and agricultural areas close to the roadside, but it also presents a major visibility hazard for traffic.

An on-going programme of rehabilitation of the main traffic routes is currently underway, which should result in a reduction of dust impacts from traffic.

## 5.8 Water Resources

### 5.8.1 Water resources in Afghanistan

Water is Afghanistan's most precious natural resource, although water management systems country-wise have been severely damaged during years of internal conflict. The need for integrated water resource management to balance the competing demands is a key priority for the country. Competing water demands include:

- water supply, drainage and wastewater management in urban areas
- rural water supply for domestic purposes
- agricultural water use
- generation of hydropower
- industrial water uses
- water to support natural systems (forest, rangelands and wetlands).

Most Afghans do 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.

An estimated 99% of developed water resources of the country are used for irrigation.

Groundwater has traditionally been utilized for irrigation purposes through the use of *karezes mer*, springs and shallow hand dug open wells. In more recent years, deep drilled wells have become a more common means of extraction. Today, all traditional groundwater irrigation systems have reduced or dried up completely (URL 1).

Groundwater resources and recharge rates throughout the country are poorly understood, which has resulted in depletion of deep aquifers and pollution of shallow groundwater resources. Demands on surface and groundwater resources are likely to grow substantially due to the large number of returning refugees and internally displaced people.

### 5.8.2 Project area water resources

The water resources of the central eastern region are entirely derived from rainfall and the 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.

The Bamyan river flows north from Bamyan through the Saighan,Talah and Barfak gorge to join the Shir Mikh zarin and Salang Rivers in Kandoz. The Bamyan River and its main tributary, the Shir Mikh zarin and northern Salang Rives range in width from 15 to 50 m, reaching 100m in places. They reach a depth of 0.5-2 m. One hydropower station has been built on the Bamyan River.

From where the line turns towards south up to Sang Safid (about 70 km), it passes a mix of agriculture land, rocky hills of high slope, rivers and residential areas. This is a mix of mildly mountainous and highly hilly area which ends with a highly mountainous terrain. This is located in the south east areas of Kahmard district belonging to Bamyan province. This area also passes in the vicinity (2 km) of the biggest coal mine in Baghlan.

The third part starting from the center of the Kahmard district is a very mountainous area, with high slopes, cuts of rocky hills and a river. This is a

very difficult terrain in terms of access, erection of towers, and will maybe pose difficulties to the maintenance works. Although the towers will be placed close to the road, the river crossing during construction and tower erection may imply a temporary road construction or installation of a temporary bridge.

There are 127 irrigation systems providing water to 679 villages and 58,966 families in the province. A total of 126 canals are registered with the government, and the remaining one is not registered. All of the irrigation systems are private. Out of the 58,966 families, 81 % or 47,921 families also use water from the canals for drinking, and the remaining 19 % or 11,045 families use water from canals for irrigation purposes only. The total lengths of both main and branch canals are around 642,530m and 807,022m, respectively. There are 138 Mirabs, who are responsible for the overall management of these canals. At present, the average width of the canals and their water depth are approximately 1.4m and 0.95m, respectively. A total of 125 systems have water on a 10 - 12 month basis, while one is only on a 3 month basis and one was dried up at the time of the survey. The total command area of the irrigation systems in the province is reported to be 55,910ha. However, the current irrigated area is only approximately 10,929ha, whereas 44,899ha were normally irrigated before the war.

The planned TL crosses water courses in ca. 130 locations.

**Groundwater**

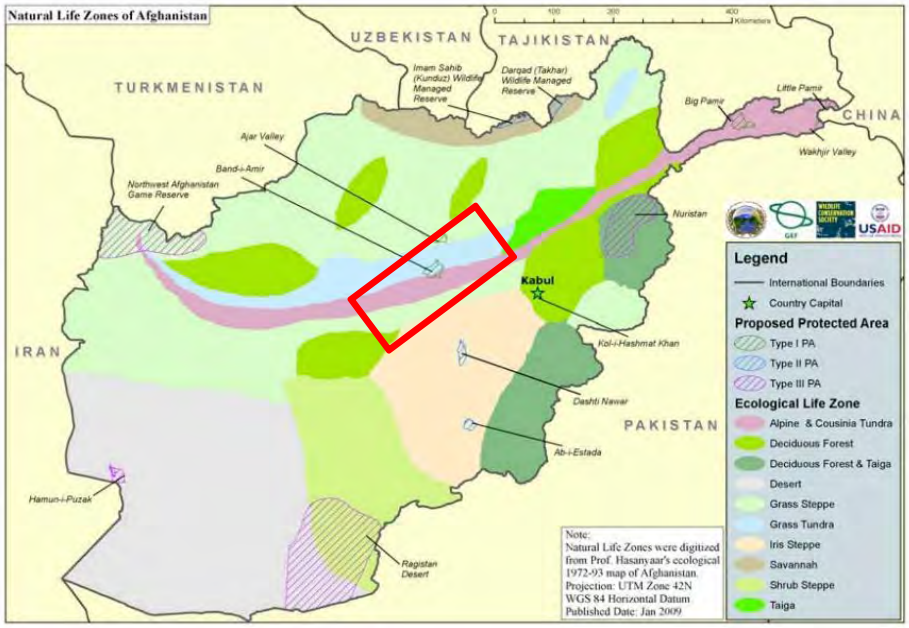
Although there is no actual information on the groundwater depth in the corridor of the transmission line Section from Doshi to Bamyan, it can be assumed that the groundwater table can be found at minimum 14 m depth there, due to similar topography and soil characteristics to other regions in Afghanistan for which data exist.

## 5.9 Flora and Fauna

Afghanistan is not a global biodiversity "hotspot". On the Index of Biodiversity, which is based on the number of mammals, birds, reptiles, amphibians, vascular plants and endemic species, Afghanistan has relatively low score results, largely from the lack of vertebrate endemics.

The desert and semi-desert biome comprises 252,044 km² or about 39% of the country's land area. The WWF classifies 73% of the desert and semi-desert biome in Afghanistan as globally vulnerable and 27% as globally endangered. Virtually no information is available on Afghanistan's biodiversity in this biome. However, it is clear that biodiversity in the Badghyz and Karabil semi-desert is much reduced in both Afghanistan and Turkmenistan with the loss of the tiger (*Panthera tigris virgata*), cheetah (*Acinonyx jubatus venaticus*) and wild goat (*Capra aegagrus*) (WWF, 2010).

A map of the natural life zones of Afghanistan is shown in Figure 5-9.




Source: USAID (2009)

**Figure 5-9: Natural Life Zones of Afghanistan (Map with Investigation area)**

According to Figure 5-9, the transmission line corridor traverses a grass tundra and a alpine & cousinia tundra zone.

### 5.9.1 Flora

Afghanistan shows a big variety of vegetation types and a high biodiversity due to floristic influence from various neighbor regions. In most parts the vegetation depends on the winter rain. Natural vegetation has been severely influenced by man and only a few high mountain and very dry desert areas retain a *quasi* natural vegetation cover. In the cultivated areas, natural vegetation was cleared long ago. The severe and uncontrolled usage of natural vegetation has totally changed the vegetation type and has deteriorated its quality and density. At present, practically all grasslands and grazing types of Afghanistan are facing a serious state of reduction.

The hilly plateaus of Afghanistan are covered with remnants of the savanna like wild pistachio (*Pistacia vera*) groves, with dominant herbaceous communities of desert sedge (*Carex pachystylis*), bulbous bluegrass (*Poa bulbosa*) and ephemeroid (perennial) plants. The largest remaining pistachio grove can be found in the Badghyz Reserve and covers 76,000 ha (760 km²). There are over 1,100 species of vascular plants, of which 75 are endemic to this ecoregion (such as *Cousinia badghysi*, *Ferula badrakema*, *Tulipa kuschkensis*). 650 species of vascular plants are found within the protected territory of the Badghyz Reserve. Among them are representatives of the genera *Eremurus*, *Allium*, *Ixyolirion*, *Tulipa*, *Rhamnus*, *Atraphaxis*, *Euphorbia*, *Salvia*, *Amberboa*, *Calligonum*, *Cousinia*, *Astragalus*, and *Ferula*. Vegetation is dominated by ephemeral (annual) and ephemeroid grasses and forbs, with dominant species belonging to *Poaceae*, *Brassicaceae*, *Asteraceae*, *Caryophyllaceae*, and *Boraginacaeae*. Most perennials are typical desert or arid foothill species (WWF, 2008).

Historically, Afghanistan had 3.2 million hectares (5 % of the total land area) forested in evergreen and deciduous trees. A third of the land was open woodland populated with almond, juniper, and pistachio trees. The decades of conflict and social unrest have steadily reduced Afghanistan's forests as trees were destroyed by military forces, stockpiled by residents, and lost to forest fires. The country's forests now amount to roughly 1.3 million hectares (2% of the total land area) (UNEP, 2008).

Figure 5-10 shows the natural vegetation zones of Afghanistan and indicates the Investigation Area.

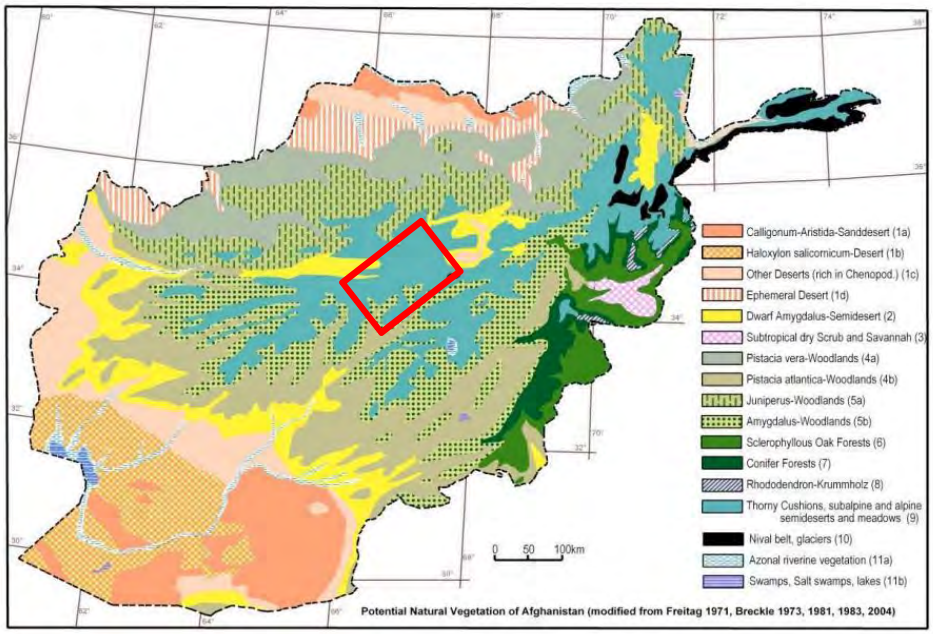



**Figure 5-10: Natural Vegetation of Afghanistan (Map with Investigation Area)**

The vegetation along the line route varies according to the fertility and humidity of the local soil. The line corridor crosses a semi-desert landscape for most of its length. The area is marked by subalpine and alpine semiderts and meadows. In the lowlands, especially near Bamyan and the other villages and the perennial/ seasonal rivers, all arable surfaces are cultivated lands. There are some plantations, trees, bushes and grassland.

Fruit plants growing in different locations of the line corridor include melon, water melon and zegher. It is not expected that any endangered plant species grow in the line corridor.

There is hardly any forest in the entire Investigation area. Occasional trees and small patches of forest can be found in the vicinity of houses and rivers.

No reserved forest exists in the Investigation area.

### 5.9.2 Fauna

Due to the degraded habitat and sparse vegetation, not many wild animals live in the Investigation area. Mammals, birds, reptiles, amphibians, fresh water fish and insects are the main animal groups there. Jackals, foxes, cats and different species of bats are commonly found in the desert and semi desert area, whereas wolves are rare.

It is not expected that any endangered wildlife species (based on IUCN categories and AWEC) live in the line corridor.

## 5.10 Protected Areas

Table 5-1 shows the designated and the proposed Natural Protected Areas in Afghanistan according to the UNEP/ WCMC World Database of Protected Areas.

