Draft Initial Environment Examination

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Islamic Republic of Afghanistan: North-South Power Transmission Enhancement Project

Prepared by Fichtner GmbH for Da Afghanistan Breshna Sherkat of the Government of Afghanistan for onward submission to the Asian Development Bank

CURRENCY EQUIVALENTS

(as of 3 September 2013)

Currency unit	–	Afghani (AF)
AF1.00	=	$0.01765
1.00	=	AF56.63

ABBREVIATIONS

ACEP	– USAID-supported Afghanistan Clean Energy Program
ADB	– Asian Development Bank
AEIC	– Afghan Energy Information Center
AERA	– Afghanistan Energy Regulatory Authority
AIS	– Air Insulated Station
ANDS	– Afghanistan National Development Strategy
AP	– Affected Persons
AP1, AP2	– Angle Point 1, Angle Point 2
AT	– Angle Tower
AWEC	– Afghanistan Wildlife Executive Committee
CC	– Construction Contractor
CEO	– Chief Executive Officer
COI	– Corridor of Influence
DABS	– Da Afghanistan Breshna Sherkat (National Power Utility)
EA	– Environmental Assessment
EHS	– Environment, Health, and Safety
EHS-MS	– Environment, Health and Safety Management System
EIA	– Environmental Impact Assessment
EL	– Environmental Law
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
KWh	– Kilowatt-hour
LARP	– Land Acquisition and Resettlement Plan
LARPF	– Land Acquisition and Resettlement Policy Framework
MACCA	– Mines Action coordination Center for Afghanistan
MDG	– Millennium Development Goal
MEW	– Ministry of Energy and Water
MFF	– Multi-Tranche Financing Facility
MIC	– Ministry of Industry and Commerce
MOE	– Ministry of Economy
MoPH	– Ministry of Public Health
MRRD	– Ministry of Rural Rehabilitation and Development
MWh	– Megawatt-hour
NEPA	– National Environmental Protection Agency
NEPS	– Northern Electric Power System
NGO	– Non-Governmental Organization

OHL	– Overhead Line
PA	– Protected Area
PAP	– Project Affected Person
PCR	– Physical Cultural Resources
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 Program
USD	– United States Dollar
WB	– World Bank
WWF	– World Wide Fund for Nature

NOTES

(i) The fiscal year (FY) of the Government of Afghanistan ends on 21 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2012 ends on 21 December 2012.

(ii) In this report, "$" refers to US dollars

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1. Executive Summary

1. The proposed Project Pul-e-Khumri to Kabul in Afghanistan comprises the construction of a single circuit 500 kV (Pul-e-Khumri to Kabul) overhead line (OHL) including a substation with 400 MVA 500/220 kV transformers, in Kabul SW (Arghandy). The Project is complemented by another ADB assisted project to construct 500 kV substation at Dashte Alwan at the northern end of the transmission line. Project has been classified by the ADB as a Category B Project, for which an Initial Environmental Examination (IEE) has to be carried out. The Investigation area covers the transmission line corridor of the planned OHL and its perimeter of influence in the provinces of Kabul, Parwan and Baghlan of Afghanistan including a 500/220 kV substation at Arghandy.

2. The line routing was determined regarding technical, economic, environmental and social aspects. The detailed design including final land survey is shifted to the construction contractor and will be part of the tender documents. For the 500 kV line (first and second line sections), the Right of Way (ROW) is of 60 m (30 m on both sides of the centre line). Complete clearing of the ROW will be required in the centre strip of 25 m. Outside this strip but still inside the ROW, vegetation above 3 m height needs to be cleared, if applicable, including possible tall danger trees outside the ROW corridor. The proposed towers are of galvanized steel lattice. At each tower location, four separate pits have to be excavated to a depth of 2.5 to 3.5 m.

3. Arghandy substation (SS) is located east of the main road (highway) Kabul-Kandahar and the final tower is just about 30 m away from the road. For the Arghandy sub-station, DABS will purchase additional government land just adjacent to existing 220 kV (SMEC) Arghandy sub-station. Therefore the existing sub-station of Arghandy will be extended further. The area is uninhabited and unfarmed.

4. The planned transmission line traverses three provinces of Northern Afghanistan - Kabul, Parwan and Baghlan. According to the Scale of Richter, the earthquake hazard is of 6.0 local magnitude (ML) in the Investigation area, meaning a medium risk. The Investigation area is presently not a touristic area. The groundwater between Kabul and Pul-e-Khumri is located relatively deep and the water table (as stated by local communities) can be found at 40 to 120 m depth in valley areas (minimum 10 m) and 70-95 m depth in desert areas.

5. The line corridor crosses a semi-desert landscape for most of its length. In the lowlands, especially near Pul-e-Khumri and the other villages and the perennial/ seasonal rivers, all arable surfaces are cultivated lands. There are some plantations, trees, bushes and grassland. There is hardly any forest in the entire Investigation area. Not many wild animals live in the Investigation area due to the degraded habitat and sparse vegetation. It is not expected that any endangered plant or animal species live in the line corridor. The TL does not cross any Protected Area. However, it trespasses one unprotected IBA (Salang Kotal) with a diversity of at least 33 species of Himalayan breeding birds and passage birds.

6. The villages passing by the line corridor are small and consist of 10 houses and the majority of the population lives as a joint/ extended family system. The land along the line corridor is mainly a communal property of the tribes and localized clans. The major occupation in the Investigation area is agriculture. Section 1 from Arghandy to Salang is a dense agriculture area; Salang is a very mountainous and cold area where much less agricultural land is available or sometimes limited due to the very cold weather. The third section, from Salang North to Pul-e-Khumri, is also densely cultivated with some settlements.

7. In summary, the results of the investigation demonstrate that the Project will have no high but mostly low impacts on the environment if the proposed EMP is implemented and all mitigation measures are accomplished.

8. No Project Alternative: This alternative would not cause any resettlement or environmental impacts, but would also prevent electricity imports from Central Asia for electrification in Afghanistan and potential exports. If this line is not constructed, other lines will have to be connected to the substations and power plants of the present line in the near future.

9. 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. For some sections several line route options have been discussed. However only the optimized line route, and not the staged optimization process, which lead to this optimized line route, is shown in the reports in order to save time and paper.

10. Substation Alternative: An optimization process similar to the line routing has been conducted for the substation at Arghandy. This optimisation process comprised an alternative site about 1 km north of the selected site and the shifting of the site in the vicinity of the finally selected present location.

11. Significant project impacts could be avoided by the careful routing or siting optimization process for the power lines and the substations. The remaining lower impacts are addressed in the Environmental Management Plan (EMP), which 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.

12. The main mitigation measures defined in the EMP are (i) Land Mine Clearance, (ii) Avoidance of settlements in the ROW to minimize resettlement activities; (iii) Full compensation of remaining resettlement affected APs (see LARP), (iv) Minimization of access road construction; (v) Avoidance of damages to river ecosystems at river crossings (avoidance of soil run off and water pollution), (vi) Compensation for crop damages; (vii) Avoidance of historical and cultural sites and implementation of a chance find procedure; and (viii) Implementation of EHS Management Plans.

13. Due to the nature of the Project, the detailed line routing and selection of the tower sites will be performed by the Project Implementation Consultant (PIC). A strict monitoring by an external expert of re-routing to further avoid resettlement and cultural sites is recommended for all line sections.

14. The costs for the implementation of the EMP are presently expected to be of 363,000 USD.

15. Although the Project will have no high but mostly low impacts, some medium impacts on the environment remain. Careful line routing during the final design will help minimize resettlement needs and environmental impacts. The impact on physical cultural resources (historical and cultural sites) shall be minimized. Especially, the construction of access roads and the final location of towers have to be implemented very carefully to avoid any sensitive historical and cultural area, making future excavation activities possible. In case of chance finds of historical artifacts the construction process has to be stopped immediately and the local representative of the Ministry of Culture has to be contacted.

16. The proposed transmission line will not cross protected areas but will trespass an unprotected Important Bird Area (Salang Kotal). Here, technical measures such as horizontal placement of the phases and bird diverters shall be considered. At river crossings special care must be exercised in order to avoid water pollution and river bank erosion. The overall construction shall be supervised by an independent internationally experienced expert. The duty of such an EHS Audit shall be to ensure that the requirements stipulated in the Environmental Management Plan to this Project are fulfilled.

17. Within DABS an Environmental and Social Department does currently not exist. It is recommended to implement such a department and train the staff regarding all health, safety and environmental aspects including social aspects that will invariably arise during construction and operation of overhead lines and their associated substations. The EMP has to be part of the tender documents and construction contracts.

18. Due to an elaborate line routing and substation siting process in close cooperation between the technical and the environmental survey experts, and based on recent high-resolution (50 cm) satellite scenes, most significant impacts, especially resettlement, could be widely avoided in these early planning stages. If the contractor who conducts the detailed design follows this approach, resettlement could be further diminished. For remaining impacts mitigation measures are proposed to minimize social and environmental impacts. If all proposed mitigation measures are implemented, the Transmission Line from Dashte Alwan to Arghandy Substation (SS) can be constructed with a minimum of adverse effects on the natural and human environment.

2. Introduction

2.1 Project Background

1. The planned project comprises construction of a single circuit 500 kV overhead line (OHL) with a length of ca. 225 km from Dashte Alwan to Arghundy and a 500 kV substation at Arghundy in south west Kabul. This project is part of a pool of several projects which have the objective of importing electricity from Central Asia to Afghanistan (AFG).

2. This is assessed to be a Category B Project according to the ADB's Safeguard Policy Statement (2009), for which an Initial Environmental Examination (IEE) is required. In addition, this IEE is the result of a request from the GoA.

3. 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 ADB's Safeguards Policy Statement, 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-feasibility study was conducted by FICHTNER in mid 2013.

2.2 Scope of the Study

4. Within the scope of this IEE, FICHTNER investigated the potential environmental impacts of the planned 500kV transmission line from Pul-e-Khumri to Arghandy. On the basis of the existing environmental situation in the Investigation area (Chapter 4.1) and the technical planning (Chapter 4.2), FICHTNER determined the potential environmental impacts of the proposed transmission line during design (Chapter 6.1), construction (Chapter 6.2), operation (Chapter 6.3) and decommissioning (Chapter 6.5) and also considered downstream impacts of the Project (Chapter 6.4). Alternative routings and options (Chapter 4.2), as well as appropriate mitigation and monitoring measures (see EMP Chapter 10) were considered to reduce possible adverse impacts.

5. The planned transmission line traverses a semi-desert area characterized by cultivated lands, several houses, settlements and towns. 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 evaluated depending on the detailed line routing (see also LARP document). During the investigation, 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) prevent 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

6. For preparing this IEE study, FICHTNER set up a multi- disciplinary team of International Environmental and Ecological Expert; International Socio-Economic Expert; and National Environmental and Socio-Economic Experts. One basis for the study consisted of intensive field surveys conducted by the national environmental and socio-economic experts in May 2013.

7. 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.

8. 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.

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

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

10. 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

1. 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.

2. 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.

3. 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)".

4. 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.

5. Province administration of Baghlan, Parwan and Kabul 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.

6. 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).

7. 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

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

Act/ Law	Year	Key areas
Environmental Act	2007	This act has been promulgated to give effect to Article 15 of the Constitution of Afghanistan and provide for the management of issues relating to rehabilitation of the environment and the conservation and sustainable use of natural resources, living organisms and non-living organisms.
Minerals Law	2010	The Minerals Law of 2010 governs the ownership, control, prospecting, exploration, exploitation, extraction, marketing, sale, and export of minerals in the territory of Afghanistan. The law provides that all deposits of minerals on or under Afghanistan or in its water courses are the exclusive property of the state. A surface land interest does not include right to minerals. The Ministry of Mines is authorized to grant mineral rights in accordance with the provisions of the law (GIRoA, 2010; Kuo, 2007) (source USAID, 2010).

Act/ Law	Year	Key areas
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.

Table 3-1: National acts/laws of Afghanistan

Relevant regulations, guidelines and policies are named in Table 3-2.

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.

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

9. 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.

10. 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.

11. 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).

12. 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'a in 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).

13. 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.

14. National Environment Strategic Documents

Afghanistan's national environmental strategies are contained within the 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

15. 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

16. 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.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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 biosafety 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

22. The Environmental Policy of the Asian Development Bank (ADB) is grounded in ADB's poverty reduction strategy and long-term strategic framework (ADB's Strategy 2020). 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.

23. 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: (i) Safeguard Policy Statement (SPS), June 2009, effective since January 2010; (ii) 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.

3.3.3 Gap Analysis

24. 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.

25. 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.

26. 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.

4. Description of the Project

4.1 Investigation Area

1. The Investigation area covers the transmission line corridor of the planned OHL and its perimeter of influence in the three provinces Kabul, Parwan and Baghlan of Afghanistan including the two towns Pul-e-Khumri and Kabul as well as several small settlements between them. The Investigation area is shown in Figure 4-1.