**Table 5-1: Natural Protected Areas in Afghanistan**

| Name | Desig-nation | IUCN CAT | Min Elev (m) | Max Elev (m) | Latitude | Longitude | Udvardy Province | Biome | Event | Area (ha) | Data Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Band-i-Amir | National Park | II | 2900 | 3832 | 34° 52' 40"N (34.878°) | 67° 16' 51"E (67.281°) | Anatolian-Iranian Desert (20) | Cold-winter deserts (08) | Designated 1 January 1973 | 41,000 | |
| Ajar Valley | National Park | | 2000 | 3800 | 35° 21' 21"N (35.356°) | 67° 19' 17"E (67.322°) | Hindu Kush Highlands (37) | Mixed mountain systems (12) | Proposed | 40,000 | |
| Ab-i-Estada | National Park | | 1900 | 2100 | 32° 28' 58"N (32.483°) | 67° 56' 14"E (67.937°) | Anatolian-Iranian Desert (20) | Cold-winter deserts (08) | Proposed | 27,000 | |
| Nursitan | National Park | | 4876 | 6293 | 36° 34' 43"N (32.483°) | 70° 50' 16"E (70.838°) | Himalayan Highlands (38) | Mixed mountain systems (12) | Proposed | | |
| Ab-i-Estada | Waterfowl Sanctuary | IV | 1950 | 2100 | 32° 28' 58"N (32.483°) | 67° 56' 14"E (67.937°) | Anatolian-Iranian Desert (20) | Cold-winter deserts (08) | Designated 1 January 1977 | 27000 | |
| Dasht-i-Nawar | Waterfowl Sanctuary | IV | 3200 | 3210 | 33° 49' 48"N (33.830°) | 67° 45'E (67.750°) | Anatolian-Iranian Desert (20) | Cold-winter deserts (08) | Designated 20 December 1977 | 7500 | |
| Hamun-i-Puzak | Waterfowl Sanctuary | IV | 1620 | 1731 | 31° 29' 44"N (31.496°) | 61° 42' 55"E (61.715°) | Iranian Desert (24) | Cold-winter deserts (08) | Designated 1 January 1973 | 35,000 | |
| Kol-i-Hashmat Khan | Waterfowl Sanctuary | IV | 1792 | 1974 | 34° 30'N (34.500°) | 69° 11' 59"E (69.200°) | Anatolian-Iranian Desert (20) | Cold-winter deserts (08) | Designated 1 January 1973 | 191 | |
| Ajar Valley | Wildlife Reserve | IV | 2000 | 3800 | 35° 21' 21"N (35.356°) | 67° 19' 17"E (67.322°) | Hindu Kush Highlands (37) | Mixed mountain systems (12) | Designated 1 January 1978 | 40,000 | |

Source: UNEP/WCM's World Database on Protected Areas

Three of the Natural Protected Areas are in the surroundings of the project area, but not touched by it (Figure 5-11):

- Band I Amir National Park and Important Bird Area (IBA) (48 km to the west of the Bamyan SS)
- Ajar Valley National Park (60 km to the northwest of the Bamyan SS)
- IBA Salang Kotal (6 km to the east of the Doshi SS)


**Figure 5-11: TL route (in red) and nearby natural protected areas**

Band I Amir's six lakes of crystal-clear water, separated by a travertine dam and surrounded by spectacular red cliffs, comprise one of the world's most uniquely beautiful natural landscapes. The lakes compose a National Park and are located in western Hindu Kush in Bamyan province. The park lies about 225 km north-northwest of Kabul and 75 km west of Bamyan old town, in an east-west trending valley at approximately 2,900 m elevation. From west to east, the lakes are called Gholaman, Qambar, Haibat, Panir, Pudina and Zulfaqar. Because of the high calcium content of the water, the lakes are abounded by shear limestone cliffs topped by a high plateau.

The Ajar Valley Wildlife Reserve is a mountainous area in Afghanistan's Central Hindu Kush that was protected for many years as a Royal Hunting Reserve. It is located in Bamyan and Baghlan Provinces 70 km northwest of the town of Bamyan. Prior to the outbreak of hostilities in 1979, the area surrounding the Ajar Valley was ecologically undisturbed compared with most Afghan rangelands.

Salang Kotal is an IBA with an excellent diversity of at least 33 species of Himalayan breeding birds and passage birds. One passage bird is the critically endangered Siberian Crane (*Leucogeranus leucogeranus*).

Neither important wetlands (Ramsar Wetlands) nor wildlife sanctuaries can be found in the Investigation area.

## 5.11 Population

The following information is based on the Socio-Demographic and Economic Survey for Bamyan Province from the Central Statistics Organization of the Islamic Republic of Afghanistan (SDES, 2013).

In the LARP document further socio-economic information about the project affected people can be consulted.

### 5.11.1 Population and settlements

Bamyan Province is one of the thirty-four provinces of Afghanistan, located in the central highlands of the country. It has 18,029 km² and a population of 425,500 (2013). It is the largest province in the Hazarajat region of Afghanistan, and is the cultural capital of the Hazara ethnic group that predominates in the area. The province is divided into six districts, with the town of Bamyan serving as its capital.

Its name can be translated as "The Place of Shining Light". In antiquity, central Afghanistan was strategically placed to thrive from the Silk Road caravans which crossed the region trading between the Roman Empire, China, Central and South Asia. Bamyan was a stopping point for many travelers. It was here where elements of Greek and Buddhist art were combined into a unique classical style, known as Greco-Buddhist art.

The province has several famous historical sites, including the famous Buddha statues with more than 3,000 caves around it, the Band-e Amir National Park, Dara-i-Ajhdar, Gholghola and Zakhak ancient towns, the Feroz Bahar, Astopa, Klegan, Gaohargin, Kaferan and Cheldukhtaran.

Baghlan Province has a total population of 848,900. There are 119,378 households in the province and households on average have 7 members (MRRD, 2007).

### 5.11.2 Land ownership

The land along the line corridor is mainly a communal property of the tribes and localized clans. There is no practice of sale and purchase of land. However, in case land is required for some development projects, acquisition is done through consultations with the elders of the concerned tribes. At some places governmental land can be found (see LARP).

The total affected land is of around 108,000 $m^2$ of land permanently lost, and 1,750,000 $m^2$ of productive land temporarily affected within the transmission line corridor from Doshi to the Bamyan substation. Further details can be consulted in the LARP document.

## 5.11.3 Literacy

Literacy rates for the population 10 years and above, 15 years above and for the age group 15-24 for Bamyan and its districts are shown in Table 5-2. In this table, data for age group 5-9 years were excluded.

**Table 5-2: Literacy Rates for Males and Females by Age Groups (SDES, 2013)**

Literacy Rates for Males and Females Aged 10 Years and Above, 15 Years and Above and 15-24 Years, and Ratios of Female Literacy Rate to Male Literacy Rate, by District: Bamiyan, September 2011

| District | 10 Years and Above | | | | 15 Years and Above | | | | 15 -24 Years | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Both Sexes | Male | Female | Female/ Male Ratio | Both Sexes | Male | Female | Female/ Male Ratio | Both Sexes | Male | Female | Female/ Male Ratio |
| Bamiyan | 38.1 | 50.1 | 25.0 | 50 | 31.7 | 45.4 | 16.5 | 36 | 48.5 | 61.6 | 34.1 | 55 |
| Provincial Center | 43.7 | 58.2 | 27.3 | 47 | 37.0 | 53.5 | 18.3 | 34 | 55.8 | 72.3 | 37.1 | 51 |
| Shibar | 32.4 | 44.3 | 18.9 | 43 | 27.6 | 40.2 | 13.4 | 33 | 40.7 | 51.5 | 28.0 | 54 |
| Saighan | 30.7 | 41.6 | 19.0 | 46 | 23.9 | 36.1 | 10.4 | 29 | 40.2 | 54.3 | 23.6 | 44 |
| Kahmard | 29.6 | 40.6 | 16.0 | 39 | 24.9 | 36.2 | 10.8 | 30 | 44.4 | 57.9 | 24.5 | 42 |
| Yakawlang | 43.3 | 53.9 | 31.8 | 59 | 35.5 | 48.3 | 21.7 | 45 | 54.0 | 64.5 | 43.1 | 67 |
| Panjab | 37.3 | 49.2 | 24.6 | 50 | 31.7 | 45.5 | 16.8 | 37 | 46.0 | 56.8 | 34.5 | 61 |
| Waras | 35.2 | 46.8 | 23.3 | 50 | 28.5 | 42.1 | 14.6 | 35 | 43.1 | 56.5 | 29.8 | 53 |

The literacy rate in **Bamyan** is low. In 2011, the literacy rate for the population 10 years and above was 38.1 percent, which means that for every 100 persons in Bamyan in 2011 who were aged 10 years and above, 38 were literate. The literacy rate for the males was 50.1 percent, which is twice that for the females. At the district level, the literacy rate for the males 10 years and above ranged from 40.6 percent to 58.2 percent, with the Provincial Center having the highest rate and Kahmard having the lowest. In comparison, the literacy rate for the females 10 years and above was lowest in Kahmard at 16.0 percent and highest in Yakawlang at 31.8 percent. The gaps between the male and female literacy rates were wide. Kahmard, which had the lowest literacy rate for both males and females, had the lowest female/male ratio in 2011. Among the population 10 years and above in that district, there were only 39 females who were literate for every 100 literate males. Yakawlang, which had the highest female literacy rate, had the highest female/male literacy ratio at 59 percent.

The overall literacy rate in the **Baghlan province** is 21%, however, while nearly one third of men are literate (29%), this is true for just over one tenth of women (12%). However, in the population aged between 15 and 24 the situation for men is significantly better with 40% literacy, whereas for women the figure shows little change (13.5%). The Kuchi population in the province has particularly low levels of literacy.

## 5.12 Health Situation

### 5.12.1 Diseases and health problems

Food or water-borne diseases occurring in Afghanistan are e.g. bacterial and protozoal diarrhea, hepatitis A, and typhoid fever. This is due to the extremely poor sanitation throughout the country. Local food and water sources are heavily contaminated with pathogenic bacteria, parasites, and viruses. A risk to obtain such food or water-borne diseases is given countrywide, including major urban areas.

From May to November large populations of arthropod vectors, including mosquitoes, ticks, and sand flies can be found in the country. Malaria, which is acquired through the bite of an infected female Anopheles mosquito is the major vector-borne risk, which exists countrywide (including urban areas) below 2,000 meters elevation. Regarding the Investigation area, malaria risk is mainly given along the rivers.

Other diseases in Afghanistan are measles, diphtheria, meningitis, influenza, tuberculosis, and acute respiratory infections. The biggest concern is the high mortality among the 5 and under age group and the low vaccination.

According to the UN Children's Fund (UNICEF), at least two women die every hour in Afghanistan due to obstetric and pregnancy related complications (1,600 deaths per 100,000 live births). Lack of access to health services, malnourishment, early marriages and multiple pregnancies are the main reasons for Afghanistan's high maternal mortality rate, according to MoPH.

The exact number of Afghans living with sexually transmittable diseases (STD) like HIV/AIDS is unknown, but the Ministry of Public Health (MoPH) estimates that at least 3,000 people might have been infected by the virus. Most are undiagnosed and lack adequate awareness about the risks of HIV/AIDS.

Easy access to cheap drugs and limited access to drug treatment, combined with three decades of war-related trauma have resulted in drug use among almost 1 million Afghans, roughly 8% of the population between 15 and 64 years old (URL 2).

### 5.12.2 Health infrastructure

**Bamyan province**
In Bamyan province a basic infrastructure of health services exists. In 2005, there were 20 health centers and 3 hospitals with 112 beds. 41 doctors and 280 nurses were working in the district, employed by the Ministry of Health.

In the province of Bamyan there are 22 privately owned pharmacies. 22% of the population lives 5 km away from the closest medical facility, more than 75% of the population in the province has to travel 10 km to reach a medical facility (MRRD, 2007).

**Baghlan province**
A basic infrastructure of health services exists in Baghlan province. In 2005 there were 23 health centers and 5 hospitals with a total of 236 beds. There were also 65 doctors and 147 nurses employed by the Ministry of Health working in the province, which represented a decrease of about 15% in the number health service personnel compared to 2003. The province also has 156 pharmacies of which 154 are owned privately and 2 are run by the government.

The majority of communities do not have a health worker permanently present in their community. Eighty four percent of men's *shura* and 72% of women's *shura* reported that there was no community health worker present, and both groups most commonly said that they did not know what their closest health facility was.

Out of 1,365 villages, only 38 have a health centre within their boundaries, and only 48 have a dispensary. Access to health care is difficult for many people in the province with four out of five people having to travel more than 5 km to reach their nearest health facility. More than half the population has to travel over 10 kms to get medical attention – 54% for health centers and 50% for dispensaries.

### 5.12.3 Access to safe drinking water

In **Bamyan province** the most common sources of drinking water are unprotected spring and surface waters, such as rivers, streams, dams, lakes, ponds and canals. 35% of households are getting their drinking water from unprotected spring, 33% from surface waters. Only about 16% of households in this province had access to improved sources of drinking water liketubewell boreholes, protected wells or protected spring water in 2013 (SDES 2013).

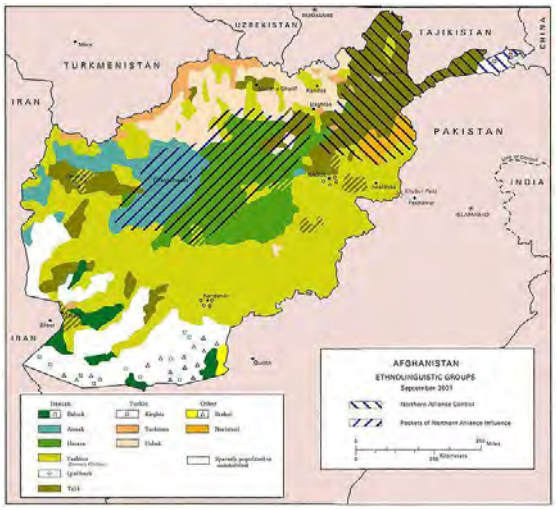
In 2005 15 % of the households in Bamyan used flush latrines. The majority, 46% used traditional cover latrines and 32% of the households had open pits (MRRD 2007).

In **Baghlan Province**, on average only 19% of households use safe drinking water. This rises to 35% in the urban area, and falls to 16% in rural areas. Nearly three quarters of households have direct access to their main source of drinking water within their community, however one in five households has to travel for up to an hour to access drinking water, and for 4% travel to access drinking water can take up to 6 hours.

On average only 2% of households have access to safe toilet facilities. The situation is better in the urban area where 9% of households have safe toilets, but this is true for only 1% of rural households. The following table shows the kinds of toilet facilities used by households in the province:

## 5.13 Ethnic Groups/Minorities

Afghanistan is a multi-ethnic country; the north-western region is inhabited by several ethnic groups (Figure 5-12).




Source: US Army 2001-2009

**Figure 5-12: Ethno-linguistic groups in Afghanistan**

The Bamyan province is a multi-ethnic tribal society. According to the Naval Postgraduate School, the ethnic groups of the province are as follows: 67.4% Hazara; 16% Sadat; 15.7% Tajik; 0.5% Tatar; 0.2% Qizilbash; and 0.1%Pashtun (Table 5-3).

**Table 5-3: Ethnic groups and total population in the Bamyian province**

| District | Capital | Population | Ethnic groups |
|---|---|---|---|
| Bamyan | Bamyan | 117636 | Hazara jaan, Tajik jaan, saraik jaan |
| Kahmard | Kahmard | 31042 | Tajik jaan, Hazara jaan, Tatar jaan, Pashtun jaan |
| Panjab | Panjab | 48397 | Hazara |
| Sayghan OR | Sayghan OR | 23215 | Tajik, Hazara ,Saraik |
| Shibar | Shibar | 22933 | Hazara, Tajik |
| Waras | Waras | 82119 | Hazara |
| Yakawlang | Yakawlang | 100158 | Hazara |

Out of the 253 affected households in both provinces, 78 were Hazara, 73 Tatar, 2 Pashton, 40 Tajik and 58 Isamaili. Hazara makes up for 31%, Tatar 29%, Pashton 1% Tajik 16% and Isamili 23% of the affected people (please refer to the LARP document).

## 5.14 Gender Aspects

In the Investigation Area, about one half of the population is female. In the tribal area, the women have a limited role in decision-making process at household level. Women in rural areas/ villages along the transmission line corridor are involved in several activities such as fetching of drinking water from streams/ wells as well as tube wells located at the edge of stream; collecting fire wood in the nearby hilly area; washing clothes and household utensils; child rearing; livestock rearing especially goat/ sheep, livestock grazing etc. Men are the main responsible for agriculture activities (cultivation, irrigation, harvests). Women help the men of their family mostly in cultivating and harvesting and also process the products. However, in some families in the tribal area, the extent of women's involvement remains limited to domestic matters only. In most of the cases men sell the agricultural products and spent the income for their families, including women.

## 5.15 Agriculture and Lands Ownership

Afghanistan is essentially an agrarian country with around 80% of the population involved in farming or herding or both a combination of war civil conflict exploration and enforced neglect have resulted in degradation of rangelands and/or un-maintained irrigation system and fragmented rural institution these problems have been exacerbated by the recent severe drought resulting in a halving of crop production and heavy depletion of livestock herds. Land cultivation is concentrated in oases and valleys and livestock breeding is generally nomadic in character. Two basic farming patterns exist including a mixed crop and livestock system, and the kuchi pastoral (nomadic) system.

More than half of the irrigated arable land lies north of the Hindu Kush mountain range in the drainage systems of the Amu dray River. It is estimated that about 3.3 million ha (5% of the total land area)is irrigated and regularly cropped while 4.4 million ha is rain-fed and cropped depending on rainfall of the remaining area about half (57 million half) is rangeland used for extensive livestock grazing. The rest has little or no vegetative ground cover.

Wheat is the main crop cultivate on both irrigated and rain fed land throughout the country. Cropping and rotational systems show considerable regional variation depending on climate precipitation and the availability of irrigation water and altitude traditional crop rotations are practiced in many places including a combination cereals crops with a variety of pulses and fodder crops. A wide variety of vegetables including onions and potatoes are cultivated for subsistence and as commercial crops. Other high value crops such as cumin, sesame, linseed and sugarcane are cultivated where appropriate. Afghanistan is also noted for many kind of fruits (including apricots, apples, pomegranates and grapes) and nuts (almonds, walnuts, and wild pistachios). In the 1970s dried fruit, raisins and nuts contributed more than 40% of the country's foreign exchange earnings. The years of conflict result in a loss of production and formers market niches however rapid expansion of orchard plantation and the adoption of modern systems and varieties occurred between 1989and 1999.

Small-scale industries exist in the main centers, primarily producing goods for domestic consumption i.e.) wheat , flour, bread, meat, preserved fruits, sugar, salt, plastic bags, toilet paper, etc. natural gas has been a valuable export commodity in the past and potential exists for further exploitation including mineral deposit such as iron ,barites, talc, mica, and copper, and semi-precious stones. Some small to medium scale manufacturing enterprises exist such as leather working and carpet making.

In recent years Afghanistan has earned notoriety as the world's largest producer of opium contributing some 75% of the global illegal supply. During the years of conflict opium poppy has increasingly replaced wheat as the most significant autumn-sown cash crop in the southwest and eastern provinces.

## 5.16 Electricity

### 5.16.1 Bamyan Province

**Electricity**
About 26.8% of the households in Bamyan Province has electricity at their homes. Solarpower was the leading source of energy for lighting among the households, but kerosene lamps, gas lamps and candels are also still used for lighting (SDES, 2013).

### 5.16.2 Baghlan Province

**Electricity**
On average 15% of households in Baghlan province have access to electricity with the majority of these relying on public electricity. Access to electricity is much greater in the urban area where 65% of households have access to electricity; however this figure falls to just 4% in rural areas, and only half of these (2%) have access to public electricity.

## 5.17 Physical Cultural Sites

Throughout Afghanistan, there are many undiscovered archaeological artifacts. But years of conflict have kept most professional archaeologists away. Instead, illegal excavation and smuggling have become big business.

Only recently, the Ministry of Culture has formed a special police force to try to combat the looters. But there are only 500 officers working for the entire country. As the transmission line corridor runs partly near to a branch of the Historic Silk Road, there are several potential cultural sites in the vicinity of the ROW.

### 5.17.1 The 38 meters Bamyan Buddha (Shahmamah)

The 38 meters statue was carved inside a 41 m high niche. The statue was 14 m wide at the upper part and 16 m in the lower level of the niche (Figure 5-13). It is believed that this statue was built around the fourth or fifth centuries AD. During the years there have been several attacks on the Buddha statues and in 2001 they were finally destroyed by the Taliban.

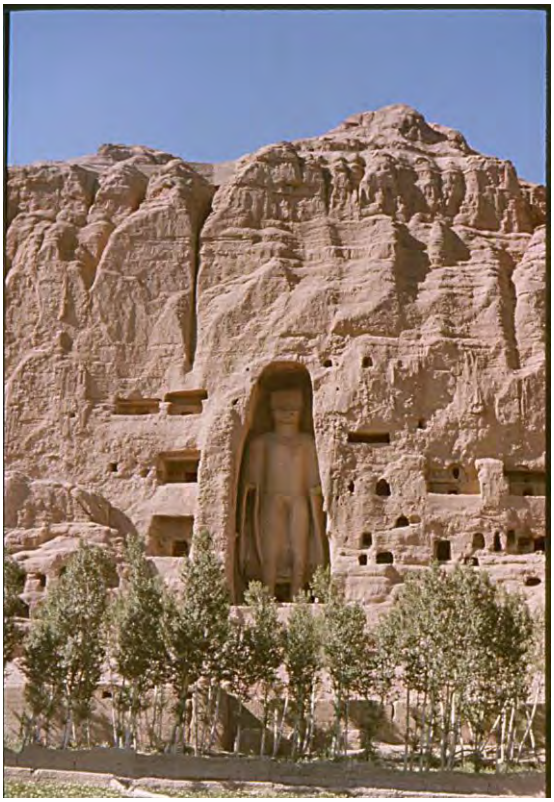


**Figure 5-13: The Bamyan Buddha (Shahmamah) statue before destruction**

The Ministry of Culture, UNESCO (United Nations Educational, Scientific and Cultural Organization) and ICOMOS (International Council on Monuments and Sites) have undertaken large conservation and stabilization works in the niche to protect the few remaining elements of the statue, founded by the governments of Germany and Japan.

The Bamyan Buddha (Shahmamah) is located approximately 1 km to the north of the transmission line in a protected area (Figure 5-14).


**Figure 5-14: Location of the 38 meters Bamyan Buddha (Shahmamah), and of the 55 meters Bamyan Buddha (Salsal) statues; TL route in red**

## 5.17.2 The 55 meters Bamyan Buddha (Salsal)

The 55 m statue was carved inside a 58m high niche. The statue was 16 m wide at the upper part and 24 m in the lower level of the niche. It is believed that this statue was built around the fourth or fifth centuries AD. During the years there have been several attacks on the Buddha statues and, in 2001 they were finally destroyed by the Taliban (Figure 5-15).

The Ministry of Culture, UNESCO and ICOMOS have undertaken large conservation and stabilization works in the niche to protect the few remaining elements of the statue, founded by the governments of Germany and Japan.

The Bamyan 58m Buddha (Salsal), its located 750 m to west of the small Buddha statue and 850 m to the north side of the transmission line in a protected area (Figure 5-14 above).

**Figure 5-15: The 55 meters Bamyan Buddha (Salsal) statue after destruction**

### 5.17.3 Shar –e- Gholghola (Ghoghola City)

Shar- e Gholghola ("the city of screams") is located around 1.5 km away from Bamyan town (Figure 5-16). It was totally destroyed in 1221 by Gengis Khan. The remains of the fortress are nowadays protected by UNESCO and belong to the world heritage site: "Cultural Landscape and Archaelogical Remains of the Bamyan Valley".

The Gholghola city lies around 300-500 m to the south of the transmission line (Figure 5-17).

**Figure 5-16: Shar- e Gholghola**


**Figure 5-17: Location of the Gholghola city; TL in red**

### 5.17.4 Khuaja Meer Hashame -e- Dawbandy Shrine

Many people go to Khuaja Meer Hashame –e- Dawbandy in Gorwanan village from villages far away as well as from around the Bamyan province for treatment.

The line crosses this area. An alternative route around it crosses 600 m in front of the exit point to the south side. The importance of this area shall be further discussed with the national authorities.

### 5.17.5 Kakrak Valley Caves

The Kakrak valley is located around 3 km southeast of the Bamyan Cliff, behind Shar-e – Gholghla (Figure 5-18). It is one of the beautiful valleys in the area. Kakark is also one of the major Buddhist entrees in the Bamyan region along with the main Bamyan valley complex and the Foladi valley complex located to the south-west of the town.

The main part of the Kakrak valley suitable for tourism is the northern end where it joins the Bamyan valley. At this point a multitude of caves has been found, cut into the low cliffs and hills on the valleys east side. Of particular significance are the fragments of a 10 m tall standing Buddha figure and of a sanctuary with painted decorations from the Sasanian period.


**Figure 5-18: Location of the Karkrak valley caves; TL in red**

## 5.17.6 Historical Fortress A

A historical fortress is located in a distance of 9 km toward east of Bamyan City and the transmission line (Figure 5-19).