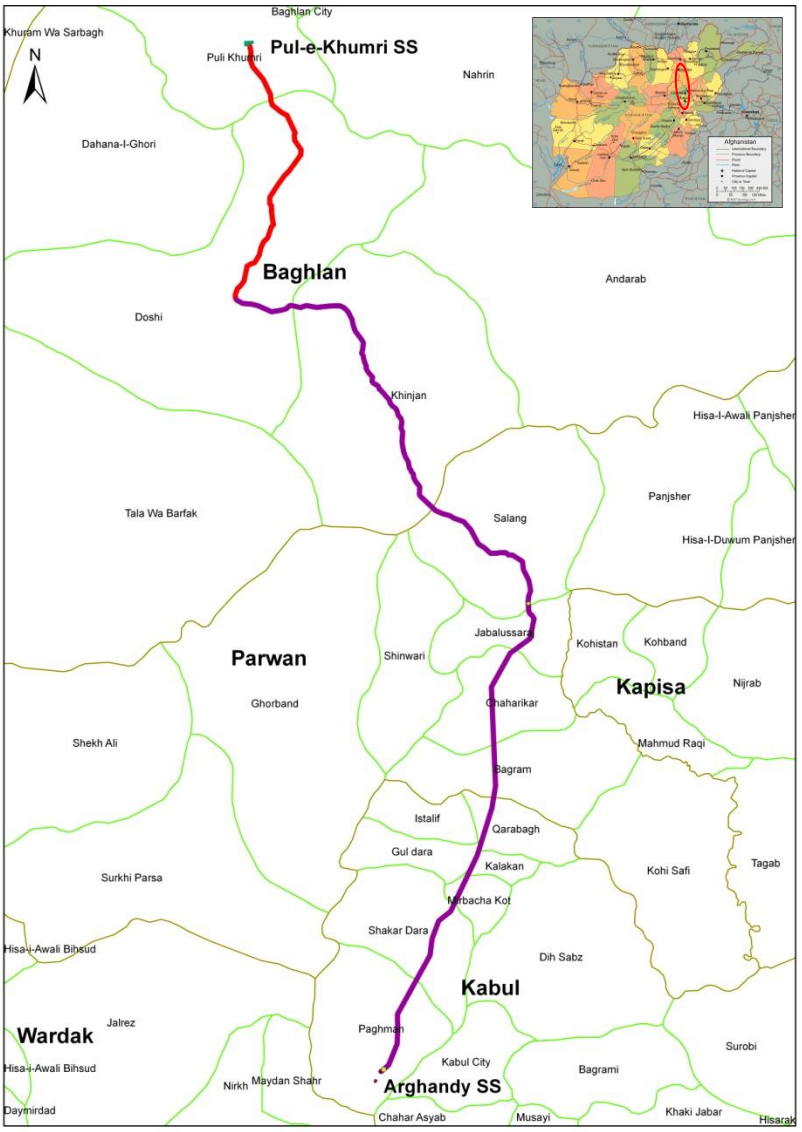


Figure 4-1: Investigation Area

4.2 Technical Description

2. The planned project comprises the construction of a single circuit 500 kV overhead line (OHL) with a length of ca. 225 km from Dashte Alwan to Arghandy in Afghanistan. Construction of one 500 kV substation at Arghundy is also included in the Project. In parallel processing, under Energy MFF Tranche 5, the construction of another 500 kV substation at Dashte

Alwan, with 400 MVA 500/220 kV transformers, is being financed. Both projects are part of a pool of several projects which have the objective of importing electricity from Central Asia to Afghanistan (AFG).

4.2.1 Line routing

3. The line routing, with a total planned length of ca. 225 km, was determined regarding technical and economical aspects as well as environmental and social aspects. Considered environmental and social aspects were (FICHTNER, 2013):

- 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.

4. The detailed design including final land survey is shifted to the construction contractor and will be part of the tender documents. In general, the average distance between the towers will be around 450 m (mean span of 400-450 m). The final location of the towers will be fixed by the constructing contractor after conducting the final land survey.

4.2.2 Towers

5. A proposed tower design for the 500 kV line is shown in Figure 4-2.

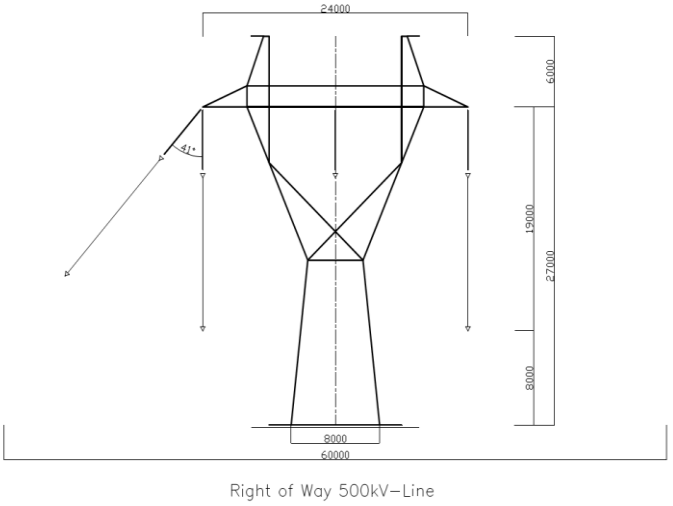


Figure 4-2: Proposed Tower Design 500 kV with 60m Right of Way (ROW)

The proposed towers are of galvanized steel lattice construction. Usually, individual foundations are used for each leg, which means that at each tower location four separate pits have to be excavated to a depth of 2.5 m to 3.5m. Regardless of whether prefabricated parts or cast-in-situ concrete is used, these foundations consist of a floor slab with an underground shaft. Following installation, the foundations are grouted (and compacted), so that only the heads of the foundation shafts are visible.

4.2.3 Arghundy Substation

6. Arghandy SS is located east of the main road (highway) Kabul Kandahar and the final tower is just about 30 m away from the road (Figure 4-3). The site is located at a west-exposed hillside, which is uninhabited and almost completely without vegetation. The hillside area is non-productive land. No rare or endangered species are expected at the site, due to the proximity to the main road and the existing settlement structures. The only problem of this site is the inclination, which demands substantial earth movement activities in order to create plain areas for the SS infrastructure. From an environmental point of view the combination of the SNEC area with the planned SS Arghandy is the optimal solution as thus the land requirements are reduced to a minimum.

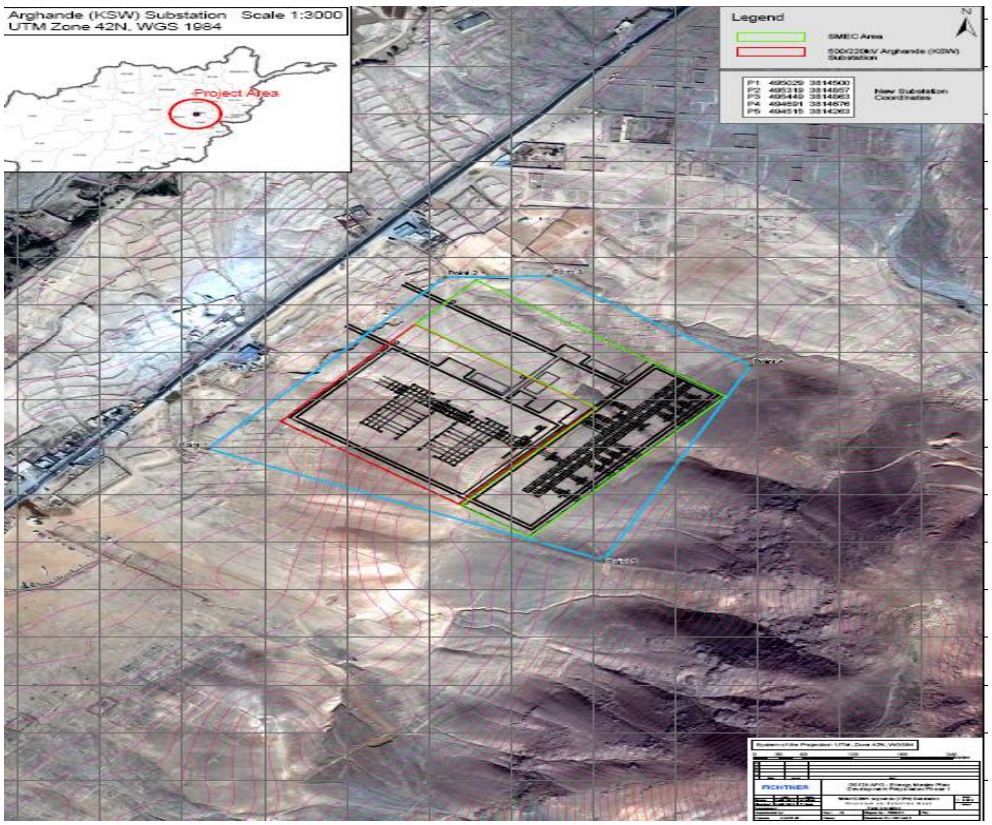


Figure 4-3: Arghandy Substation

4.2.4 Right of Way and Clearance

7. The 500 kV line has an associated Right of Way (ROW) of 60 m (30 m on both sides of the centre line) on the basis of the span-width, the line swinging and the electrical safety distance. The minimum safety distance to conductors to respect international standards for electric and magnetic fields (EMF) is assumed to be 15 m in view of the public.

8. Complete clearing of the ROW would be required in the centre strip of 25 m allowing for stringing of conductors. Outside this strip, but still inside the ROW, vegetation above 3 m height needs to be cleared, if applicable, including possible tall trees outside the ROW corridor. Concerning ground clearance, given the lack of harmonized standards for usage at an international level, Table 4-1 shows the ones adopted in the Soviet Union (PUE).

Clearance	500 kV Line
Above normal ground	8.0 m
To roads	9.0 m
To other OHLs	5.0 m

Table 4-1: Clearance as per PUE for 500 kV transmission lines

5. Description of the Environment

1. The provinces crossed by the transmission line and siting of substation project are Baghlan, Parwan and Kabul. This chapter presents a brief description of the physical, biological and social characteristics of the project area. The OHL is divided in three sections for the purpose of the field survey that was undertaken by national environmental and socio-economic experts in June 2013. A brief description of the 3 sections is given:

2. First Line Section: from Arghandy to Salang South. The first line section (Arghandy to Salang south) starting from the substation is passing over the main road (highway) Kabul-Kandahar, goes through some agriculture fields and some small settlements along the corridor up to the line, and climbs up on the hills around Shekerdara and Gul Dara districts. This section also passes some gardens (fruit and other trees and grapevines). There is a sharing called Astalef and second place cultural places called Gul Ghundai. According to the field survey estimates, both places lay outside of the 1.5 km corridor of the line, so they are identified as non-affected areas. However, there are still discussions whether the changes that may come to the line route will change this situation.

3. Second Line Section: from Salang south to Salang north. The second line section passes through high sloppy areas, estuaries, hills, mountains and rocks. Some trees, a small number of houses and residential structures potentially affected can easily be circumvented. Minor changes in the tower location will safe most of these potentially affected assets. This section crosses mainly the road, an existing 220 kV line and trees while pass from one hill to another.

4. Third Line Section: from Salang north to Dashte Alwan. The third section is an intensely used and irrigated agricultural area with some settlements and gardens, the most economically effective agricultural assets. Here, the effects on settlements can be mitigated by changes in the tower locations, but the effects on agriculture cannot be easily mitigated. For this reason, more compensation care must be paid to agricultural impacts on this section.

5.2 Geography

5. The planned transmission line traverses three provinces of Afghanistan:

Baghlan Province is situated in the northern Afghanistan, bordering in the north with Samangan, in the east with Kunduz and Panjshir, and in the South with Bamyan provinces. This province covers an area of 18,225 km^2.

Parwan Province is situated in the central part of Afghanistan, bordering with Baghlan in the north, with Kabul in the South, with Kapisa and Panjshir in the Easth and with Bamyan in the west. This province covers an area of 5,715 km^2 and Sheberghan is its capital.

Kabul Province is situated in the northern part of Afghanistan, bordering with Parwan in the north, with Nangarhar and Kapisa in the east, with Logar and Wardak in the south and with Bamya in the west. The province covers an area of 4,524 km^2.

The Investigation area is located in the non-mountainous zones of the three provinces. Table 5-1 shows some altitudes of major terrain points.

Location	Terrain altitude above sea level	Remarks
Dashte Alwan	678 m	Lowest elevation
Salang Pass	3,991 m	The Highest OHL location
Chemtala SS	1,894 m	Substation location
Arghandy	2,188 m	Substation location

Table 5-1: Major Terrain Points

There are no high hills or mountains in the line corridor. The main features of the Investigation area are:

- Very cold places in Salang High Mountains
- Roads in different locations;
- Settlements in Arghandy
- Settlements in Paghman
- Settlement in the Shekerdara Ghorband river
- Salang south or Salang river
- Salang north or Khinjan river
- Salang Pass
- Salang Tunnel and the adjacent galleries
- Settlements in Khinjan called Mosoyee
- Gojar settlements in Dasht Kelagai,
- Doshi settlements
- Doshi River
- Dashte Alwan substation

5.3 Topography

6. The general topography of the central-eastern region immediately on the southern side of Hindu Kush 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 Gardez the river system forms part of the lndus catchment area with all drainage north of Gardez flowing into the Kabul River south and west of the Gardez lake of sistan on the southwestern border with Iran.