**Figure 5-19: Fortress A east of Bamyan City (in the background)**

### 5.17.7 Historical Fortress B

This historical Fortress is located in distance of 9 km toward east of Bamyan City and transmission line (Figure 5-20).

**Figure 5-20: Fortress B east of Bamyan (in the background)**

### 5.17.8 Woman garden

The Woman Garden (Figure 5-21) is located approximately 15 km north eastern of Bamyan, ca. 93 m to the north of the transmission line, and in front of the Shar-e- Zuhak (see next section 5.17.9 and Figure 5-22). Many people come here for picnics during the year.

**Figure 5-21: Woman garden**


**Figure 5-22: Location of the Woman Garden and the Red City; TL in Red**

## 5.17.9 Shahr-e Zuhak - The Red City

Located approximately 15 km to the east of Bamyan town (Figure 5-22 above), Shahr-e Zuhak is one of the spectacular historical sites within the province. It is accessible via the main road through the eastern to the Bamyan Valley.

Situated high up on the striking red sandstone cliffs at the confluence of the Bamyan shikary and Hajigak rivers, the site commands spectacular views over the surrounding countryside and is particularly noticeable at sunset when the red cliffs are highlighted. As other historical architecture throughout the region it is primarily made of mud with elements of baked bricks.

**Figure 5-23: Shahr-e Zuhak (The Red City)**

### 5.17.10 Unknown cultural resources

As the transmission line corridor runs partly near to a branch of the Historical Silk Road, there is a potential for unknown archaeological objects, as excavations have not yet been systematically conducted by the relevant authorities.

# 6. Screening of Environmental Impacts and Mitigation

## 6.1 Impacts and Mitigation during the Design Phase

### 6.1.1 Line routing

The present design of the transmission line routing (part of the Pre-Design Report) is preliminary. The line routing was determined regarding technical and economical aspects as well as environmental and social aspects (please refer to Section 4.2 for further details). However, not all impacts can be avoided:

- in some locations (ca. 130) rivers will be crossed
- throughout some of its extent, the line route crosses culturally protected areas or their respective buffers
- some land acquisition and resettlement impacts (LAR impacts) are expected to be felt by the 253 AHs, namely:
  - 108,000 $m^2$ of land permanently lost
  - 1,750,000 $m^2$ of productive land temporarily affected
  - 1,700 m of walls, fences, and water channels lost
  - 14 houses to be physically resettled
  - 28 houses to be partially damaged
  - 1,100 fruit trees and 3,900 timber tress lost.

Adjustments to the route shall be considered during detailed design to minimize or avoid the impacts above listed. Specifically regarding cultural assets/sites, other solutions shall as usage of cables instead of overhead lines may be procured. The final decision regarding this issue shall be made in cooperation with the responsible cultural authorities (see also Section 6.3.3)

As the detailed design is shifted under the responsibility of the construction 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.

Under consideration of the above mentioned facts and mitigation possibilities, the extent of impact regarding the design of the line routing is assessed to be medium.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Line routing | ■ ■= medium |

### 6.1.2 Substations and converter station

One substation will be built in Bamyan and one will be extended in Doshi. One back to back converter station will be built in Dasht-e-Alwan. The new substation in Bamyan is planned to be located in an empty and unused land composed of sand and soil. DABS has allocated the plot, as well as the plot for the converter station. For the extension of the substation in Doshi, there is no need to acquire additional land.

Neither economical nor physical resettlement impacts, as well as environmental impacts are therefore expected from the design of the substations.

### 6.1.3 Access roads

The construction of access roads will be necessary, as well as improvement of existing ones. So far, a detailed plan of such roads is not available. Similar impacts as foreseen for the line routing design may be expected.

The line routing was and will further be selected with focus on minimizing the need to build new access roads by designing it along existing paved roads or tracks. Such existing roads/tracks will be used to the greatest extent possible.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Construction of access roads | ■= low |

## 6.2 Impacts and Mitigation during the Construction Phase

### 6.2.1 Soil and Erosion

As the transmission line corridor is characterized by flat or slightly undulated semi-desert (no slopes above 15 %), there is no major risk for erosion during construction of access roads, towers and substations. Erosion prevention measures such as drainage systems and road-side plantation with bushes (in view of the operation phase) will have to be implemented.

A risk of accelerated sand deflation occurs during the construction process. This can be mitigated by construction of sand deflation prevention structures in sensitive areas and where vegetation (grass) is removed and bare soil exposed/ land cover diminished.

The circulation of construction machinery can lead in to compaction of the soils, which causes increased soil density and reduced permeability, leading to problems such as pounding of water, decreased root penetration and reduced aeration of the soil. The TL is planned to cross several agricultural areas, where negative effects in the soil productivity due to compaction may be felt. In areas with soils sensitive for compacting (clay, silt - to be determined with support from the farmers) excavator support mats should be used for temporary access. In case compaction of the soils has occurred, mechanical decompactors or sub-soilders can be used to relieve compaction. This activity shall also be carried out on all temporary traffic and storing areas, which are not needed after the end of the construction phase.

Other mitigation measures can be consulted in the EMP (Section 10 of this report).

| **Impact of/on** | **Extent of impact** |
|---|---|
| Erosion | ■ = low |
| Sand deflation | ■ = low |
| Soil quality | ■ = low |

### 6.2.2 Air Quality and GHG Emissions

Due to the limited time of the construction period, the impacts on ambient air quality by vehicle exhausts will be low. Machines and vehicles will be checked regularly to minimize exhausted pollutants.

The creation of dust during construction works is also a short term impact and could be mitigated by sprinkling dusty access roads, especially in densely populated areas. However, in locations where water is scarce, it should be considered to use the water for irrigation instead.

Sulfur Hexafluoride ($SF_6$)
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. On the other hand, $SF_6$ is a very highly effective and persistent greenhouse gas and has to be handled very properly following guidelines as:

- IEC (DIN EN)1 60376 „Specification and acceptance of new sulfur hexafluoride”
- IEC (DIN EN) 60480 „Guide to the checking of sulfur hexafluoride ($SF_6$) taken from electrical equipment”
- IEC 61634 „High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride ($SF_6$) in high-voltage switchgear and Control gear”.

Following these guidelines and considering the recommendations of the International Council on large Electric Systems (CIGRE: $SF_6$ Task Force: Handling and given Recycling of $SF_6$ Mixtures) (URL 3) will ensure that the amount of released $SF_6$ into the atmosphere is reduced to an absolute minimum.

However, new transformers of international standard do not contain $SF_6$. Switchgears containing $SF_6$ shall not be installed. In view of this, the impact of $SF_6$ is considered to be insignificant.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Climate | ○= nil |
| Air quality | ■ = low |

### 6.2.3 Water Resources

There is a general risk of surface water and groundwater pollution by e.g. oil/ fuel of machines and trucks. This can be avoided by proper maintenance and construction site control.

In some locations (ca. 130) rivers will be crossed. Towers shall not be placed too close to rivers and creeks (i.e. avoid flooding areas) and fragile river banks shall not be damaged.

As the groundwater table in the future line corridor between Bamyan and Doshi can be found at a minimum of 15 m depth, the risk of groundwater pollution is low even under sandy soils. For impact avoidance, especially in view of accidental oil/ fuel spills, a selection of existing wells for analysis of basic groundwater parameters as well as measurements during the construction period and after completion has to be carried out.

Soil run-off with oil/ fuel during construction could pollute surface waters. Avoidance of soil run-off is necessary.

Also, the construction of temporary bridges (if riverbeds are not dry) may cause deterioration of river beds and banks. Existing bridges shall be used wherever possible. Bridges to be constructed shall be temporary and bridges which are not needed anymore will have to be dismantled.

Pollution of rivers by vehicles and waste shall be forbidden and controlled, (e.g. no car washing in the rivers, no oil spills, etc.).

| **Impact of/on** | **Extent of impact** |
|---|---|
| Groundwater | ■ = low |
| Surface water | ■ ■ = medium |

### 6.2.4 Flora and fauna

Due to the location of the Project in open grasslands of a semi-desert area without almost non forest cover, the environmental impacts are very localized (i.e. at the substation sites and tower foundations). Felling of trees in the future 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.

Even though the future 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. Access roads should be limited, wherever possible.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Flora and fauna | ■ = low |

### 6.2.5 Natural protected areas

The construction sites are not located in any declared or planned protected area, important biodiversity conservation area or important wetland (Ramsar Wetland). They are further not situated within a major bird migration corridor. However, the beginning of the TL in Doshi is located ca. 6 km to the west of an Important Bird Area (Salang Kotal). Any impacts on this IBA could eventually be felt during operation (please refer to the respective section further in this document).

| **Impact of/on** | **Extent of impact** |
|---|---|
| Natural protected areas | ○ = nil |

### 6.2.6 Waste

An environmental problem often associated with construction works is improper waste disposal at the construction sites and at workers camps. Indiscriminate waste disposal is not only aesthetically objectionable but also ultimately capable of polluting soil, surface water, groundwater and habitats. Decomposing waste gives rise to odor and attracts disease vectors.

The main solid waste generated during the construction of the proposed OHL and substations can be generally classified as follows:

- domestic wastes generated by the workers
- excavated inert material
- construction and demolition waste
- chemical waste like fuel, oils etc.
- general refuse.

In detail, it is expected that the waste consists of:

- soil and rocks from foundation activities
- plant debris from tower site clearance and ROW
- construction waste like unused/ unusable construction material, wood from framework, maintenance waste, packaging material, empty containers, etc.
- soil polluted by fuel, engine oil and lubricants
- drums and containers from fuel, engine oil and lubricants
- garbage from the workers like paper, plastic, drink containers, food waste, etc.

In order to handle the waste in a proper manner during construction, the Construction Contractor shall develop a Waste Management Plan (within the EHS Plan) that contains the following principles:

- a waste management hierarchy of avoidance, minimization, reuse, recycling, treatment and disposal
- all waste will be segregated by category on site, based on their nature, and ultimate disposal sites
- staff training to increase awareness of waste minimization issues.

If the Waste Management Plan is in place, the impact of solid waste on the environment will be minimal.

Construction sites and workers camps shall be fitted with functional sanitary equipment (proper toilets and lavatories).

All products used for the transmission lines and substations shall be PCB free.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Solid waste | ■= low |
| Liquid waste | ■ = low |

### 6.2.7 Workers and community health & safety

Direct impacts on health and safety (H&S) of the workers during construction of the planned transmission line and substations may result from various factors: potential work accidents (e.g. electrocution, falling from height, blasting of rocks), noise emissions, sanitary situation, contaminated drinking water or food. Modest issues may also arise from dust generation, vehicle emissions, construction waste and regarding traffic/ pedestrian safety.

For avoidance/ mitigation of H&S impacts on workers, all construction workers shall be fitted with personal protection equipment (PPE). Due to the limited time of the construction period and the sparsely populated area for the largest part of the transmission line route, impacts of noise on the population during the construction activities will be low.

Regarding the sanitary situation, it is assumed that the construction sites and camps are fitted with functional sanitary equipment. Health and Safety trainings shall be implemented to inform workers about hygienic behavior as well as risks of transmission of STDs. Alcohol and drugs shall be strictly forbidden at the construction site.

As the construction will be undertaken in an environment where other functioning transmission lines are present (almost all the line length from Bamyan and Doshi), the risk of electrocution may be increased in some areas, especially those where the distance between the TLs is small or where crossing of existing lines is planned.

Due to the tense social situation in parts of the area, the influx of workers needs to be handled with great care in order to avoid social conflicts with the resident population. Local workforce shall be hired whenever possible. Due to the limited time of construction a specific area and the regular shifting of workers camps, the impact is assessed to be limited.

Indirect health and safety impacts for workers and community may result from land mines. The development of EHS Plan shall also include a mine clearance statement that assesses that the area is free of mines. Before the start of physical works, the assessment needs to be provided. According to the EARF, clearance assessment is provided by MACCA.

The impact of worker's influx from outside on the local host population is expected to be limited, but there may be conflict situations between such workers and locals. This needs to be prevented and the Construction Contractor needs to implement measures to prevent and sanction irregular behavior of the workers.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Workers Health and safety | ■ ■ = medium |
| Community Health and Safety | ■ ■ = medium |

### 6.2.8 Land Acquisition and Resettlement

The issues are treated in detail in the Land Acquisition and Resettlement Plan (LARP) in a separate document.

Some land acquisition and resettlement impacts (LAR impacts) are expected to be felt by the 253 AHs, namely:

- 108,000 $m^2$ of land permanently lost
- 1,750,000 $m^2$ of productive land temporarily affected
- 1,700 m of walls, fences, and water channels lost
- 14 houses to be physically resettled
- 28 houses to be partially damaged
- 1,100 fruit trees and 3,900 timber tress lost.

The strategy adopted is to avoid and to minimize land acquisition and related impacts wherever possible and to compensate affected persons (APs) for impacts that cannot be avoided. According to ADB safeguards, full compensation of APs and livelihood restoration to a situation that at the minimum equals the level prior to the Project are necessary. Land has to be acquired to compensate house owners that need to be relocated or lands have to be purchased and given in exchange to resettle them.

Agriculture will be possible in the ROW again after finalizing the construction period. A permanent impact is expected only for the tower locations. Compensation for the loss of agricultural produce and production capacity will have to be paid if towers are located in fields, as specified in the entitlement framework presented in the LARP. Temporary impacts, i.e. damages to crops will be compensated on the spot. In the ideal case, the construction period would avoid the agricultural season. Compensation is not limited to people with land titles. Also people without land titles, whose crops are damaged during the construction process, have to receive compensation.

Most of the grazing lands/steppe pastures are communal lands used by livestock owners. Grazing will be allowed within the corridor after having finalized the construction. Therefore, permanent as well as temporary impacts on grazing lands will be limited.

Land acquisition by access roads can either be permanent, if the change of land use is not reversible or temporary, or temporary, if the former land use can be continued after construction. Presently, these LAR impacts cannot be estimated as the design of the access roads is not complete. However, if private lands are irreversibly changed for the construction of access roads, the same expropriation procedure applies as for tower locations and lands with settlements. In case of a temporary impact, damages to crops and production capacity of the land will have to be fully compensated.

Due to the general scarcity of arable land and the number of plots required for the construction of towers and access roads, the extent of the potential impact on land use through land acquisition is estimated to be medium.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Land acquisition and resettlement | ■ ■ = medium |

### 6.2.9 Gender aspects and vulnerable people

The issues are treated in detail in the Land Acquisition and Resettlement Plan (LARP) in a separate document.

The construction of the new transmission line and the substations may increase existing gender disparities. The reason is that benefits from construction work will be earned mostly by men and access and control over compensation payments are likely to be at the disposal of men and not of women, which increases the probability that the family will benefit less. Single women headed households are among the most vulnerable people. Two of the AHs are headed by widowed/unmarried women (see LARP document). If resettlement issues arise, for single women headed households the same procedure applies as for vulnerable people.

In the Investigation area most people make a living from subsistence based agriculture and shepherding. Most of the poor people are vulnerable to trends, shocks and seasonality, meaning that a reduction in rainfall due to climate change, unexpected events like earthquakes or simply at the end of the winter season brings them to the edge of sustaining their livelihood.

Potential impacts as expropriation of land or damages to crops could reduce the livelihood base of vulnerable people to the extent that their livelihood is critically endangered. Most of the vulnerable people do not have land titles or own very little land. In this case already the loss of a surface of a tower foundation could result in vulnerability. In most cases safe drinking water, medical assistance, education etc. are also issues of concern.

Households below the poverty line and otherwise vulnerable households may lose their livelihood base if impacted by the Project / loss of land or relocation. In this case, a special livelihood support program shall be implemented (see LARP).

| **Impact of/on** | **Extent of impact** |
|---|---|
| Gender aspects and vulnerable people | ■ ■ = medium |

### 6.2.10 Local Economy

During the construction period local workforce will be employed for the construction of substations, towers and stringing procedures. This will contribute to much needed monetary income in remote rural areas and towns, where the industrial basis has eroded. However, the income generation opportunity is not of long term duration.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Local economy | **+**= locally positive |

### 6.2.11 Infrastructure and traffic

Respect of minimal ground clearance (8 m for 220 kV lines) will be sufficient in order to avoid negative interference with the traffic at road crossings. Proper traffic management will avoid negative impacts on traffic as far as possible.

During construction of towers near roads, and especially during stringing procedures, traffic signs and signalization shall be implemented near roads in order to prevent accidents.

During construction the crossing of roads and existing transmission lines will be unavoidable. Crossing of roads will interfere with traffic only marginally and for a very short time. Crossing of the present transmission lines will be conducted without need of power disruption. A sufficient distance of the new conductors to the existing TL will be respected.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Infrastructure and traffic | ■ = low |

### 6.2.12 Physical Cultural Resources

As described in Section 5.17, several cultural sites (nationally and internationally protected) are located within or nearby the project affected area.

The stringing works and circulation of machinery and individuals pose a physical risk to the structures and areas under protection. Ultimately, such negative impacts may lead to the loss of cultural value of the area. Mitigation measures during the final design phase have been defined in Section 6.1.1. For the construction stage, the workers shall be made aware of the cultural value of the areas crossed, and the contact with the cultural relicts shall be forbidden. The construction machinery shall be maneuvered in a sufficient distant from these sites. Any other demands from the cultural authorities shall be respected.

In addition to the above, there may be possibilities for chance finds during the construction phase within the investigation area, as not all sites are known or excavated. In case of chance finds, the construction has to be stopped immediately and the Ministry of Culture has to be informed to agree on further steps. A Standard “Chance Find Procedure” must be referred to as standard provisions in construction contracts, when applicable.

Standard “Chance Find Procedure”:

a) stop the construction activities in the area of the chance find
b) delineate the discovered site or area

c) secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the equivalent
d) take over
e) notify the supervisory Engineer who in turn will notify the responsible local authorities and the Ministry of Culture / Department of
f) Historical and Cultural Sites immediately (within 24 hours or less)
g) responsible local authorities and the Ministry of Culture / Department of Historical and Cultural Sites would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the Ministry of Culture / Department of Historical and Cultural Sites (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values
h) Decisions on how to handle the finding shall be taken by the responsible authorities and the Ministry of Culture / Department of Historical and Cultural Sites. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage
i) implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Ministry of Culture / Department of Historical and Cultural Sites and
j) Construction work could resume only after permission is given from the responsible local authorities and the Ministry of Culture / Department of Historical and Cultural Sites concerning safeguard of the heritage.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Historical and cultural sites | ■ ■ = medium |

## 6.3 Impacts during Operation Phase

### 6.3.1 Soil and water resources

During operation of the new substations and converter station pollution of soil and water through oil leakage is possible. Such impacts can be avoided by fitting transformers with oil pits beneath to collect leaking oil. These oil pits shall be connected to a drainage system. The oily wastewater shall be lead into separate storage tanks for further treatment. Sanitary waste water at substations will need to be collected and treated.

Water pollution during maintenance works (operation phase) shall be avoided with similar mitigation measures as for construction phase.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Soil and water resources | ■ = low |

### 6.3.2 Landscape and visual impacts

The new TL partly traverses scenic areas, where towers are going to be visible from far. Due to the character of the present landscape there will be a good visibility of the new towers and it will be possible to see several towers from almost every point on the main road.

Visual impacts of the new towers can hardly be mitigated. Disguising towers as palms (as done i.e. in the USA for mobile-phone towers) is not considered an option, as there are other priorities for the local population.

Planting trees/ bushes around the new substation in Bamyan can reduce their visual impacts partly.

The additional visual impact on the landscape of the extension of the Doshi S/S will be low as this is planned within the same area of the existing S/S. The same is valid for the converter station, as this is planned to be included within the planned Dasht-e-Alwan substation.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Visual impacts/ landscape | ■ ■ = medium |

### 6.3.3 Physical cultural resources

The line will also cross or be located nearby culturally protected areas (please refer to Section 6.2.12), which may cause a loss of their cultural and touristic value.

The Bamiyan city has islanded distribution networks fed by three solar power plants (Haidar Abad, Sinia Foladi, and Mula Ghulam). These networks include power cables in areas which are protected due to their cultural value (Figure 6-1).

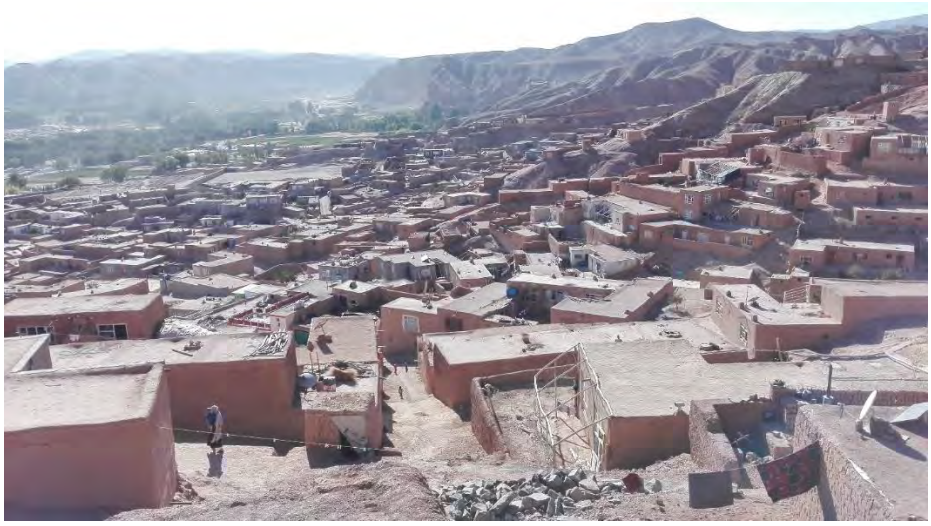


**Figure 6-1: Overview of one of the villages served by the distribution network of the Haidar Abad solar power plant consisting of buried cables**

The usage of cables may as well be imposed in the areas crossed by the project which are under protection for their cultural values, or which are proposed to be classified as such. Ultimately, a decision/strategy shall be undertaken by the national authorities.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Physical Cultural Resources | ■ ■ = medium |

### 6.3.4 Flora

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 cables (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.

New access roads will promote access by cars in formerly little disturbed places. However, no dense forest areas occur in the Investigation area and no rare or endangered species are expected to be found in the line corridor and at the substation sites. Thus, the impact of the proposed Project on the flora during the operation phase is assessed to be low.

| **Impact of/on** | **Extent of impact** |
|---|---|
| Flora | ■ = low |

### 6.3.5 Fauna

Birds are the animal group which are most affected by the presence of OHLs. The three main types of risk to birds from overhead lines are:

- risk of electrocution
- risk of collision
- parceling of bird habitats.

The TL begins nearby (6 km to the west) one IBA site (Salang Kotal) with a diversity of breeding and passage birds. Impacts on birds using and living in this IBA cannot be excluded.

The risks of bird electrocution and collision can be avoided or mitigated by installation of bird diverters at least in the first kilometers of the line (starting in Doshi).

Other fauna is not considered to be impacted significantly by the Project.

| Impact of/on | Extent of impact |
|---|---|
| Avifauna | ■ ■= medium |
| Other fauna | ■ = low |

### 6.3.6 Waste

Generally, the amount of waste generated by maintenance of the transmission line is negligible. However, the substations and the converter station need to have a waste management concept and removal of waste to a disposal site needs to be assured. If such a waste management is warranted, the impact of waste production during the operation phase is low.

| Impact of/on | Extent of impact |
|---|---|
| Waste Production | ■ = low |

### 6.3.7 Workers and community health & safety

Natural disasters

Given the seismic conditions of the project area, it is necessary to consider the risk of possible earthquakes. In general, substations are more vulnerable to earthquake damages than OHLs, as there are e.g. porcelain component and possibility of leaking gaskets. Damages at transmission lines may occur as a result of tangled wires.

Construction of the transmission line and the substations according to earthquake safety standards suited for the seismic risk level in the Investigation area is assumed to reduce the risk as far as possible.

Noise emissions

The intensity of the corona noise emitted by transmission lines is influenced by weather conditions. Wet weather, fog or rain increases the noise level but these weather conditions are not frequent in the Investigation area.

Also, noise emitted by the new substations will be minimal and will not affect the population outside the fence. For the population, the limit values shown in Table 6-1 are valid according to the General IFC EHS Guidelines:

**Table 6-1: Limit values for noise regarding population**

| Receptor | One Hour $LA_{eq}$ (dBA) | |
|---|---|---|
| | Day time 7:00 – 22:00 | Night time 22:00 – 7:00 |
| Residential; institutional; educational | 55 | 45 |
| Industrial; commercial | 70 | 70 |

Noise levels for workers within the substations will also not be exceeded. As stipulated in the General IFC EHS Guidelines of the World Bank Group, "no employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection". Such high noise levels are not to be expected to occur within a substation designed as state-of-the-art during regular operation.

Noise emitted by the new substations or by the conductors (corona effect) will be minimal. Specific mitigation measures are not necessary.

Electric and magnetic fields

Electric and magnetic fields are invisible lines of force that surround any electrical device. Power transmission lines, electrical wiring, and electrical equipment all produce EMF. There are many other sources of EMF as well. Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m).