5.4 Geology and seismicity

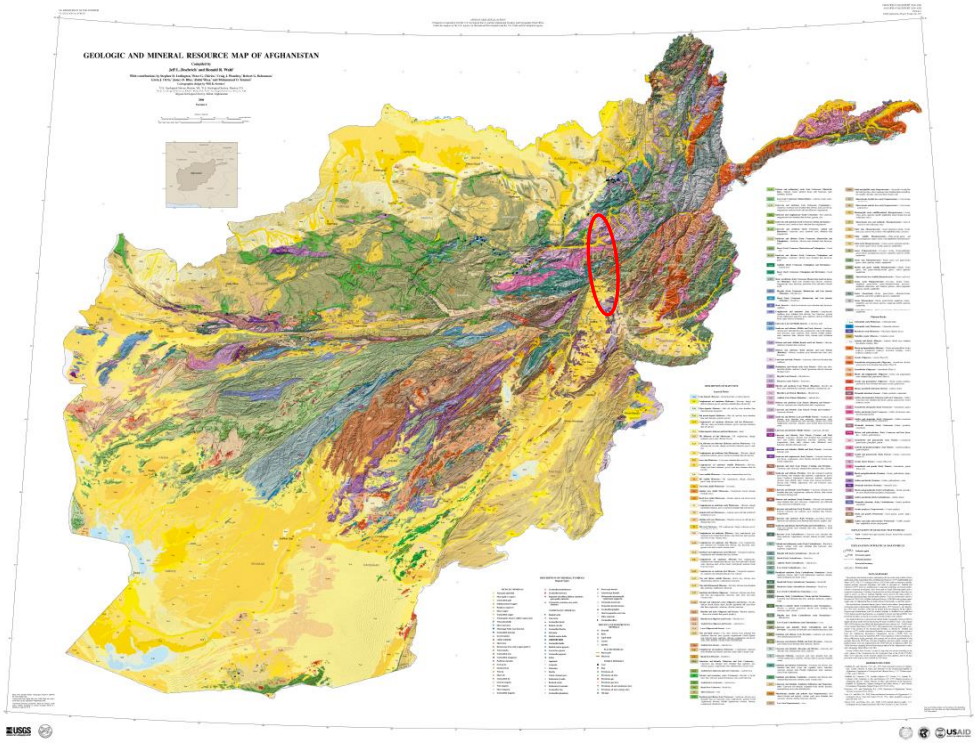
5.4.1 Charikar Kabul–Poli-Alam–Gardez

7. The geology of the central-eastern region is complex. A broad northeast trending belt of Tertiary siltstones, sandstones, conglomerates, limes tones and volcanic rocks dominates the area between Khost and Gardez. These overly a complex of Mesozoic and Paleozoic sandstones, lime stones and schist stones which crop out mainly between Ghazni and Kabul and between Kabul and Jalalabad. The intermountain basins are blanketed with late Tertiary and quaternary conglomerates, sandstones, loess and evaporate deposits. Throughout the area pockets of intrusive and extrusive igneous rocks of different age have been identified. The area is seismically active with Earthquakes as strong as 7 and 8 on the Richter scale having been recorded.

5.5 Geology and Soil

5.5.1 Geology

8. 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 1400 mineral occurrences recorded to date.



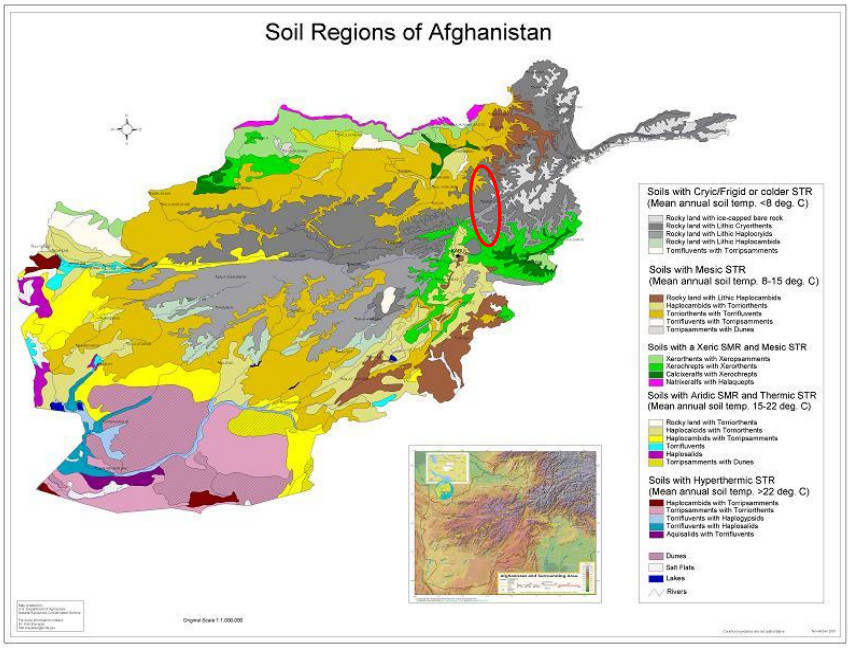
Source: United States Geological Survey (1997)

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

9. 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.

5.5.2 Soil

10. 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 and in the river valleys, sand and gravel (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)

11. 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.

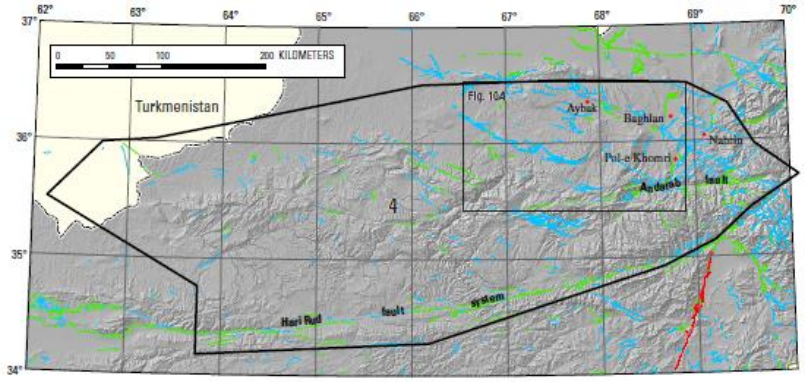
5.5.3 Mineral Resources

12. 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).

13. According to the mineral resource map shown in Figure 5-1, in the investigation area there are deposits of unclassified clay and marble north-west from Kabul, unclassified iron and pegmatite (beryllium, lithium, tantalum, gem-quality minerals) between Charikar and Salang Pass, skarn copper north-west from Salang Pass and bedded marine gypsum, coaland marble in the vicinity of Pul-e-Khumri.

5.6 Seismicity

14. Afghanistan is located in a tectonically active region where earthquakes have historically caused damage, not only from strong ground shaking and surface rupture, but also from liquefaction and extensive land sliding in mountainous areas. Figure 5-3 shows the seismic hazard maps for Afghanistan.



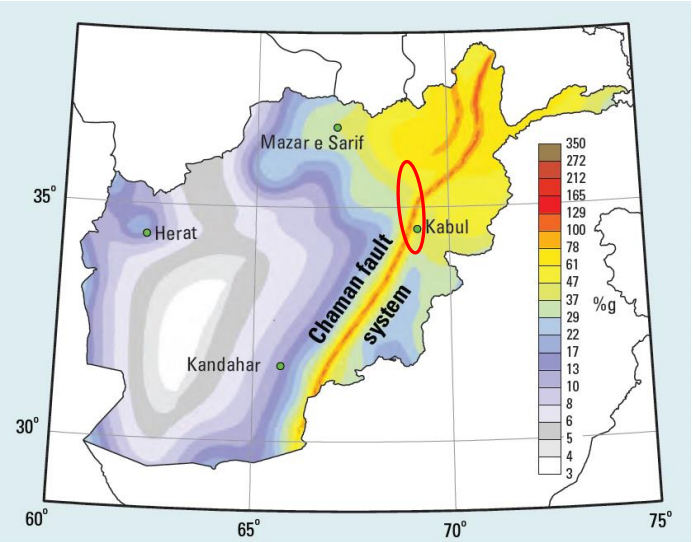


Figure 5-3: Generalized seismic-hazard map of Afghanistan with indication of the project area (USGS, 2007)

15. Along much of eastern Afghanistan and particularly in the northeast, where the project area is located, faults and background seismicity both contribute to seismic risk (USGS, 2007). In comparison to the Investigation area, there are other areas in Afghanistan where the seismic risk is considerably higher. According to the Scale of Richter, the earthquake hazard is assumed to be 6.0 local magnitude (ML) in the Investigation area, meaning a medium risk (FICHTNER, 2012).

5.7 Landscape

16. Afghanistan is an arid country, much of which is mountainous or 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).

17. 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 Pul-e-Khumri and the other villages and around the perennial/seasonal rivers the vegetation is fairly dense of cultivations, some plantations, few trees, bushes and grassland.

18. Further south-eastern across the plains and from Pul-e-Khumri in the southern direction, the bush and cultivation thins out to grassland savanna and sandy desert without vegetation. After the Pul-e-Khumri SS the line corridor traverses three rivers and three grouped settlements. From there, it leads through semi-desert savannah along the road and the existing transmission lines.

5.8 Climate and Air

5.8.1 Climate

19. The climate in the central-eastern part of Afghanistan is dry continental and varies according to elevation from moderately warm in the valleys to cold above 3,000 m. The winter in the valleys (from December to February) is mild and clear weather predominates, the spring lasts from March through April in the valleys and basins. From May to mid-June the spring weather in the mountains is typically unstable and wet with most of the annual precipitation falling as brief heavy rain during this period. The days are warm, the nights are cold. The summer in the valleys (May through September) is hot (24 to 30 °C) and the weather is clear and dry. In the mountains summers (mid June-August) are cool (10 to 15°C) in the day time and snow is possible on the mountains tops. Autumn begins dry but turns relatively wet. Winds are predominantly southerly and northerly throughout the year.

Figure 5-2 shows a precipitation map for Afghanistan.

Figure 5-4: Precipitation on the territory of Afghanistan (map with Investigation area)

5.8.2 Air Quality and Noise

20. 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.

21. 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.

5.9 Water resources

5.9.1 Water resources in Afghanistan

22. 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).

23. 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.

24. 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 (source: http://www.cawater-info.net/afghanistan/afg7_e.htm). Groundwater resources and recharge re 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.

5.9.2 Project area water resources

25. 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 Kabul River flows from Kabul through the Jalalabad gorge to join the Indus River in Pakistan. The Kabul River and its main tributary, the Punisher River, range in

width from 15 to 50 m, reaching 100 m and a depth of 0.5-2 m in some places. Two hydropower stations have been built on the Kabul River, the Naghlu hydropower station and the Surobi hydropower station. The Naghlu has a dam and reservoir with a volume of 550 million m^3 (in March the water level is normally about 35 m below the maximum water level; in June the water is normally spilling). The Surobi dam has a reservoir with a volume of 6 million m^3 and in March it is normally reasonably full.

26. South of the Kabul River, catchment rivers are small and often turbulent in their upper reaches with widths of 10 m and depths of under 1 m in the mountains. The river banks are high and steep and the bottoms are rocky. In the intermountain basins, river currents slow banks are low and flat and the bottoms are sand and gravel. High water occurs from March through July over most of the area during which brief storm surges occur. The water table in the river valleys lies at 1-50 m below the surface and on the up to 120 m below the surface. At the feet of the mountainsides the water table often reaches the surface in spring.

Groundwater

27. The groundwater between Kabul and Pul-e-Khumry is located relatively deep and the water table (as stated by local communities) can be found at 40 to 120 m depth in valley areas (minimum 10 m) and 70-95 m depth in desert areas, depending mainly on the lateral distance from a river or stream. Although there is no actual information on the groundwater depth in the corridor of the Line Section from Arghandy to Pul-e-Khumry, it can be assumed that the groundwater table can also be found at minimum 14 m depth there, due to similar topography and soil characteristics. The water is salty in major areas from Karezak to Salang.

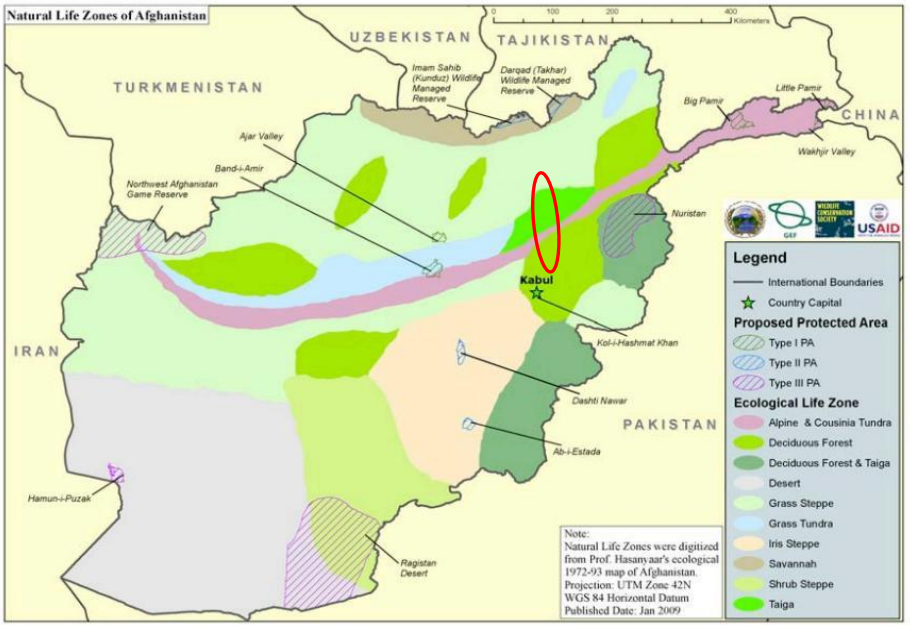
28. Water pools to preserve water for days of need are installed in the area of Chrikar and Pul-e-Khumry. Extraction of underground water by electric or diesel pumps is quite expensive. There are no pumping stations for collection and supply of drinking water along the corridor.