As a precautionary measure, other projects have adopted an internationally accepted standard ROW width of 40 m along 220 kV TL. All habitation and structures are excluded from the ROW to ensure safety of people and animals from EMFs, as well as from direct electric shocks and "flashover". No permanent human presence shall be allowed within the ROW.

With regard to substations, in general, the strongest EMF around the outside of a substation comes from the transmission lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

Based on a recent in-depth review of extensive scientific literature (World Health Organization's International EMF Project), the WHO has concluded that "despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health". The low levels referred to by the WHO are levels expected to be found outside of a 40 m ROW of a 220 kV line.

Reference levels for exposure of the general public have been obtained from those for occupational exposure by using various factors over the entire frequency image. These factors have been chosen on the basis of effects that are recognized as specific and relevant for the various frequency ranges. Generally speaking, the factors follow the basic restrictions over the entire frequency range, and their values correspond to the mathematical relation between the quantities of the basic restrictions and the derived levels as described below:

- In the frequency range up to 1 kHz, the general public reference levels for electric fields are one-half of the values set for occupational exposure. The value of 10 kV $m^{-1}$ for 50 Hz or 8.3 kV $m^{-1}$ for a 60 Hz occupational exposure includes a sufficient safety margin to prevent stimulation effects from contact current under all possible conditions. Half of this value was chosen for the general public reference levels, i.e. 5 kV $m^{-1}$ for 50 Hz or 4.2 kV $m^{-1}$ for 60 Hz, to prevent adverse indirect effects for more than 90% of exposed individuals.

From similar projects it can be stated that the relevant internationally accepted limit values for the public will not be exceeded if the minimum safety distance of 8 m to the nearest conductor is kept as recommended.

Risks of Electrocution

The resident population shall be made aware during the construction process that the transmission line is a high voltage line and that individual household connections are impossible. Masts shall be equipped with explanatory boards explaining the risks of electrocution and warn against attempts to individually connect to the line. Maintenance workers shall also be made aware of electrocution risks.

Possible transformer fires

Fire walls will be installed between the transformers to prevent fire expansion in case of a transformer fire. It has to be pointed out that transformer fires are absolutely rare events and in case of proper maintenance of the substations practically excluded. Within control buildings, mobile fire extinguishers will be provided and checked regularly. Fire protection measures will follow international requirements. The staff will be trained on how to handle a fire within a substation. If adequate mitigation measures are implemented, the extent of impact by possible transformer fires is low.

| **Impact of/on** | **Extent of impact** |
|---|---|
| **Health and Safety:** | |
| - Natural disasters | ■ ■ = medium |
| - Noise emissions | ■ = low |
| - Electric and magnetic fields | ■ = low |
| - Risks of electrocution | ■ ■ = medium |
| - Possible transformer fires | ■ = low |

### 6.3.8 Electricity Supply

An increased stability of the electricity supply, especially if a raising demand is expected, is a locally positive impact of the Project. An increased efficiency/ reduction of transmission losses in the electricity network will be regionally positive.

| Impact of/on | Extent of impact |
|---|---|
| Electricity supply | **+** = locally positive<br>**++** = regionally positive |

## 6.4 Impacts during Decommissioning Phase

In order not to create a long-lasting permanent visual impact, the towers and conductors of the TL will have to be completely dismantled after the life-span of minimum 50 years. Also substations will have to be dismantled completely when they are out of function.

Recycling of metal parts (towers, conductors), waste management and disposal according to national and international standards will have to be planned for the decommissioning phase. If adequate recycling and waste management procedures are respected, the Project impact is assessed to be low. Recycled metal parts could be sold as scrap metal having a locally positive economic impact.

| Impact of/on | Extent of impact |
|---|---|
| Decommissioning | ■ = low<br>**+** = locally positive |

# 7. Analysis of Alternatives

No project alternative

Not constructing the sub-projects would not cause any resettlement, land acquisition and other social and environmental impacts. However, it would also prevent the achievement of the broad objectives of the Tranche 2 of the Energy Supply Improvement Investment Program, namely boost energy trade and regional cooperation, strengthen the country's energy infrastructure, increase energy supply to accelerate electrification rate, and improve operational efficiency in the sector.

Line routing alternatives

Beginning with first rough power line route options and based on recent high-resolution satellite scenes the technical and the environmental line survey experts together optimized the line route step by step and section for section in order to avoid settlements and single houses and to reduce the impacts on the environment e.g. by following already existing power line corridors, existing roads or by circumventing sensitive locations.
Considered environmental and social aspects were:

- avoiding traversing or close by-passing of urban areas, densely populated areas, settlements, schools, public buildings and market places
- avoiding traversing or close bypassing of shrine, historical places, national parks and protected areas
- avoiding traversing of forest and water catchment zones
- keep electrical field, magnetic field, audible noise and TV interference as far as possible below national/ international accepted levels
- keep impact on flora, fauna, nesting places, animal trails, migration zones and sensitive ecological areas to a minimum
- apply selected bush clearing, minimize access tracks
- consider accessibility in order to avoid new access roads
- avoiding areas prone to flooding and erosion, intermittent water courses and runoff areas, areas of alluvial sediment.

In the next stages of the project, the line will be further refined. One revised routing will be submitted with the Draft Final Pre-design Report. The final routing (detailed design) will be undertaken by the contractor and will have in mind the objective of reducing the impacts to an absolute minimum.

# 8. Public Consultation and Information Disclosure

A preliminary consultation process was carried out with the potentially displaced people/public along the transmission line routing from Doshi to Bamyan. Due to security challenges, extensive and more detailed consultaions will be undertaken by the turnkey contract upon detailed design of the Project, when precise tower locations will be known. The objective was sharing of information related with the project planning and execution activities. The information shared included project activities and their expected impacts on the physical, biological and socio-economic conditions. Accordingly, the concerns/issues of the affected population/locals associated with the project were documented and understood.

The public consultations conducted in September 2016 included scoping sessions with stakeholders and focused group discussions with local communities. Consultations were initially carried out from the 3rd to the 9th of September 2016. During the field survey, some preliminary consultations were held in the Bamyan center, and others along the line corridor with regional and local stakeholders from Kahmard down to Doshi. The meetings focused on the collection of information on the socio-economic conditions in the wider areas of the planned line corridor. At the same time, information on the project was provided to those stakeholders who, until that point, had not been informed. With regard to the primary stakeholders, apart from many individual interviews, 11 focus group discussions (FGD) were held in various districts (Kahmard, Tala Wa Barfak and Doshi). The meetings were held at the DABS field office in Bamyan and at the Governors compound, attended by village elders only. Comprehensive consultation will be undertaken at the time of detailed design of the Project.

All the people asked along line corridor indicated that they would be happy to pay for electricity. 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) shura or the government established shura. In three cases Community Development Councils (CDC) were also mentioned.

The predominant concern is that the future supply would not be fair (i.e. that their village would not be included in the public network - as it had been left out once before). Seven groups expressed the fear that compensation payments would not be made at all, or that the compensation money would not cover losses adequately.

The majority of the people would not have any problems with land acquisition and compensation procedures. However, they all pointed out that there were vulnerable households living in their communities (not affected by the ROW though). The areas where a relatively high number of very poor and vulnerable people were reported is between Shash Pula and Dasht-e-Safid of Bamyan, and between Barfak and Ismaily area of Baghlan provinces.

# 9. Grievance Mechanism

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.

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 started.

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.

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.

Members of the grievance committee will be the constructor, DABS-PMO, local administration, the environmental authority in charge, a lawyer and NGO representatives.

The constructor 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.

The constructor, together with the 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.

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 aggrieved person (AP) is encouraged to proceed in the following way (Figure 9-1):

a) 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
b) lodge the complaint and provide information on the case
c) agree with the construction contractor on specific mitigation measures
d) agree with the contractor on a time limit for the grievance settlement
e) grievances have to be settled within two weeks, or as otherwise specified in scheduled agreement
f) sign if the mitigation measure has been implemented as agreed
g) seek redress from DABS if not satisfied with above mentioned procedure
h) involve appropriate local authorities to liaison with DABS and constructor
i) involve NGOs or the construction supervision consultant to liaison with DABS and the constructor
j) seek redress from ADB if not satisfied with response by DABS
k) seek redress from court if all else fails.

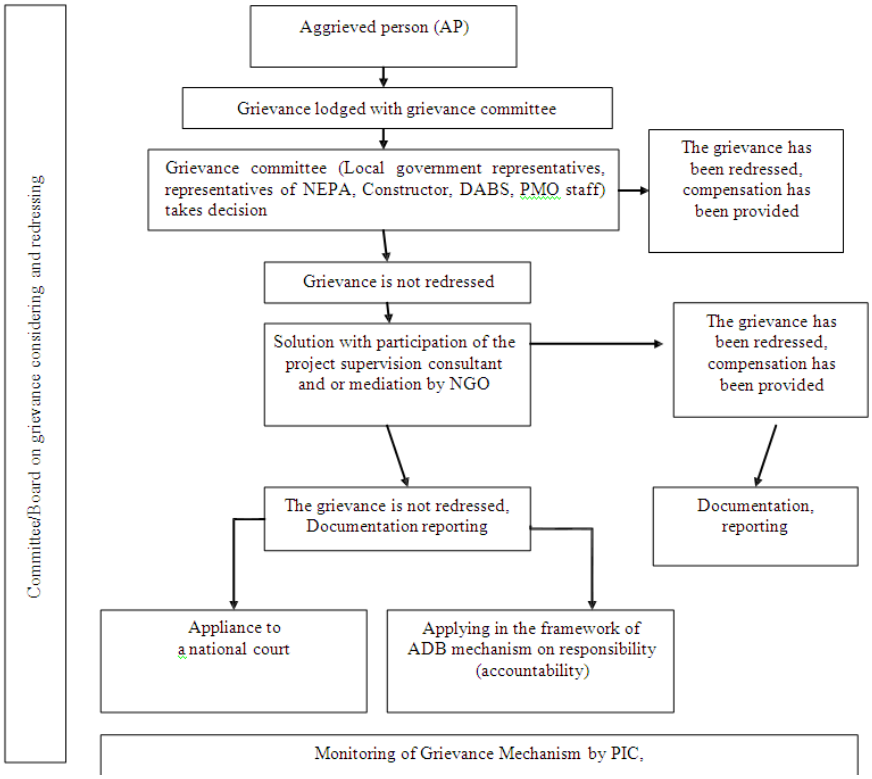



**Figure 9-1: Grievances Redress Chart**

ADB = Asian Development Bank
IA / PMO = Implementing Agency / DABS-PMO
NGO = Non-governmental Organizations
NEPA= National Environment Protection Agency

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 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.

The provisions for the grievance mechanism shall be included in the construction budget.

The grievance mechanism shall be implemented by the PMO in cooperation with the constructor. The PMO shall ensure the availability of GRM staff and make information about GRM (telephone number, contact persons etc. (see above) publicly available and free of charge. The PIC consultant will monitor the functioning of GRM.

# 10. Environmental Management Plan

## 10.1 Mitigation Measures

### 10.1.1 Mitigation Measures for the Design Phase

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| Line Routing | Physical and Economical Resettlement<br><br>Crossing of rivers<br><br>Damage of Physical Cultural Sites | • Adjustments to the route shall be considered during detailed design to minimize or avoid the impacts.<br><br>• Specifically regarding cultural assets/sites, other solutions shall as usage of cables instead of overhead lines may be procured. The final decision regarding this issue shall be made in cooperation with the responsible cultural authorities<br><br>• Update IEE based on the detailed design | Turnkey Contractor | During final design |
| Access roads | | • The line routing was and will further be selected with focus on minimizing the need to build new access roads by designing it along existing paved roads or tracks.<br>• Such existing roads/tracks will be used to the greatest extent possible. | Turnkey Contractor | During final design |

### 10.1.2 Mitigation measures for the construction phase

The measures proposed in this Section shall be considered within a comprehensive **Health, Safety and Environment Plan (HSE Plan)** to be developed by the contractor before the construction phase begins.

The HSE plan has to be applied by the contractor in the construction phase. A PIC (Project Implementation Consultant) will assist DABS-PMO (Project Management Office) in supervising the EMP/HSE Plan implementation and compiling reports on environmental performance, as well as in conducting training. More details on these procedures can be consulted in Section 11.

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| Soil and Erosion | Erosion and pollution of soil<br>Sand deflation | • Erosion prevention measures as drainage systems<br>• road-side plantation with bushes<br>• construction of sand deflation prevention structures in sensitive areas and where vegetation (grass) is removed and bare soil exposed/ land cover diminished<br>• Installation of drainage systems<br>• Replanting of grass at tower sites, river banks, access roads and other work areas that are not needed anymore<br>• Careful selection of locations for access roads.<br>• Sand deflation prevention measures at tower foundations and access roads.<br>• Use of existing roads/ tracks wherever possible<br>• Redevelopment will include replacing stockpiled soil cover, replanting grass, shrubs, and trees, and installing sediment runoff control devices.<br>• In areas with soils sensitive for | Turnkey Contractor | During construction<br><br>After construction |

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| | | compacting (clay, silt - to be determined with support from the farmers) excavator support mats should be used<br>• In case compaction of the soils has occurred, mechanical decompactors or sub-soilders can be used to relieve compaction (also to be carried out on all temporary traffic and storing areas) | | |
| Air Quality and GHG Emissions | Air pollution by exhaust gases from construction vehicles<br><br>Suspension of dust<br><br>Emission of GHG from equipment | • Machines and vehicles will be checked regularly to minimize exhausted pollutants.<br>• sprinkling dusty access roads, especially in densely populated areas (avoid this measure in locations where water is scarce)<br>• Switchgears containing SF6 shall not be installed | Turnkey Contractor | During construction |
| Water resources | Surface water and groundwater pollution by e.g. oil/ fuel of machines and trucks<br><br>Construction of temporary bridges may cause deterioration of river beds and banks | • Selection of existing wells for analysis of basic groundwater parameters as well as measurements during the construction period and after completion<br>• Towers shall not be placed close to rivers and creeks, water pools and wells (i.e. avoid flooding areas)<br>• River banks shall not be damaged.<br>• Avoidance of soil run-off<br>• Existing bridges shall be used wherever possible.<br>• Bridges to be constructed shall be temporary and bridges which are not needed anymore will | Turnkey Contractor | During construction<br><br>After construction |

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| | | have to be dismantled | | |
| Flora and Fauna | Felling of trees<br><br>General disturbance by presence of machinery and workers | • The construction process should be carried out with great care in order to limit damages to vegetation and habitats<br>• Access roads should be limited, wherever possible. | Turnkey Contractor | |
| Waste | Improper waste disposal at the construction sites and at workers camps<br><br>Pollution of soil and groundwater with used oils and sanitary waters | • develop a Waste Management Plan with the principles of: a waste management hierarchy of avoidance, minimization, reuse, recycling, treatment and disposal; all waste will be segregated by category on site, based on their nature, and ultimate disposal sites; Staff training to increase awareness of waste minimization issues.<br>• All products used for the transmission lines and substations shall be PCB free.<br>• Construction sites and workers camps shall be fitted with functional sanitary equipment | Turnkey Contractor | Before construction<br><br>During construction |
| Workers and Community Health and Safety | Work accidents , noise emissions, sanitary situation, contaminated drinking water or food, dust generation, vehicle emissions, construction waste and traffic/ pedestrian safety, electrocution, social conflicts | • All construction workers shall be fitted with personal protection equipment (PPE)<br>• Construction sites and camps shall be fitted with functional sanitary equipment<br>• Health and Safety Trainings shall be implemented<br>• Hire local force as much as possible<br>• Obtain a mine clearance statement<br>• Implement measures to prevent and sanction irregular behavior | Turnkey Contractor | Before construction<br><br>During construction |

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| | | of the workers | | |
| Land Acquisition and Resettlement | Losses of land, crops, houses and economic trees (see LARP Document) | • Avoid and minimize land acquisition and related impacts wherever possible and to compensate affected persons (APs) for impacts that cannot be avoided (see LARP document) | DABS<br><br>LARP coordinator/facilitator (see LARP document) | Before construction |
| Gender aspects and vulnerable people | Increase of existing gender disparities and vulnerabilities(see LARP Document) | • special livelihood support program shall be implemented<br>• for single women headed households subject to resettlement, the same procedure applies as for vulnerable people (see LARP Document) | DABS<br><br>LARP coordinator/facilitator (see LARP document) | Before construction |
| Infrastructure and Traffic | Traffic problems during transportation of the components, accidents, interference with existing electrical infrastructure | • Proper traffic management<br>• Traffic signs and signalization shall be implemented near roads in order to prevent accidents.<br>• Sufficient distance of the new conductors to the existing TL will be respected. | Turnkey Contractor | During construction |
| Physical Cultural Resources | Damages to cultural sites and assets due to movements of machinery and people, and stringing activities | • The workers shall be made aware of the cultural value of the areas crossed<br>• The contact with the cultural relicts shall be forbidden<br>• The construction machinery shall be maneuvered in a sufficient distant from these sites<br>• Any other demands from the cultural authorities shall be respected. | Turnkey Contractor | During construction |

### 10.1.3 Mitigation measures for operation phase

| Issue | Main potential impacts | Mitigation measures | Implementing agency | Timing for implementation |
|---|---|---|---|---|
| Soil and Water Resources | Pollution of soil and water through oil leakage in the SS | • Fitting transformers with oil pits beneath to collect leaking oil<br>• These oil pits shall be connected to a drainage system<br>• The oily wastewater shall be lead into separate storage tanks for further treatment<br>• Sanitary waste water at substations will need to be collected and treated. | DABS | Before operation<br>During operation |
| Landscape and Visual Impacts | Visual impacts of SS | • Planting trees/ bushes around the new substation | DABS | Before operation |
| Physical Cultural Resources | Loss of cultural and touristic value of culturally protected areas | • Usage of cables may be imposed in the areas crossed by the project which are under protection. Ultimately, a decision/strategy shall be undertaken by the national authorities. | DABS | Before operation |
| Flora | Clearance during maintenance works | • Herbicides shall not be used for corridor clearance. | DABS | During maintenance |
| Fauna | Impacts on birds living in Salang Kotal | • Installation of bird diverters at least in the first kilometers of the line (starting in Doshi). | DABS | Before operation |
| Waste | Production of waste in the SS | • develop a waste management concept<br>• removal of waste to a disposal site needs to be assured | DABS | Before operation<br>During operation |
| Workers and Community Health & Safety | Earthquakes, EMFs, electrocution, fires | • Construction of the transmission line and the substations according to earthquake safety standards<br>• Establish a ROW width of 40 m along 220 kV TL, where no houses can be present<br>• Population awareness of the risks of illegal connections<br>• Fire protection measures that follow international requirements | DABS | Before operation |

## 10.2 Monitoring Measures

### 10.2.1 Design phase

Monitoring activities during design phase or pre-construction phase shall ensure that the process of final line routing complies with the following mitigation measures:

- avoidance of settlements in ROW to minimize resettlement activities
- avoidance of historical and cultural sites
- minimization of construction of access roads

Due to the nature of the Project, the detailed line routing and selection of the tower sites will be performed by the PIC. A strict monitoring by an external expert of re-routing to avoid resettlement and cultural sites is recommended for all Line Sections.

Monitoring includes further a control if the EMP is adequately updated during detailed design phase and if EMP implementation is included in tender documents and contracts.

### 10.2.2 Construction phase

Internal environmental monitoring will be conducted by DABS-PMO. Monitoring of EMP implementation will be performed by an EHS Consultant within the PIC contract during construction phase. Monitoring results will be included in the project quarterly progress reports, semi-annual environmental reports during the construction phase and annual reports after commissioning.

In addition, construction site audits shall be performed by an international expert to ensure that all requirements as stipulated in this EMP are fulfilled. Such an EHS Construction Site Audit shall be performed three times a year with special focus to the period of performing the detailed land survey.

Tasks during construction phase are the monitoring of environmental performance of contractors with regard to control measures to pertaining to erosion material storage, sitting of work site, noise, waste disposal, traffic management, workers safety, protection of physical cultural resources, etc.

The detailed monitoring program will be subject to review and approval by ADB.

### 10.2.3 Operation phase

Environmental monitoring during operation phase will be performed by DABS. Monitoring results will be included in biannual environmental reports during the construction phase and in annual reports after commissioning. The detailed monitoring program will be subject to review and approval by ADB.

Operation and Maintenance (O&M) practice and environmental effects include soil erosion soil contamination, surface water and EMFs.

During operation, when the transmission line is under full load, it is recommended to measure the electric and magnetic fields under the lowest clearance and at housings located nearby the line (especially in case where houses are located within the ROW). The objective is to show that the internationally accepted permissible limits of 5 kV/m and 100 µT are not exceeded.

Operation phase environmental monitoring will include regular substation and transmission line inspections to verify compliance with EMP requirements and with relevant laws and regulations.

A budget provision for monitoring of the decommissioning after the life-span of the transmission line (min. 50 years) shall be included in the operation cost.

**Table 10-1: Monitoring Plan for Design Phase and Construction Phase**

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Line Routing | Compliance with ADB SPS,<br>Minimization of resettlement needs,<br>Avoidance of cultural sites,<br>Compensation payments (see LARP),<br>Access road design,<br>Design of river crossings | Avoidance of environmental and social impacts during line routing,<br>Avoidance of resettlement requirements,<br>Towers shall not be located near river banks and flooding areas<br>Towers shall be located with minimum local environmental impact<br>Construction activities shall be restricted to as small an area as possible (incl. access roads). | Entire line corridor | Visual control (Field visit) of final line routing including selected deviations by independent expert | One time, before start of physical works | EHS Auditor | During design phase, before the start of physical works |
| Soil and Erosion | Construction standards of access roads,<br>Temporary bridges,<br>Re-planting activities | Control of low impact construction standards<br>Visual control of river crossings<br>Visual control of re-planting activities | Entire line corridor | Visual control of record keeping of length built and length rehabilitated/ decommissioned after Project completion. | Periodically during construction | EHS Auditor | During construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| 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 sites | Visual control, records, survey | After final design | DABS<br>LARP coordinator/facilitator (see LARP document) | Before construction |
| Air Pollution | Construction standards | Monitoring of good construction standards; Monitoring of correct implementation of construction manual, especially related to vehicle use and maintenance | Work areas | Visual control | Periodically during construction | EHS Auditor | During construction |
| 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. | 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 | During Construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| | | Visual control that any temporary bridges are properly constructed, do not cause deterioration of river bed and are dismantled after completion<br><br>Control of Implementation of EMP measures | | | | | |
| Pollution of Groundwater | Appropriate sewage treatment of workers camps<br>Appropriate groundwater protection measures | Visual inspection of pollution sources<br>Visual control of oil absorbers at SS and good construction practices during stringing, tower construction and substation construction<br>Analysis and measurements of basic groundwater parameters. | Substations, tower sites, work camps | Visual control, water analysis in wells | Periodically during construction | EHS Auditor | During construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Flora and Fauna | Respect of minimal ground clearance (8 m for 500 kV lines,7 m for 220 kV lines) in design<br><br>Extent of lay down areas and routing of new access roads<br><br>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,<br><br>Monitoring of implementation of bird flappers/ markers | Entire line ROW | Regular visual inspection during construction<br><br>Complete line survey after construction | Periodically during construction<br><br>General survey after construction | EHS Auditor | During construction |
| Waste | Economic land use,<br><br>Proper topsoil management,<br><br>Erosion control and post construction | Visual control of economic land use, proper topsoil management, erosion control and post construction site restoration.<br><br>This should be reviewed in the final design and also checked in the field for design compliance. | All work areas | Design compliance, Visual control | One time before start of works,<br><br>yearly during construction,<br><br>at end of construction phase | EHS Auditor | Before, during and after construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| • Liquid Waste | Implementation of Sewerage Management Plan<br><br>Septic tanks at each construction campsite<br><br>Measures to prevent spills of liquid wastes ( i.e oil change of construction vehicles) | Visual control of construction sites and workers camps, especially sanitary facilities, Waste Management Plan and Sewerage Management Plan facilities | Work camp sites;<br><br>Substations;<br><br>Lay-down Areas | Design compliance, Visual control | Regular monitoring during construction process; EHS Audit | EHS Auditor | During construction |
| • Health and Safety | • Compliance with EHS Plan (Work Safety / Sanitation, Noise) | Construction Site/ EHS Audit.<br><br>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 | During construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Health and Safety | Clearance of all work areas from mines | Clearance Report of Mine Action Coordination Centre of AFG (MACCA) | All work areas | Clearance status | One time before start of works | EHS Auditor | During design phase, before the start of physical works |
| Local Workforce | Monitoring of Training of workers on Health and Safety measures in workers camps<br><br>Conflict mitigation / mediation training | Monitoring of measures to prevent and sanction irregular behavior of the workers<br><br>Monitoring of Implementation of Construction Manual<br><br>Grievance Mechanism / related to conflicts and complaints | Workers camps, construction sites | Site visits and interviews<br><br>No. of trainings conducted, content, participants<br><br>Grievance Mechanism Settlement records | Yearly during construction, during EHS Audit visits | EHS Auditor | During construction |
| Infrastructure and Traffic Safety | Traffic Safety Plan included in EHS Plan<br><br>Implementation of measures to enhance traffic safety, road signs | Short term impact during construction, no specific monitoring necessary. | Entire line corridor | Visual Control | Quarterly during construction | EHS Auditor | During construction |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility (see Section 11) | Date for Implementation |
|---|---|---|---|---|---|---|---|
| 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 are fenced off and secured against unintended damage during construction. | All work areas | Visual Control, Records | Yearly during construction | EHS Auditor | Before, during and after construction |
| Physical Cultural Resources | Material transport | Recording of kinds of materials and routes of transport | Entire line Out of the Corridor | Visual Control, Records | Regular monitoring during construction process | EHS Auditor | 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 all provinces | Survey | 3 times during construction process | EHS Auditor | During Construction |