5.10 Flora and Fauna

29. 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 (Groombridge and Jenkins (1994)), Afghanistan has relatively low score results, largely from the lack of vertebrate endemics.

30. 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 5-5.



Source: USAID (2009)

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

31. According to Figure 5-5, and beginning in the North the transmission line corridor traverses a grass steppe zone of the ecoregion Badkhys-Karabil-Semi-Desert, crosses Taiga (lower) and Tundra (higher) zones in the mountainous region and ends up in a wider Deciduous Forest zone around Kabul.

5.10.1 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.

32. **Figure 5-6** shows the natural vegetation zones of Afghanistan and indicates the Investigation area.

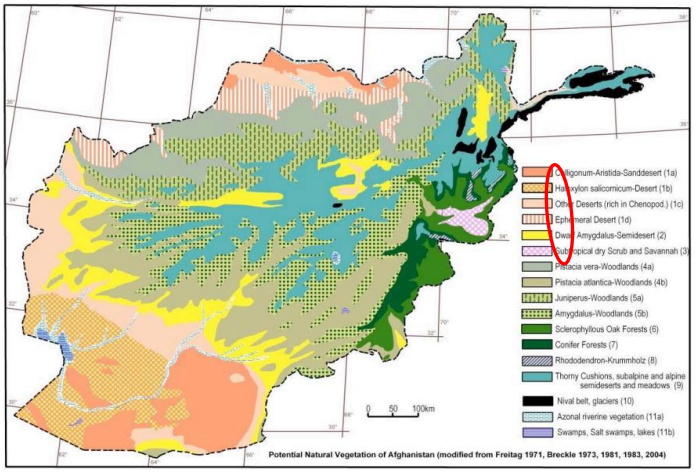


Figure 5-6: Natural Vegetation of Afghanistan (Map with Investigation Area)

33. 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.

34. 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).

35. 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, 2009).

36. 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 alternate grassland savanna and sandy desert (Ephemeral desert; *Caligonum Aristida* Sand Desert; other Deserts). Only at crossings of river valleys there are patches of zonal riverine vegetation (Shirin River, Safid River, Balkh River). Woodlands (*Juniperus* or *Pistacia Vera*/ *Atlantica* Woodlands) are not crossed by the line corridor. In the lowlands, especially near Pul-e-Khumri and the other villages and the perennial/ seasonal rivers, all arable surfaces are cultivated lands. There are some plantations, trees, bushes and grassland.

37. The plain areas from Pul-e-Khumri to Doshi are covered by savannah and grass vegetation, as well as barren land. Regarding wood, only shrubs and bushes remain, which, however, yield considerable firewood and pasture. Further south-east across the plains and from Pul-e-Khumri in the southern direction, the bush and savannah thins out to savannah like grassland or semi-desert. Both in Section 1 and Section 2 the line corridor passes through dry arid habitats poorly vegetated with quite minimal biological diversity due to shortage of water, limited rainfall and scanty soil cover.

38. The major tree and shrub species found along the proposed transmission line up to 1.5 km distance from the line are given in Table 5-2.

Common English Name/ Vernacular Name	Scientific Name	Remarks
Deodar cedar/ Lemanz or Archa	*Cedrus deodara*	Tree
Morinda spruce/ Surp	*Picea smithiana*	Tree
East Himalayan Fir/ Bejor	*Abies spectabilis*	Tree
Blue pine/ Neshtar	*Pinus wallichiana*	Tree
Chilgoza pine/ Jalghoza	*Pinus gerardiana*	Medicine and fruit tree
Hinmalayan pencil juniper/ Obakht	*Juniperus semiglobosa*	Tree
Scots pine/ Kaj-e-Safid	*Pinus sylvestris*	Tree
Allepo pine/ Najo	*Pinus helepensis*	Tree
Kharsu oak/ Kacho	*Quercus semicarpifolia*	Tree
Green oak/ Maro	*Quercus dilatata*	Tree
Black saxaul/ Black saksawol	*Haloxylon ammodendron*	Medicine tree
White saxaul/ White saksawol	*Haloxylon persicum*	Medicine tree
Pistachio/ Pesta	*Pistacea vera*	Fruit tree
Walnut	*Juglans regia*	Fruit and medicine tree
White Acacia	*Robinia pseudoacacia*	Tree
Elm/ Pashakhana	*Ulmus campestris*	Tree
Tree of heaven	*Ailanthus glandolsa*	Tree
Afghan redbud/ Arghawan	*Cercis griffithii*	Tree
Russian olive/ Sorbs	*Elaeagnus angustifolia*	Fruit tree
Bolle‟s poplar/ Chenar-e-Ar Ar	*Populus pyramidalis*	Tree for fire
White poplar/ Safidar	*Populus alba*	Wooden beam
Plane tree	*Populus ciliate*	Wooden beam
Kabul willow	*Salix aemophyla*	Tree for fire
Wallich‟s Nepalese willow	*Salix wallichiana*	Tree for fire
Rosemary leaved willow/ Bead-e- zard	*Salix angustifolia*	Tree for fire
Elegant willow	*Salix elegant*	Tree
Weeping willow	*Salix babylonica*	Tree

Table 5-2: Major tree and shrub species along the Line Route

39. Fruit plants growing in different locations of the line corridor include melon, watermelon 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. The only identified "forest" patches are located in river bends and are not crossed by the transmission line corridor. No reserved forest exists in the Investigation area even up to 5 km from the proposed transmission line corridor.

5.10.2 Fauna

40. The ecoregion supports at least 40 species of mammals, 270 species of birds (of these, 117 are nesting within the Baghyz Reserve), and 40 species of reptiles. Most common among the present mammals are the fox (*Vulpes vulpes*), the wolf (*Canis lupus*), the jackal (*Canis aureus*), the steppe cat (*Felis libyca*), the weasel (*Mustela nivalis*), the ground squirrel (*Spermophilus*), the gerbils (*Rhombomys*, *Meriones*), voles (*Microtus*), hamsters (*Calomyscus*), and desert hedgehogs (*Hemiechinus*). Among the birds, larks (*Galerida*), doves (*Streptopelia*), wheateaters (*Oenanthe*), egyptian vulture (*Gyps fulvus*), saker falcon (*Falco cherrug*), hawks (*Accipiter nisus*, *A. badius*), buzzard (*Buteo rufinus*), kite (*Milvus korshun*), falcons (*Falco tinnunculus*), buntings (*Emberiza*), warblers (*Sylvia*), and shrikes (*Lanius*) dominate. Remaining riparian forests and wetlands along Murghab and Tedzhen rivers house a number of aquatic birds (WWF, 2008). 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.

41. Mammals. Along the line corridor several mammal species were detected (Table 5-3).

Common English Name	Scientific Name
Wolf	*Canis lupus*
Red fox	*Vulpes vulpes*
Rupell's Fox	*Vulpes rueppellii*
Asiatic Jackal	*Canis aureus*
Cat	*Felis catus*
Rabbit	*Lepus capensis*
White Rabbit	*Lepus cunniculus*
Indian Hare	*Lepus nigricollis*
Indian crested porcupine	*Hystrix indica*
Squirrel	*Funambulus pennant*
Indian Mongoose	*Herpestes auropunctatus*
Forest dormouse	*Dryomys nitedula*
Turkistan rat	*Rattus rattoides*
Rat	*Rattus rattus*
House mouse	*Mus musculus*
Long tailed hamster	*Calomyscus lailward*
Gray hamster	*Cricetulus migratorius*
Common white toothed shrew	*Crocidura russula*
Common pipistrelle	*Pipistrellus pipistrellus*
Medius Bat	*Pterous medius*

Table 5-3: Animal species living along the Line Route

Jackals, foxes, cats and different species of bats are commonly found in the desert and semi desert area, whereas wolves are rare.

42. Birds. The Investigation area is not very rich regarding the avifauna and its diversity due to the lack of suitable habitats. The only places

where a number of birds can be found are vegetation areas in the center of Pul-e-Khumri and between Baghlan and Parwan provinces. The main bird species found in and around the Investigation area include Rock pigeon (*Columba livia*), Dusky cuckoo dove (*Macrophygia magna*), Common myna (*Acridotheres tristis*), Great grey owl (*Strix nebulosa*), House sparrow (*Passer domesticus*), Common teal (*Anas crecca*), Eagle Owl (*Bubo bubo*), Chukar partridge (*Alectoris chukor*), Shikra (*Accipeter badius*), Peregrine falcon/ Behri (*Falcon peregrine*), Kestrel (*Falco tinunculus*), Bulbul (*Pycnonotus cafer*), crows, kites, ducks, quails, and sandgrouses.

43. Reptiles and Amphibians. The semi-desert area of the line corridor is a typical biotope for snakes, scorpions and lizards, which are the common reptiles in the Investigation area. Regarding snakes, mostly non-poisonous species like rat eaters can be found. Black and soil coloured scorpions are in abundance. Concerning lizards, agamas, geckoes and monitor lizards live in the Investigation area. Goh (*Varanus monitor*) is the largest lizard there. Frogs and toads are common amphibians in the Investigation area.

44. Insects. Due to the scanty vegetation not many insects are found in the Investigation area. However, flies and mosquitoes are very common. The surface waters of the line corridor are typical biotopes for sand flies and a variety of butterflies can be found on shrubs and herbs. Millipedes, centipedes, bugs and beetles are also found in the area. It is not expected that any endangered wildlife species (based on IUCN categories and AWEC) live in the line corridor.

5.11 Protected Areas

45. Table 5-4 shows the designated and the proposed protected areas (PA) in Afghanistan according to the UNEP/ WCMC World Database of Protected Areas.

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

Table 5-4: Protected Areas in Afghanistan

None of the protected areas described in Table 5-4 is crossed by the transmission line corridor.

46. On the south eastern outskirt of Kabul adjacent to the Kabul - Puli-alam highway is situated a shallow reed-covered seasonal lake known as Lake Hashmut. Transmission line towers marking the alignment of a former 110 kV TL cross the northern part of the lake and extend along the north-eastern bank for about 1.5 km before crossing the Kabul to Puli-alam highway and trending east toward Surobi. Lake Hashmut, with 191 ha, has been a hunting ground since Moghul times and was declared a waterfowl reserve by king Zahir Shah in the 1930s. Currently designated as the kola Hashemite khan waterfowl sanctuary (IBA code AF 009 by BirdLife International), the site has great recreational value for the Kabul residents and is important for migrating and wintering birds and as a source of reeds for roofing thatch. The existing transmission towers crossing the kola Hashemite waterfowl sanctuary will not be rehabilitated under this project and proposed new facilities under this project are located away (67 km - see Figure 5-7) from any influence on the sanctuary.

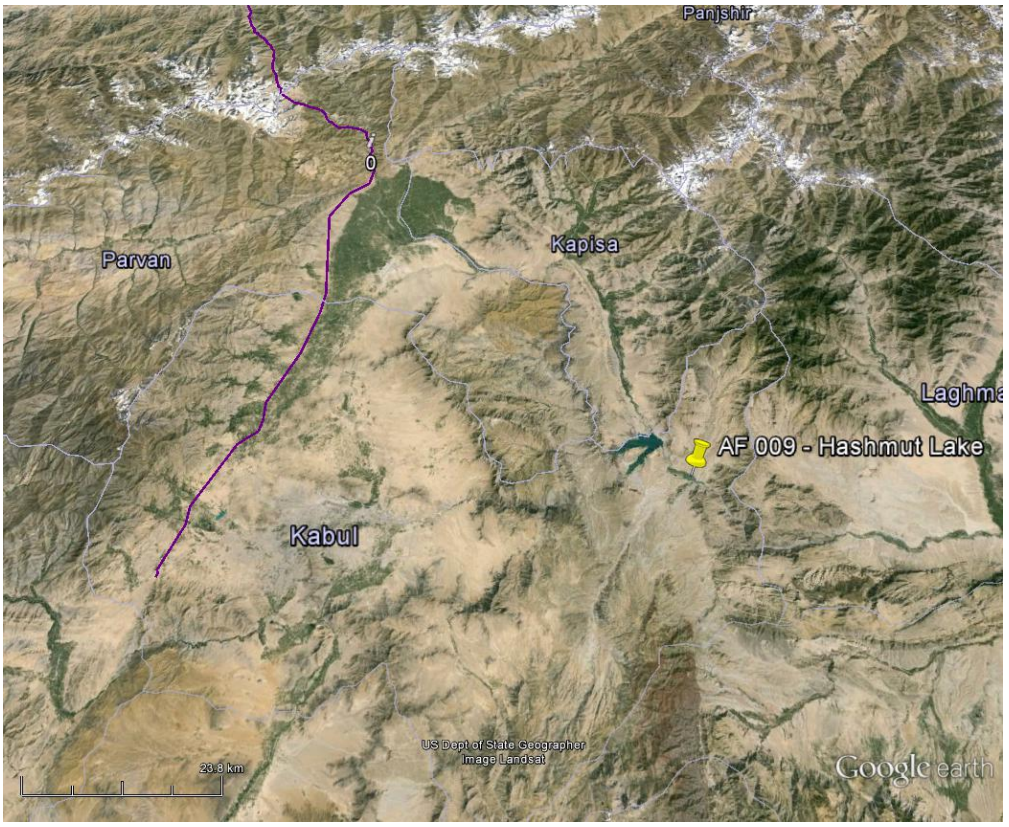
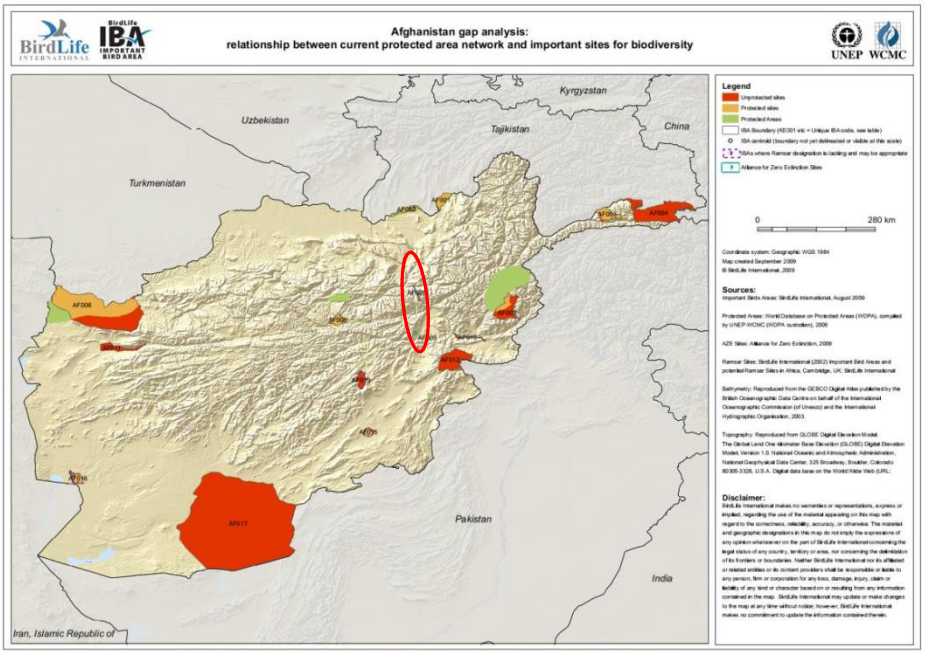


Figure 5-7: Location of the kola Hashemite waterfowl sanctuary/ Lake Hashmut in relation to the project area.

5.12 Important Bird Habitat Salang Kotal (not protected)

47. Figure 5-8 shows that the investigation area trespasses one unprotected IBA (Salang Kotal - AF 005) with a total of 2,000 ha and a diversity of at least 33 species of Himalayan breeding birds and passage birds. One passage bird is the critically endangered Siberian Crane (*Leucogeranus leucogeranus*). The IBA Salang Kotal follows the valley from Khinjan up to Salang-e Shamali for about 40 km.

48. The 500 kV is planned within this valley, as the neighboring valleys do not provide sufficient accessibility for the construction of a power line. Building new access roads in a neighboring valley in order to avoid the Important Bird Habitat Salang Kotal would most probably cause more environmental impacts than the power line itself. Measures are proposed in Chapter 6.3.5 to reduce collisions of birds with the power lines (bird flappers).



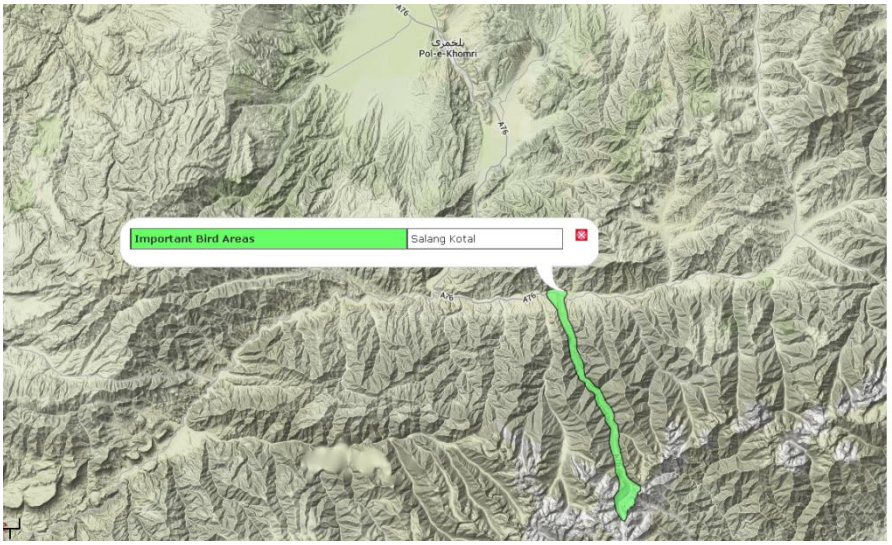


Figure 5-8: Protected Areas and Important Sites for Biodiversity in Afghanistan (Source: BirdLife International)

5.13 Population

5.13.1 Population and Settlements

49. According to the Provincial Development Plan, the Parwan Province has a total population of 631,600 habitants. There are 105,266 households in the province, with an average of 6 members each. Around 91% of the

population of Parwan lives in rural districts while 9% lives in urban areas. Around 51% of the population is male and 49% is female. The Kabul Province has a total population of 3,950,300 persons. The province comprises 640,900 households. The Baghlan Province has a total population of 848,900 habitants. There are 119,378 households in the province with an average have 7 members each (source: *"Provincial Development Plan" Ministry of Rural Rehabilitation and Development (MRRD), 2007).*

50. The field survey revealed that the following towns and villages are located along the transmission line corridor:

- the towns of Doshi, Khinjan, Gul Bahar, Charikar and Kabul north;
- the villages of Kelagai, Doshi, Mosayee , Khinjan in North Salang and Shekerdara, Paghman and some settlements in Arghandy.

51. The villages passing by the line corridor are small and consist of 10 to 30 houses. These small villages belong to bigger villages and even towns that are not in the line corridor. To facilitate the survey, the team considered only those villages that are exactly along the line corridor and have been independent communities for the last 10 years.

52. Along the line corridor, the majority of the population lives as a joint/extended family system. The elder of the house is responsible for all social matters and other activities of the house including income and expenditure. Based on the field survey, the size of most of the households located along the line corridor is between 10 to 30 persons, while the average family size is to the extent of 26 persons. The gender composition reveals that the proportion of males and females is of 57% and 43%, respectively.

5.13.2 Land Ownership

53. 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).

5.13.3 Education

54. Kabul Province. The overall literacy rate in Kabul is 58%. Within the male gender, 66% are educated. Among the women, 56% are educated. 73% of the men between 15 and 24 years old try to learn individually. In the last nomads population (Kochi), 2.8% of the men are little educated but women are not educated at all. In average, 46% of the children between the ages of 6 and 13 attend school (48% of the new students are boys and 44% of them are girls). Among these, 5% of the boys are nomads (Kochi) but the nomad girls are only 2%. Overall there are 347 elementary schools in the province, which has 746,626 students for the time being. The rate of boy students is almost 59%. 19,497 teachers are serving the students, being 3/5 of them women.

The access to schools in Kabul province is easier than in other provinces. Elementary and middle schools are located in a distance of about 5 km for ca. 70% of the students; high schools are located in the same distance for half of the students.

55. Parwan Province. The overall literacy rate in the Parwan province is of 37%. However, while half of the men are literate (51%), this is true for just one-fifth of the women (20%). In the population aged between 15 and 24 the situation for men is better, with 61% literacy rate, whereas for women the figure shows little change (20.9%). The Kuchi population in the province has particularly low levels of literacy with just 0.6% of men and no women being able to read and write. On average, 42% of the children between 6 and 13 years old are enrolled in school; however, again the figure is around over half of boys (53%) and about one-third of girls (30%). Amongst the Kuchi population, 1% of boys attend school in Parwan during the winter months; however, no Kuchi children attend school in the province during the summer. Overall there are 293 primary and secondary schools in the province for 151,582 students. Boys account for 69% of students and 72% of schools are boys' schools. There are 4,575 teachers working in schools in the Parwan province, around one seventh of whom are women (13%). Primary schools are located less than five km from home for about three-fifths (58.3%) of the primary school students.

56. Baghlan Province. The overall literacy rate in Baghlan province is 21%, however, while nearly one third of men are literate (29%), this is true for just a little 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, with just 6.6% of men and 0.3% of women being able to read and write. On average, 29% of children between 6 and 13 are enrolled in school; however, again the figure is around one third of boys (35%) and one fifth of girls (22%). Amongst the Kuchi population, one in four boys (26%) and one in eight girls (16%) attend school in Baghlan during the winter months. No Kuchi children attend school in the province during the summer. Overall there are 277 primary and secondary schools in the province for 247,313 students. Boys account for 63% of the students and 87% of the schools are boys' schools. There are nearly 8,000 teachers working in schools in the Baghlan province, one fifth of whom are women (21%). High schools are located more than 10 kms away for nearly half of the students (48%). Around a quarter of primary school students (24%) doesn't have to travel outside their village to reach their school, but this is true for only one in six secondary school students (14%) and one in twenty high school students (5%).

57. Baghlan province also has a number of higher education facilities. The University of Baghlan has a faculty of Education and a faculty of Agriculture. In 2005 there were 1,013 students enrolled at the university, of whom 814 were men (80%) and 199 were women (20%). Of those, 380 students were in their first year, 307 men (80%) and 73 women (20%). Thirty seven male students live in dormitories provided by the University. There is an

Agricultural vocational high school with 7 teachers for a total of 89 students, all of whom are men, and a Mechanic high school with 10 staff and 121 male students. In 2005, 27 students graduated from each of vocational institutes. There is also a teacher training institute which had 689 students, 68% of whom were men and 32% were women. Three hundred and sixty one new teachers graduated from Baghlan teacher training institute in 2005, including 42% women and 58% men.

5.13.4 Occupations and sources of income

58. The main source of income in Afghanistan is agriculture. Industry is also based on agriculture and pastoral raw materials. More than 80% of Afghanistan's population is involved in farming and/or herding. The Investigation area was an industrial area with predominance of the Karkar industries, the Ghori cements industries, food industries of Pul-e-Khumri and textile industries. But due to war and the privatization process, most of these industries have already been cut out or might be removed. Previously, this area was famous for its opportunities for industrial occupation and most of the people living there had come to the place and settled there. Now the agriculture is the first largest employment opportunity in Pul-e-Khumri, Doshi and Gul Bahar areas, being business the second. In other Parwan districts and Kabul districts like Paghman and Shekerdara, the agriculture also makes the largest opportunity for employment and income and about 70% of the population living along the line corridor is dependent on the agricultural income. There are other income sources like shops, small construction material production industries and food processing.

5.14 Health Situation

5.14.1 Diseases and health problems

59. 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. Ensuring the availability of basic health and hospital services and developing human resources in the health sector is essential to reduce the incidence of disease, increase life expectancy and enable the whole population to participate in sustainable development. A basic infrastructure of health services exists in Kabul province. In 2005 there were 63 health centers and 23

hospitals with a total of 3,203 beds. In total there are 426 health posts in the 14 districts of the province. 36 Basic Health Centres (BHC) and 24 Comprehensive Health Centres (CHC) are supported by different NGOs.

60. There were also 643 doctors and 4,790 nurses employed by the Ministry of Health working in the province, which represented 55% decrease in the number or doctors (down from 1,429) but around a 7% increase in the number of nurses (up from 3,000) since 2003. 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 (source: http://www.unodc.org/documents/data-and-analysis/Studies/Afghan-Drug-Survey-2009-Executive-Summary-web.pdf). As the Investigation area is located on the main drug route from Afghanistan to Turkmenistan, the presence of such problems in the area cannot be excluded.

5.14.2 Health Infrastructure

61. In Kabul, Parwan and Baghlan provinces, a basic infrastructure of health services exists (source: "Provincial Development Plan", Ministry of Rural Rehabilitation and Development (MRRD), 2007).

62. **Kabul Province.** Kabul currently has s basic health care system in place. In 2005 there were 63 health care centers, 23 hospitals with a total of 3,203 beds. In total, this province has 426 health centers in 14 districts and 26 basic health centers and 24 public health centers supported by NGOs. The Ministry of Public health has hired 643 doctors and 4,790 nurses in this province in 2003. This province also has 3,083 pharmacies, of which 99% are private. More than half of the people of this province has to travel 5 km to get to a health clinic.

63. **Parwan Province.** A basic infrastructure of health services exists in Parwan province. In 2005 there were 46 health centers and 3 hospitals with a total of 131 beds. There were also 64 doctors and 246 nurses employed by the Ministry of Health working in the province, which represented a 100% increase in the number of doctors (up from 32) and a small increase in the number of nurses (up from 239) since 2003. The province also has 190 pharmacies, of which 187 are owned privately and 3 are run by the government. The majority of communities do not have a health worker permanently present in their community. Sixty eight percent of men's *shura* and 76% of women's *shura* reported that there was no community health

worker present, and both groups most commonly said that their nearest health facility was a basic health center or a clinic without beds. More than one-third of the population has to travel more than ten kilometers to seek medical attention. Health care facilities are located at a distance of 5 to 10 kilometers for more than one quarter of households. Out of 937 villages, only 69 have a health centre or dispensary within their boundaries.

64. **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.

65. 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.

5.14.3 Access to Safe Drinking Water

66. **Kabul Province.** In Kabul province, an average of 65% of the families has access to potable water. The percentage in city areas goes high in each three quarter and in rural areas it comes down to 41%. More than 9 out of 10 families has access to potable water in the communities, meanwhile 9% has to walk for one hour to reach for potable water. Beside this, 7 % other people has to walk for an hour to get potable water. In average, one quarter of the families in Kabul province have sanitation. The sanitation is better in the majority of cities and 32% of the families are facilitated from that.