**Table 10-2: Monitoring Plan for the Operation and Decommissioning Phases**

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Soil and Water Resources | Removal of temporary infrastructure<br>Replanting of unneeded access roads, lay down areas, and other work sites<br>Fitting transformers with oil pits connected to a drainage system.<br>Provision of separate storage tanks for further treatment of oily wastewater at SS | Visual control of downstream water quality (turbidity),<br>Regular measurements of upstream / downstream basic water parameters,<br>Plan for detailed analysis (e.g. for hydrocarbons) if pollution / spills are suspected.<br>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 | NEPA | After construction |
| Landscape and Visual Impacts | Complete dismantling of the old TL and SS without function.<br>Planting trees/ bushes around the new substations | Visual Inspection Control of planning and implementation of re-plantation sites and activities | 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<br>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 | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Waste Production | Development of a Substation Waste Management Plan<br>Reduction of waste quantity, recycling as much as possible.<br>Proper dumping of remaining waste.<br>Regular sewage treatment.<br>Run off | Monitoring of Waste Management Plan and control of implementation | Substation Sites | Periodical Inspection | Yearly during operation | DABS ED/ NEPA | During operation |
| Health and Safety | EHS Management System/ Plan development and implementation during Substation operation | Monitoring of Implementation of EHS Management Plan | Substation Sites, Maintenance locations | Periodical Inspection, Regular EHS Audits | Yearly during operation | NEPA / DABS ED EHS Auditor | During operation |
| Health and Safety | Electric and Magnetic fields | Regular EMF measurements (after purchase of EMF meters and related training for handlers)<br>Control of encroachment of safety zone | Substation Sites | Regular measurements under full load | Yearly during operation | DABS ED | During operation |
| Land Use ROW clearing and maintenance | Further agricultural land use in the ROW, Use rights and use practices<br>Compensation payment for damaged crops during maintenance.<br>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 ED | During operation |

| Issue / Potential Impact | Parameters to be monitored | Monitoring Action | Location | Measurements | Frequency | Monitoring and Reporting Responsibility | Date for Implementation |
|---|---|---|---|---|---|---|---|
| Impacts during Decommissioning Phase | | 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 practice | 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 |

# 11. Implementation Arrangements and Capacity Building

## 11.1 Institutional Arrangements and Responsibilities

The environmental assessment and review procedure involves distinct processes, dynamics and agencies. The agencies involved in the planning and implementation of resettlement and rehabilitation program are DABS as the EA and the Provincial and District governments. The DABS, with the support of the management consultant and the implementation consultant, will co-ordinate all activities related to the preparation, implementation and monitoring of the environmental management. All activities will be coordinated with the relevant local government agencies and the community *shura*.

The Implementing Agency for the construction and operation of the transmission line will be DABS. As such, DABS will also have the task to internally monitor the implementation of the EMP. The construction will be carried out as a turnkey contract by an external Construction Contractor (CC) in two lots: one for the transmission line component and one for the substations.

### 11.1.1 DABS

DABS is the national, yet commercialized, electric utility, which operates and manages electric power generation (units of over 100 kW), imports, and T&D throughout Afghanistan on a commercial basis. The company remains in a precarious financial state, and in 2008 it had to be rescued from collapse by donors. Improvements in collections and reductions in fuel costs due to higher imports have also contributed to an improvement in its finances. The utility is now organizing itself along the lines of a commercial company (Figure 11-1).

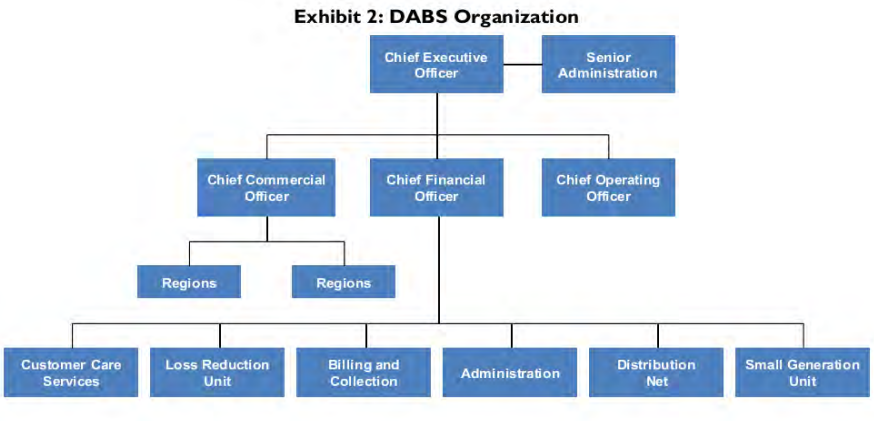



**Figure 11-1: Organizational structure DABS**

DABS will be responsible for the maintenance of the line and partly for the construction supervision.

DABS-PMO's Responsibilities

Project management office (PMO) (note: PMU is converted to PMO)
The project management will comprise an executive committee, an integratory working group, a project management organization in the DABS (DABS–CEO).

The DABS-PMO will be responsible for the overall technical supervision and execution of the project. The staffing of DABS-PMO will include experts in project management, electrical transmission engineering, institution and finance, environment, socioeconomic, land acquisition and resettlement.

The mitigation measures that are incorporated into the design will be verified by the DABS-PMO before providing technical approvals.

### 11.1.2 NEPA

The National Environmental Protection Agency (NEPA), as an independent institutional entity, is responsible for coordinating and monitoring conservation and rehabilitation of the environment. NEPA will appoint an EIA Board of Experts to review, assess and consider applications and documents submitted by the proponent. Acting on the advice of the EIA Board of Experts, NEPA shall either grant or refuse a permit. A granted permit will lapse in the event that the proponent fails to implement the Project within three years of the date of which the permit was granted. NEPA should also be consulted if complicated issues arise during construction and operation stages.

### 11.1.3 ADB

ADB is responsible for screening sub-projects to specify its safeguard requirements, undertaking due diligence, and reviewing the borrower's/client's social and environmental assessments and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles.

ADB shall further determine the feasibility of ADB financing; helping the borrower/client in building capacity to fulfill the safeguards; and monitor and supervise the borrower's/client's social and environmental performance throughout the project cycle. ADB discloses safeguard plans and frameworks, including social and environmental assessments and monitoring reports on its website.

If a borrower/client fails to comply with legal agreements on safeguard requirements, including those described in the safeguard plans and frameworks, ADB will seek corrective measures and work with the borrower/client to bring it back into compliance. If the borrower/client fails to re-establish compliance, then ADB may exercise legal remedies, including suspension, cancellation, or acceleration of maturity, that are available under ADB legal agreements. Before resorting to such measures, ADB uses other available means to rectify the situation satisfactory to all parties to the legal agreements, including initiating dialogue with the parties concerned to achieve compliance with legal agreements.

### 11.1.4 Construction Contractor (CC)

The Construction Contractor will have the responsibilities to implement the EMP during the construction phase and control workers and subcontractors to respect the environmental guidelines and the guidelines construction manual according to international best practice.

The CC shall also prepare monthly reports including the progress of the implementation of the EMP. The report shall contain all discrepancies from the EMP and list all EHS relevant incidents and accidents that occur during the implementation of the construction and implementation of mitigation measures. Based on these reports and on own regular construction site audits the CC together with the PMO will prepare annual performance reports and submit them to ADB.

### 11.1.5 Project Implementation Consultant

The PIC will be responsible for monitoring the EMP implementation. An external EHS-Auditor subcontracted by PIC will monitor the correct implementation of the EMP according to international best practice. The environmental audit will take place three times during the construction process. The mitigation measures that are incorporated part of the contract documents will also be verified by PIC consultant before getting the contract signed between the DABS- PMO and the contractor. PIC will assist PMO in supervising the EMP implementation and compiling reports on environmental performance as well as in conducting training for building capacity on EMP implementation.

## 11.2 Capacity Building

At DABS there is no Social/Environmental Department. The creation of a Social/Environmental Department in DABS and training of qualified staff are therefore highly recommended.

Staff needs to be educated in health (e.g. electric and magnetic fields), safety (e.g. working in height, working under high voltage conditions) and environmental issues (e.g. preserving areas of ecological value). Such a department should also deal with social issues and shall be responsible for monitoring during the operation phase.

The PIC will assist the PMO in designing and implementing the capacity building program and conducting trainings to enhance the EMP implementation capacities.

On the local administration level there is a need to review capacities of local administration staff to handle public consultation, expropriation, compensations and dealing with complaints (GRM).

In general, the 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.

One of the main needs during implementation of the Project regarding environmental aspects is the monitoring of the implementation of all requirements stipulated in the EMP.

Trainings should focus on the application of ADB Safeguard Policy and monitoring procedures. Provision for training requirements is approximately 50,000 USD.

## 11.3 Costs of EMP implementation

A preliminary cost estimate of the implementation of the EMP is given in Table 11-1. The costs for LARP implementation are separately calculated in the respective document.

**Table 11-1: Cost of the EMP implementation (preliminary estimation)**

| Measure | Costs (USD) |
|---|---|
| Mitigation measures during design | 10,000 |
| Mitigation measures during construction | Included in the construction costs |
| Mitigation measures during operation and maintenance | Included in the operation budget |
| Monitoring Measures EHS Audit | 220,000 |
| Monitoring of Water, Noise, Air | 30,000 |
| Training for DABS EHS staff | 50,000 |
| *Sub-total* | *310,000* |
| Contingency 10% | 31,000 |
| **Total Cost** | **341,000** |

# 12. Overall Findings and Recommendations

In summary, the results of the investigation demonstrate that the Project will have mostly low impacts on the environment if the proposed EMP is implemented and all proposed mitigation measures are considered. Some medium impacts remain regarding the line routing (design phase), land acquisition and land use, involuntary resettlement and vulnerable people during construction (see separate LARP document), as well as visual impacts and natural disasters during operation.

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.

The impact on physical cultural resources (historical and cultural sites) shall be minimized together with the responsible cultural authorities. Especially, the construction of access roads and the final location of towers have to be taken very carefully to avoid any sensitive historical and cultural area and making future excavation activities possible. In case of chance finds of historical art effects the construction process has to be stopped immediately and the local representative of the Ministry of Culture has to be contacted.

The proposed transmission line including the suggested bypasses will not cross Natural Protected Areas. At river crossings special care must be exercised in order to avoid water pollution and river bank erosion. The line will start close by an Important Bird Area (Salam Kotal). Protection measures (bird diverters) shall be implemented.

The overall construction shall be supervised by an independent international expert. The duty of such an EHS Audit shall be to ensure that the requirements stipulated in the Environmental Management Plan are fulfilled. Focus shall be put on:

- avoidance of houses in the ROW to minimize resettlement, if possible to zero
- avoidance of historical and cultural sites
- avoidance of ecological sensitive areas.

These extensive supervision activities are necessary because the elaboration of detailed design features including detailed line routing is not done yet. The determination of the details is shifted to the construction contractor and could therefore not be covered by this study.

Within DABS an Environmental and Social Department does not currently 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.

ADB will be responsible to undertake due diligence and reviewing the borrower's/client's social and environmental assessments and plans to ensure that safeguard measures are in place in accordance to ADB's safeguard policy principles.

It is argued that a careful design will be able to balance the impacts, avoiding resettlement as the highest priority, without increasing environmental impacts i.e. by long access roads or crossing protected areas and without affecting cultural heritage sites. Also quite often, design options are able to reduce environmental as well as social impacts at the same time. It is recommended to bring the IEE to the attention of the selected construction contractor and to include EMP and the LARP (see separate document) as integral part of the tender documents. A review of the final design by independent social and environmental experts is recommended.

# 13. Conclusion

It can be concluded that, if all proposed mitigation measures are implemented, the project can be constructed with little adverse effect.

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