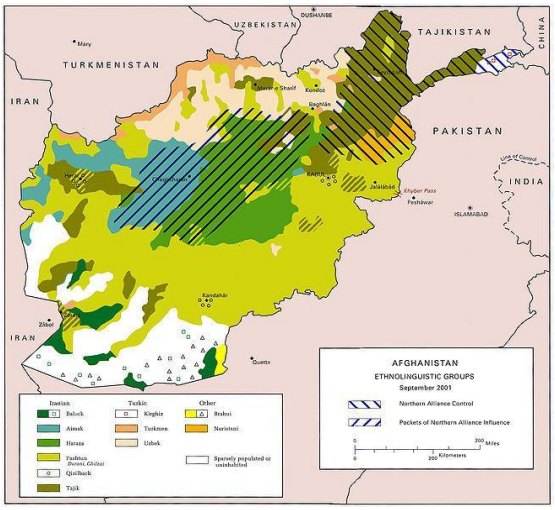
67. In **Parwan Province**, on average for only 24 % of households safe drinking water is available. This amounts to 64 % in the urban area, and declines to just 6 % in rural areas. Almost nine in every ten households has direct access to their main source of drinking water within their community. But for around one in ten households the travel to access drinking water takes up to an hour (8 %), and 3% of households has to travel up to 6 hours to drinking water access.

68. 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.

5.15 Ethnic Groups/Minorities

69. Afghanistan is a multi-ethnic country; the north-western region is inhabited by several ethnic groups (Figure 5-9).



Source: US Army 2001-2009

Figure 5-9: Ethno-linguistic groups in Afghanistan (Map with Investigation area)

Kabul province

70. Around 19% of the population of Kabul lives in rural districts while 81% lives in urban areas. Around 51% of the population is male and 49% is female. Pashtu is spoken by around sixty percent of the population and Dari is spoken by around forty percent. A small number of people located in 5 villages speaks Pashaie. Kabul province also has a population of Kuchis or nomads whose numbers vary in different seasons. In winter 49,754 individuals, or 2.1% of the overall Kuchi population, stay in Kabul. Of those Kuchi that live in Kabul in winter, 47% are short-range migratory, 16% are long-range migratory and 37% are settled. Three quarters of both the long-range and the short-range migratory Kuchis are only partially migratory, so a part of the community remains behind in the winter area. Long range Kuchis from the provinces of Nangarhar and Laghman, and in much smaller numbers from Kapisa, Khost, and Wardak, come to Kabul in summer and this makes Kabul the most important summer province for the Kuchi. The most important summer areas for the short range migratory Kuchi are the Paghman, Dehsabz, Bagrami, Charasyab, Goldara, Surobi and Shakardara districts of Kabul province. The most important summer areas for the long range migratory Kuchi are Wardak, Parwan and Logar provinces. The Kuchi population in the summer is 220,251, which represents 9.1% of the total Kuchi population.

71. **Kabul city.** The population of the city reflects the general multi-ethnic, multi-cultural, and multi-lingual characteristics of Afghanistan. There

is no official government report on the exact ethnic make-over. According to a 2003 report in the National Geographic, the population of the city consisted of 45% Tajiks, 25% Hazaras, 25% Pashtuns, 2% Uzbeks, 1% Baloch, 1% Turkmen, and 1% Hindu. Dari (Afghan Persian) and Pashto are the most widely used languages in the city, although Afghan Persian serves as the lingua franca.Nearly all the people of Kabul are Muslim, which includes the majority Sunnis and minority Shias. A small number of Sikhs, Hindus, and Christians are also found in the city.

72. **Parwan Province.** Around three quarters (73%) of the population of Parwan lives in rural districts, while one quarter (27%) lives in urban areas, Around 50% of the population is male and 50% is female. Farsi and Pashto are the main languages spoken in the province. Parwan has always been the fiercest province of Afghanistan. Parwan is one of the beautiful provinces of Afghanistan, it has been fought by many armies including Persians, Mongols, etc, but they never succeeded in taking it because Afghan people were fearless and very courageous. Thousands of Persians died in the battles in Parwan after excepting a devastating defeat they never dared to go into this province, due to fear of Afghans. Today the main ethnic groups of Parwan are Pashtun %60, Tajik %40, and other minority groups. Parwan has been one of the peaceful provinces of Afghanistan, there has been many demonstrations against Iran, many Afghans have been executed in Iran without trial or court. The Afghans who were executed were looking for jobs in Iran to feed their families, but their Shia government ordered their execution due to hatred to Muslims.

73. **Baghlan Province.** Tajiks are the majority and make up 55% of the population, followed by 20% Pashtuns, 15% Hazaras, 9% Uzbeks, and the remainders are Tatar. In another source Tajiks along their sub-groups like Aimaks and Sayyid-Tajiks make more than 70% of the provincial population. In addition, a significant number of Hazaras are also counted as part of the Persian-speaking people which stating Persian language as overwhelming speaking language, followed by Pashhtu-speaking Pashtuns, Uzbeks and some Tatars. Baghlan is also home to a small community of Ismaili Muslims of Tajik stock, led by the Sayeds of Kayan.

5.16 Gender Aspects

74. In the COI, 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. (source: Afghan Toll, Casarem Phase 2, Baseline Study). 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.

5.17 Agriculture and lands ties

75. 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 resent serve 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.

76. 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 1989 and 1999.

77. 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.

5.18 Land Use Pattern and Agriculture

Baghlan Province

78. Enhancing licit agricultural productivity, creating incentives for non-farm investment, developing rural infrastructure, and supporting access to skills development and financial services will allow individuals, households and communities to participate licitly and productively in the economy. As agriculture represents the major source of income for nearly half the households in the province, rural development will be a key element of progress in Baghlan. The most important field crops grown in Baghlan province include wheat, barley, rice and maize, rapeseeds and flax. The most common crops grown in garden plots include fruit and nut trees (50%), vegetables (12%) and produce such as grapes, potatoes, beans and alfalfa, clover or other fodder. Rapeseed (15%) and wheat (5%) are also frequently gown in garden plots in the province. Three quarters of households with access to fertilizer use this on field crops (76%) and to a much lesser degree on garden plots (6%), although nearly one fifth of households use fertilizer on both field and garden (18%). On average 62% of households in the province have access to irrigated land, whereas three quarters of rural households and 14% of urban households have access to rainfed land as shown in the table below.

Household access to irrigated and rain-fed land			
	Rural	Urban	Average
Access to irrigated land	61	71	62
Access to rain-fed land	75	14	74

Seventy percent of rural households, 64% of Kuchi households and 18% of households in urban areas in the province own livestock or poultry. The most commonly owned livestock are cattle, donkey, sheep and goats as the following table shows:

Kabul Province

79. In the year 2005, there were 23 companies in the Provincial level that had 2,376 employees who were working on the projects. As a survey shows in the 2003 all of the employees were reached to 1,389 employees. But in 2005 Agricultural Cooperatives jumped to 5,250 Acres of land which gone under the Agriculture Program and had produced around 20,000 Tons of were sold in the market; the participants got their sheers as an Average of 509,800 Afghanis. The industrial products are in the center of the districts of Saroby, Paghman, Khak-E- Jabbar Will Be Produced The sugar beets Productions are takes place in 44 villages such as Paghman district and Bagrami, Char Asiab, Saroby, Mirbacha Kott and Qara Bagh. Tobacco growing is one of the farmer's jobs which grows in the 34 villages for the people need, grow of that product will take place in the different part of the country. Most of them grow in 10 districts, villages such as Farza valley, Paghman, Bagrami, Char Asiab, Saroby, Mirbacha Kott, Moosawy, and Qara Bagh, valley. But more than half of them in another word more than 50% of these villages are exist in

Paghman district. Olive is also one of the produce of the country which and grows in Farza and Shakar Dara, Paghman district.

80. There are 9 villages who work on honey production and are some small industries which produce honey, 5 0f them are in Char Asiab, and the rest of them are exist in the districts of Istalef Paghman, Bagrami, and Saroby. Also the Abreshom and Qara Qol skin production is taking place in some part of the Kabul District. Most villagers are busy making handcrafts such as wearing carpets and other woolen floor covers which in very famous among the afghan's hand craft and products are special in Qarabagh, Shakar Dara, Mirbacha Kott, Istalef, kala kan and Farza. The carpet industries are the second common important and famous in this district. Basic jewelries are made within 12 villages Paghman district and 5 towns and urban of Farza. Qaba (chapan) with sleeve, which called special hejab. They are made in the 9 small villages. Dusty dishes are made in the 8 villages. Shawls and Platt are famous and made in the 7 individual villages. In the year of 2005 a report showed 23% of families got loans from the small loans project program and some of them invest that money for promoting of their economy situation in measure of 5% agriculture investment; 4% buying the land; and 1% of the money spent on their personal expenses.

Parwan Province

81. The most important field crops grown in Parwan province include wheat, maize, and potatoes. The most common crops grown in garden plots include fruit and nut trees (34%), vegetables (3%) and produce such as grapes, potatoes, beans, flax and alfalfa, clover or other fodder. Rapeseed (1%) and wheat (18%) is also frequently gown in garden plots in the province. More than half of households with access to fertilizer use this on field crops (53%) and to a lesser degree on garden plots (11%), although more than one-third of households use fertilizer on both field and garden (36%). On average 62% of households in the province have access to irrigated land, and around one in twenty (6%) of households have access to rain-fed as the following table shows:

Households (%) access to irrigated and rain-fed land			
	Village	city	Average
Access to irrigated land	62	84	62
Access rain-fed land	6		6

Fifty five percent of rural households and 81% of Kuchi households in the province own livestock or poultry.

5.19 Electricity and Transport Infrastructure

5.19.1 Baghlan Province

Electricity & Transportation

82. 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. The transport infrastructure in Baghlan is reasonably well developed, with 42% of roads in the province able to take car traffic in all seasons, and 32% able to take car traffic in some seasons. However, in a quarter of the province there are no roads at all.

5.19.2 Kabul Province

Electricity & Transportaton

83. Approximately (61%) people of Kabul city have access for electricity, much of that belong to government but some residential areas which is approximate three out of four or (71%) families have access to electricity meanwhile in rural areas less than one third or (29%) half of which is (14%) that have access to regular power. The basic infrastructure of transportation that develop in Kabul province, more than one out of two or (68%) roads in all weathers and one quarter or two (26%) roads are open. in some areas for traffic. meanwhile (4or5%) of provinces have no roads.

5.19.3 Parwan province

Electricity & Transportation

84. On average 22% of households in Parwan province have access to electricity with the majority of these (16%) relying on public electricity. The transport infrastructure in Parwan is reasonably well developed, with 61% of roads in the province able to take car traffic in all seasons, and 19% able to take car traffic in some seasons. However, in nearly one-fifth of the province (18%) there are no roads at all.

5.20 Physical Cultural Sites

85. 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.

5.20.1.1 Unknown cultural resources

86. 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. There are no known graveyards in the line corridor between Dashte Alwan and Kabul, as a verification on the spot could not be done yet. However, this aspect should be included in the Chance Find Procedure.

6. Screening of Environmental Impacts and Mitigation

6.1 Impacts during Design Phase

6.1.1 Line Routing and Substation Siting

1. The present design (Phase 2) of the transmission line routing is still preliminary (FICHTNER, 2013). In the Phase 1 of the design, a desk study for the line design was prepared for the Line Sections 1 and 2. Line Section 3 was planned on the basis of maps and satellite photos along an existing 110 kV transmission line, in a distance of 50 m, which nevertheless will result in a completely new corridor causing land acquisition. In three locations 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.

2. Refining of line routing shall be done during the final design in order to avoid resettlement and environmental impacts to the greatest extent possible. Minimal ground clearance will be sufficient so that no negative interference with the traffic occurs in case of road crossings. As the detailed design is shifted under the responsibility of the construction contractor, a careful monitoring will be necessary.

3. The following mitigation measures of the EMP have to be part of the EPC contract:

- Towers shall not be erected too close to rivers and creeks and fragile river banks shall not be damaged.
- Selection of a transmission line corridor that bypasses settlements so that only minimum resettlement actions/ relocation of households are required.
- Designing the TL with an horizontal arrangement of the phases in one level and placement of bird diverters in the vicinity of the IBA Salang Kotal.
- Cultural and religious relics shall be protected and respected.
- Impact on Important Bird Area (IBA) bird species around Salang-Kotal area to be minimized through baseline survey and subsequently rerouting of line, if required

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

Impact of/on	**Extent of impact**
Line routing	■ ■ = medium
Arghandy Substation	■ = low

6.1.2 Access Roads

4. In Section 1, starting from Arghandy to Salang south, there little need for constructing access roads, as the area is flat and to most of the tower locations there is a fair road that allows getting the material to the site with little improvements in some places. But in Section 2, starting from Salang south to Salang north, there is the need for constructing access roads for almost every tower location, exception in those places where the access road has been already built for the existent 220 kV TL. In Section 3, from Salang north to Pul-e-Khumri, there are just few places that may need to be improved with access road.

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

- Minimization of the number and length of access roads.
- Careful selection of location of access roads.
- No construction of access roads near Astalef Shrin, although it is too far.
- Implementation of a chance find procedure if crossing historical sites and graveyards
- Use of existing roads/ tracks wherever possible.
- On hill slopes and other potentially erosion prone areas along the embankment, appropriate vegetation which checks soil erosion will be planted.
- On sections with cut and fill, mild slopes will be maintained and planted with appropriate vegetation.
- Design consideration will include protection using retaining structures such as gabions.

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

6.2 Impacts during Construction Phase

6.2.1 Soil and Erosion

6. The transmission line corridor is characterized by flat or slightly undulated semi-desert in Sections 1 and 3, but in Section 2 (high slops 60%), there is no major risk for erosion during construction of access roads, towers and substations. Erosion prevention measures 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 (dust suppression).

Impact of/on	Extent of impact
Erosion	■ = low
Sand deflation	■ = low

6.2.2 Landscape and Visual Aspects

7. In Sections 1 and 2 the impact can hardly be mitigated in most of the places, especially in agricultural field. In case there is space and possibility to erect the towers in open spaces, this can avoid the impact in house buildings. In Sections 1 and 3 the mitigation measures will not work much but in Section 2 the impacts can be better mitigated.

Impact of/on	Extent of impact
Visual aspects/ landscape	■ = low

6.2.3 Air Quality and GHG Emissions

8. 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. If construction works are carried out in spring, dust creation shall be reduced.

9. 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".

10. 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) (www.cigre.org) 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

6.2.4 Water Resources

11. 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.

12. The groundwater table in the future line corridor is assumed to be at minimum 15 m depth between Dashte Alwan and Arghandy, so 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.

13. Towers shall not be placed close to rivers and creeks (i.e. avoid flooding areas) and river banks shall not be damaged.

14. Soil run-off with oil/ fuel during construction could pollute surface waters. However, the substations will be located far away from major surface waters. In order to avoid impacts from construction of the towers, the tower sites shall be located as far as possible from rivers, creeks, water pools and wells, which are especially important regarding future line crossings. Avoidance of soil run-off is necessary.

15. Also, the construction of temporary bridges (if riverbeds are not dry) may cause deterioration of river beds and banks. This is the reason why construction has to be carried out carefully and a regular control of the construction site is necessary. 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.

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

17. If properly done (air stringing) the stringing procedure does not create a big environmental impact. The negative impacts (especially related to vehicle movements) can be minimized by standard mitigation measures.

19. The avoidance of water pollution will be treated in a detailed EHS-Management Plan, elaborated by the Construction Contractor and shall be implemented during the construction phase.

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

6.2.5 Flora and Fauna

20. Due to the location of the Project in open grasslands of a semi-desert area without forest cover, the environmental impacts are much localized (i.e. at the substation sites and tower foundations). Felling of trees in the future ROW and the substation sites is not necessary 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.

21. The construction of access roads should be limited, wherever possible.

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

6.2.6 Protected Areas

22. The construction sites are not located in or near a declared or planned protected area or important wetland (Ramsar Wetland). However, the line will traverse an Important Bird Area (Salang Kotal) which, although not being registered as protected, contains a rich diversity of migrant and breeding birds.

23. Construction workers will not be allowed to undertake poaching activities or use ammunition to hunt birds. Necessary steps to forbid such activities in construction camps will be instituted.

Impact of/on	**Extent of impact**
Protected areas	■ = low

6.2.7 Waste Management

24. 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.

25. 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, drinks containers, food waste, etc.

26. In order to handle the waste in a proper manner during construction, the Construction Contractor shall develop a Waste Management Plan (within the EHS Management 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.

27. Generally, the generated construction waste will be recycled as much as possible on site. Together with the measures listed above the impacts caused by solid waste during the construction phase of the proposed project will be reduced to a minimum. If the Waste Management Plan is in place, the impact of solid waste on the environment will be minimal.

28. Construction sites and workers camps shall be fitted with functional sanitary equipment (proper toilets, lavatories, liquid and solid waste treatment, hygienic conditions in lavatories and other sanitary infrastructure etc.).

29. 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

6.2.8 Workers and Community Health & Safety

30. Direct impacts on health and safety of the workers during construction of the planned transmission line and substations may result from various factors as 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.

31. For avoidance/ mitigation of noise impacts on workers, all construction workers shall be fitted with personal protection equipment (PPE) as ear plugs. 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.

32. 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.

33. As the construction will be undertaken in an environment where other functioning transmission lines are present, the risk of electrocution may be increased in some areas, especially those where the distance between the OHL is small or where crossing of existing lines is planned.

34. 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. The general security situation needs to be carefully assessed before starting of civil works. However, due to the limited time of construction a specific area and the regular shifting of workers camps; the impact is assessed to be limited.

35. For impact avoidance, the construction contractor shall develop an appropriate Environment, Health, and Safety Management System (EHS-MS) and implement it during the construction phase. A proper EHS Management Plan shall address the health and safety of workers. Alcohol and drugs shall be strictly forbidden at the construction site.

36. Indirect health and safety impacts for workers and community may result from land mines. The development of EHS Management System 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.

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

6.2.9 Infrastructure and Traffic

37. Respect of minimal ground clearance (9 m for 500 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.

38. 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.

39. 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

6.2.10 Physical Cultural Resources

40. The transmission line corridor runs partly near to a branch of the Historical Silk Road. The investigation was done during a field survey by a local team and on the basis of satellite pictures. Only sites that are in the proximity (1-1.5 km distance) of the existing and planned lines as well as the substation sites were considered.

41. Astalef Shrine is the only historical place found in the area and is located east of the line corridor. However, it is not within the 1.5 km zone, meaning that it won't be affected.

42. Despite not having encountered evidence of cultural sites within the line corridor, there may be possibilities for chance finds during the construction phase within the investigation area, as not all sites are known or excavated. During final design and construction, sites of historical relevance and cultural sites (i.e. cemetery, graveyards) shall be avoided or over-spanned. Historical sites and graveyards shall be avoided via by-passing or over-spanning, e.g. in case of archaeological sites located below the surface. The same procedure shall be applied for location of needed new access roads and the substation sites.

43. 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. During Project supervision, the site engineer shall monitor the regulations relating to the treatment of any chance find encountered are observed.

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	■= low to ■■ = medium
Important bird area near Salang Kotal	■= low to ■■ = medium

6.3 Impacts during Operation Phase

6.3.1 Soil and Water Resources

44. During operation of the new substations 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 treated.

45. Water resources are scarce in the area and water consumption will need to be minimized during operation of the substations and maintenance of the transmission lines.

46. 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

47. The new OHL 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. In the first two sections the OHL is a new construction leading to an additional visual impact.

48. In order to reduce the visual impact of towers the old towers and old substations without function should be completely dismantled. 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. The visual impact of a complete OHL can only be mitigated by underground construction, which would raise the cost considerably. Planting trees/ bushes around the new substations can reduce their visual impacts partly.

Impact of/on	**Extent of impact**
Visual impacts/ landscape	■ = low

6.3.3 Climate

49. The enhancement of transmission line between Dashte Alwan and Kabul may have a positive impact regarding climate change as the energy efficiency will be increased for the new line and power distributed among local populace.

Impact of/on	Extent of impact
Climate	+ = regionally positive (increased energy efficiency)

6.3.4 Flora

50. As there are no trees growing in the transmission line corridor, it is fairly easy to keep the minimum safety clearance between vegetation and the conductor cables (8 m for the 500 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.

51. The vegetation under the towers, at the substation sites and along the access roads/ tracks will partly be destroyed permanently. New access roads will promote access by cars in formerly little disturbed places. However, no 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

52. The risks for avifauna related to the operation of a transmission line are electrocution and collision, both leading to serious injuries and, in most cases, to dead. Big and heavy birds are in special risk, because of their reduced ability to avoid suddenly appearing power lines, especially in times of reduced sight distances (fog, rain, et.) or strong winds.

53. The TL trespasses one IBA unprotected site (Salang Kotal) with a diversity of breeding and passage birds, including the critically endangered Siberian Crane.

54. The risks of bird electrocution and collision can be avoided or mitigated by an adequate design of the poles, conductors and insulators and arrangement of all conductor cables at one height, reducing the height of the conductors.

55. The installation of bird diverters along areas of special concern, namely the area where the IBA is crossed, will increase the visibility of the power lines. Studies of German Bird Protection organizations (*Landesbund für Vogelschutz*) have shown that the installation of bird diverters reduces significantly the risk of bird collisions (up to 90 % in case of dynamic bird

diverters). Therefore, FICHTNER recommends the installation of dynamic bird diverters (Figure 6-1) in a distance of 15 to 25 m between each other. Only 60% of the span between two towers needs to be marked, as the remaining portion of the wire is already unreachable due to the towers' geometry.

Figure 6-1: Dynamic bird diverters (FireFly ™) proposed to be used in the TL project

56. The impact of the transmission line on birds is assessed to be low if measures are taken.

57. Other fauna is not considered to be impacted significantly by the Project. Disturbance of animals shall be minimized during maintenance work by e.g. respecting breeding seasons.

Impact of/on	**Extent of impact**
Avifauna	■ = low
Other fauna	■ = low

6.3.6 Waste Production

58. Generally, the amount of waste generated by maintenance of the transmission line is negligible. However, substations 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

59. As the high voltage transmission line is forming the backbone of electricity supply into the south-eastern region of the country, 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.

60. 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. However, it has to be said that there are other areas in Afghanistan where the seismic risk is considerably higher than in the Investigation area.

Noise emissions

61. 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.

62. 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 HSE Guideline:

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

Table 6-1: Limit values for noise regarding population

63. 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.

64. 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

65. 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).

66. As a precautionary measure, other projects have adopted an internationally accepted standard ROW width of 60 m along their 500 kV transmission lines. 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.

67. 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.

68. 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 60 m ROW of a 500 kV line.

69. 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:

70. 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.

70. 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. Regular EMF measurements are recommended.

Risks of Electrocution

71. 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

72. Fire walls will be installed between the transformers to prevent fire expansion in case of a transformer fire. The installation of a sprinkler system around the transformers is foreseen but is under discussion because of its

limited advantage. 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 Land Use

73. An area of 225 m² per tower will have to be expropriated and partly sealed for tower foundations as a permanent impact (of the construction phase). The remaining land of the line corridor can be used as agricultural land or as pasture land as before. Maintenance works are not expected to have a major environmental and social impact if herbicides are not used. Minor impacts, as damages to crops during maintenance works will have to be compensated (see LARP).

Impact of/on	**Extent of impact**
Land use	■ = low

6.3.9 Electricity Supply

74. 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 **++** = regionally positive

6.4 Impacts during Decommissioning Phase

75. 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 **+** = locally positive

7. Analysis of Alternatives

No Project Alternative

1. This alternative would not cause any resettlement or environmental impacts, but would also prevent electricity import from Central Asia for increasing electrification rates in Afghanistan and exports to Pakistan. If this line is not constructed, other lines will have to be connected to the substations and power plants of the present line in the near future.

Line Routing Alternatives

2. 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. For some sections several line route options have been discussed. The following aspects were considered in the optimization process:

- Avoid traversing or close by-passing of urban areas, densely populated areas, settlements, schools, public buildings and markets
- Avoid traversing or close bypassing of religious or cultural sites, mosques, cemeteries, historical places, and protected areas;
- Avoid traversing of forests and surface waters;
- Keep electrical field, magnetic field, audible noise and TV interference as low as possible by staying away from away from settlements or houses;
- Keep impact on flora, fauna, nesting places, animal trails, migration zones and sensitive ecological areas to a minimum;
- Consider accessibility in order to avoid new access roads

3. Only the optimized line route, and not the staged optimization process, which lead to this optimized line route, is shown in the reports in order to save time and paper.

Substation

4. An optimization process similar to the line routing has been conducted for the substation at Arghandy. For Arghandy this optimation process comprised an alternative site about 3 km north of the selected site and the shifting of the site in the vicinity of the finally selected present location. Futue expansion was constrained in prior site which was in middle of settled area in Kabul.

5. Technology Alternative: – Humming noise could be generated from the circuit breakers. The choice is between air, oil and sulfur hexafluoride circuit breakers. While sulfur hexafluoride circuit breakers are more expensive, this is the circuit breaker type to be used in the Project to reduce the humming noise to almost close to background level.

8. Public Consultation and Information Disclosure

1. The ADB safeguard policies foresee meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.

2. This IEE was updated with the results of the field survey and the referring Public Consultations for sample populations settled along the line corridor. The surveyor team faced considerable challenges and security threats during the survey. Due to the problematic security situation, public consultations could not be made.

3. Public Consultations will be conducted at pre-construction stage under responsibility of the DABS-PMO with assistance of the Project Implementation Consultant (to be spelled out in PIC TORs).

9. Grievance Mechanism

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

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

8. 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

9. 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

10. 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 8-1):

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.

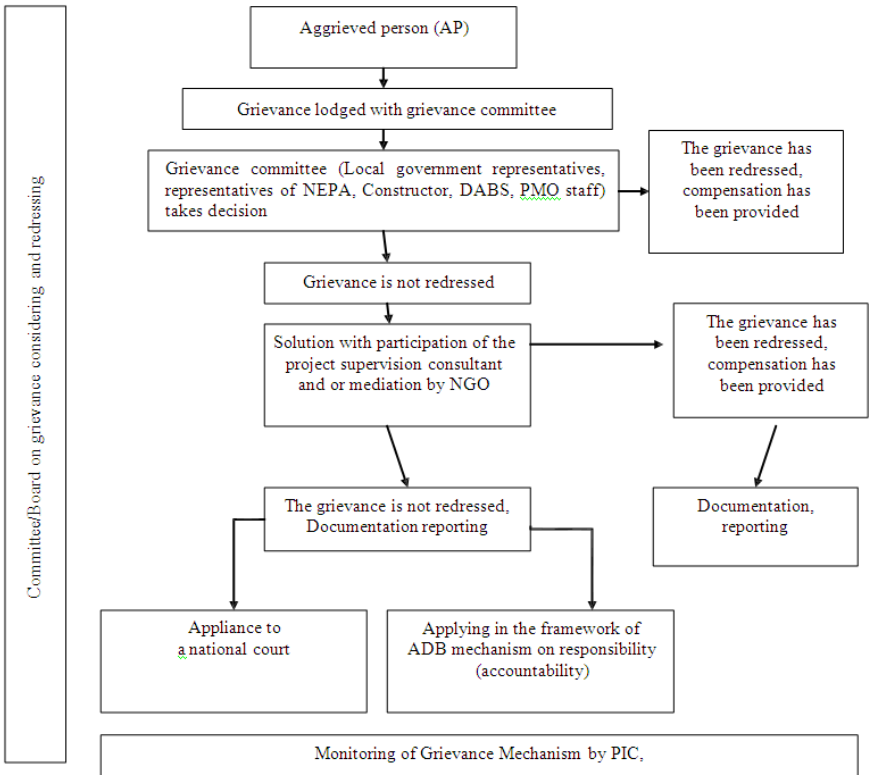


Figure 9-1: Grievances Redress Chart

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

11. 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.

12. 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	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for implementation
Line Routing (Chapter 6.1.1)	Resettlement Damage of Physical Cultural Sites Impact to Important Bird Area species	• The new TL will follow closely existing infrastructure. • Towers are not placed on hilltops • Towers shall not be erected too close to rivers and creeks and fragile river banks shall not be damaged. • Selection of a transmission line corridor that bypasses settlements so that only minimum resettlement actions/ relocation of households are required. • Protection of cultural and religious relics and graveyards. • Organize a baseline ornithological survey in vicinity of Salang-Kotal Important Bird Area (IBA) to route and define rationalized construction schedule for minimization/avoidance of impacts to birds.	PIC	Included in PIC Contract	During final routing
Line Routing (Chapter 6.1.1)	General impacts of line routing	• Prior information of APs that plantations in ROW are likely to be affected during the design phase / land survey. • Limitation of cutting vegetation and crops where feasible. • Compensation for all damages caused during land survey (See LARP).	PIC	Included in PIC Contract	Before and during design phase / land survey
Substation (Chapter 6.1.2)	Land acquisition and resettlement Surface sealing Pollution through	• Substations to be designed in order to minimize resettlement and land acquisition issues • Sealing of surface to be minimized • Planning of sufficient sanitary structures for employees • Fire-Safety equipment to be planned for substations	PIC	Included in PIC Contract	During final routing

	effluents	• Construction of oil separators for maintenance of vehicles			
Access Roads (Chapter 6.1.3)	Land Acquisition Damage of Physical Cultural Sites	• Minimization of the number and length of access roads. • Careful selection of location of access roads. • No construction of access road near Aquina Huzi. • Implementation of chance find procedure if crossing historical sites and graveyards • Use of existing roads/ tracks wherever possible. • On hill slopes and other potentially erosion prone areas, appropriate vegetation which checks soil erosion will be planted. • Design consideration will include protection using retaining structures such as gabions.	DABS-PMO and PIC	Included in PIC Contract	During final routing
Health and Safety (Chapter 6.3.7)	Natural disasters	• The infrastructure needs to be constructed respecting earthquake safety standards suited for the seismic risk level in the Investigation area	PIC	Included in PIC Contract	During design
Health and Safety (Chapter 6.3.7)	Impact of Electric and Magnetic Fields	• A minimum safety distance of 8 m from a house to the closest conductor has to be respected. From other similar projects it can be reasonably assumed that in this distance the limit values for electric and magnetic fields for the public are not exceeded. • Maximize distance between TL and human settlements.	DABS-PMO and PIC	Included in PIC Contract	During final land survey

Classification of the impact					
High	Medium	Low	No impact	Locally positive	Regionally positive

10.1.2 Mitigation Measures for the Construction Phase

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for implementation
Soil and Erosion (Chapter 6.2.1)	Erosion and pollution of soil Sand deflation	• Minimization of removing topsoil at tower sites. • Loss of topsoil will be avoided by stripping and storing topsoil prior to construction (where appropriate i.e. on productive lands) • Bringing back the topsoil to its original place after having finished erection of the tower. • Installation of drainage systems • Replanting of grass at tower sites, river banks, access roads and other work areas that are not needed anymore • Careful selection of locations for access roads. • Sand deflation prevention measures at tower foundations and access roads. • Use of existing roads/ tracks wherever possible	CC / DABS-PMO	Included in construction costs	During constructio n
Soil and Erosion (Chapter 6.2.1)	Soil damage by quarries Blasting of rocks	• If there is a need to use filling material for access roads or tower foundations existing certified and properly managed quarries shall be used • If quarries are needed, they will be redeveloped as per standard procedure. Rehabilitation will be undertaken immediately after excavation to prevent soil erosion. • Redevelopment will include replacing stockpiled soil cover, replanting grass, shrubs, and trees, and installing sediment runoff control devices.	CC	Included in construction costs	During constructio n

Air Quality (Chapter 6.2.3)	Emissions from vehicles Emissions through burning of waste Dust emissions	• Limitations of size, weight or axle loads of vehicles using particularly difficult roads Reduction of speed and limited movement of vehicles. Optimized transportation management to avoid needless truck trips. • Routine service and regular maintenance of vehicles and machines to reduce engine emissions. • Burning of rubbish on site must be strictly forbidden. Construction equipment shall be maintained to a good standard and idling of engines discouraged. • Machinery causing excessive pollution (visible smoke) shall be banned from construction sites. • Despite its dust reduction potential, access roads shall only be sprayed in exceptional cases due to scarcity of water	CC	Included in construction costs	During construction period
Climate (Chapter 6.2.3)	Emissions of SF_6	• Follow the IEC Guidelines and the recommendations of the ICLES for handling of SF_6	CC	Included in construction costs	During construction period

Surface Water (Chapter 6.2.4)	Pollution of Surface water	• All liquid materials and lubricants shall be stored in closed containers or barrels. • Construction material as bags of cement etc. shall be stored in containers in order to avoid rinsing out. • Temporary sewage treatment facilities shall be provided for the construction sites and worker's camps Avoidance of soil run-off. All necessary measures will be taken to prevent impeding cross drainage at rivers/ streams and canals or existing irrigation and drainage systems. • Construction materials containing fine particles, e.g. limestone will be stored in an enclosure such that sediment laden water does not drain into the soil. • construction of towers in distance from river banks (min m is recommended) • Avoidance of water pollution at temporary bridges at river crossings. where new access roads are to be constructed, they should not disturb the natural drainage patterns of the areas • Vegetation stripping should occur in parallel with progress of construction in order to minimize erosion and run off. • Prohibiting construction and maintenance vehicles from driving in water ways • Dismantling of bridges that are not needed after construction.	CC	Included in construc tion costs	During construction period
Groundwater (Chapter 6.2.4)	Pollution of Groundwater	• Regular maintenance of all vehicles and machines used on site is mandatory. Maintenance activities of the vehicles shall be performed in regular service stations. • Maintenance and re-fuelling of the construction equipment shall be done only on sealed and enclosed areas (careful handling and maintenance, especially of the fuel tanks). • On site storage of fuel, engine oil and lubricants in locked tanks and on sealed and shadow roofed areas. • All wastes generated through the use of fuel, engine oil and lubricants like drums and containers shall be collected and disposed of properly. • Staff training to increase awareness of waste minimization	CC	Included in construction costs	During construction period

		and appropriate waste disposal.			
Flora and Fauna (Chapter 6.2.5 and 6.2.6)	Destruction / disturbance of Flora and Fauna	• Respect of minimal ground clearance (8 m) • Skillful selective clearing towards tower location to further reduce vegetation clearing. • Minimizing and marking of the extent of lay down areas and the routing of new access roads in order to minimize impacts on vegetation and habitats. • Minimization of number and length of access tracks. • A tree cutting and planting scheme will be prepared during the design phase. During the construction phase appropriate training will be provided to the workers and penalties will be imposed for the contractor for cutting down trees for firewood • Rehabilitation of access roads not needed anymore after having finished the construction. • Instruction of the employees not to disturb animals; • Hunting shall be prohibited in general, but specially in the area around the Salang Kotal. • All contraction and maintenance activities in any natural habitat along the route should be conducted in accordance with best environmental practices to cause minimum disturbance to any habitat	CC / DABS-PMO	Included in construction costs	During final land survey and construction phase
Waste Production (Chapter 6.2.7)	Environmental pollution through waste	• Development of a Waste Management Plan within the HSE Management Plan considering following principles: (i) waste management hierarchy of avoidance-minimization-reuse-treatment-disposal; (ii) segregation of waste; (iii) minimization of construction waste by good technical planning; (iv) training of staff. • Implementation of a Waste Management System. Steel parts gained during dismantling of the old transmission line shall be reused or recycled. • Provision of construction sites and workers camps functional sanitary equipment. • Training of workers regarding proper waste and waste water handling according to environmental management requirements. • All construction materials will be reused, recycled and	CC	Included in construction costs	Prior start of construction and during construction phase

		properly disposed of. All worn out parts, equipment and empty containers must be removed from the site to a proper storage location designated by DABS-PMO. • Solid waste and garbage will be collected in bins and disposed of daily, according to a brief and basic waste management plan prepared by the contractor and approved by DABS-PMO, prior to commencement of civil works. • There will be no site- specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed of in local waste disposal sites • Any spoil generated by the construction activity should be disposed at an approved location. Littering should be prevented by providing adequate number of containers which shall be emptied regularly. • After completion of construction the site shall be properly cleaned and properly rehabilitated or re-vegetated.			
Liquid Waste (Chapter 6.2.7)	Sewage production at construction sites and workers' camps	• Prior to work initiating the contractor will present a simple sewerage management plan to DABS-PMO for approval Sewerage to be discharged into soak pits or municipal sewers and construction camps to be located away from rivers. • Septic tanks must be provided at each construction campsite • All work sites to be equipped with latrines. All toilet facilities will be located at least 300 m from water sources or existing residence.	CC	Included in construction costs	During construction period
Liquid Waste (Chapter 6.2.7)	Environmental pollution by toxic, harmful and inflammable chemicals	• Toxic, harmful and inflammable chemicals (paints, fuel, lubricants, oil and explosives) shall be stored in designated sites. • Vehicle maintenance and re-fuelling will be confined to areas in construction sites designed to contain spilled lubricants and fuels. • Spill waste will be disposed of at approved disposal sites, according to NEPA requirements.	CC	Included in construction costs	During construction period

Waste Production (Chapter 6.2.7)	Environmental pollution by PCB	• All products used for the transmission lines and substations shall be PCB free. It is highly recommended not to re-use any of the old PCB contaminated material.	CC / DABS-PMO	Included in construction costs	Before starting construction and during construction
Health and Safety (Chapter 6.2.8)	General Health and Safety impacts	• Development of an EHS Policy for the construction phase. Development of an EHS Management Plan for construction (shall include a Waste Management Plan). • Installation of an EHS Management System (EHS-MS) during the construction phase. • Clean work environment including good drainage around campsites will be provided to avoid creation of stagnant water bodies • Provide adequate sanitation and waste disposal facilities at campsites • Provide education to the workforce on prevention of communicable diseases, protective measures and disease control • Provide construction personnel with required self-protection devices such as safety helmets, belts, air plugs and other protection devices. • General operational and community safety measures for blasting activities to be detailed in construction EHS management plan.	CC	Included in construction costs	Prior start of construction
Health and Safety (Chapter 6.2.8)	Work accidents	• Installation of warning signs stating the “Danger of Electrocution” towers, substations etc. • All construction workers shall be fitted with personal protection equipment (PPE). • Alcohol and drugs shall be strictly forbidden at the construction site.	CC	Included in construction costs	During construction

Health and Safety (Chapter 6.2.8)	Noise emissions	• Optimization of transportation management to avoid needless truck drives; avoidance of truck movements in residential areas at least during night-time. • Reduction of speed of trucks crossing residential areas. Utilization of low sound power mechanical equipment like bulldozer, air compressor, concrete pumps, excavator, concrete mixer etc. whenever possible. • Regular maintenance and service of building machinery and other during construction works. • Shut down or throttling down of noisy machinery to a minimum. • Utilization of ear protection devices by the workers if they are exposed to high noise levels (included in the construction site HSE Management Plan). • All equipment shall fulfill noise control requirements of the project. • Special attention shall be given to regular maintenance of construction equipment for their best working condition. • Construction activities will be scheduled to avoid school and late night hours. • When construction takes place within 500 m from villages or within 150 m from sensitive areas such as health. centers, construction will be stopped from 21:00 to 06:00 hours. This will reduce night-time noise levels. • Work hours should be decided in consultation with local community and should avoid prayer times. • Blasting will be carried out only with the permission of PA. • Noise protection regarding blasting activities to be detailed in construction EHS management plan • Work should be restricted to specific hours within some of settlements and 150 m from sensitive receptor s (schools, hospitals and places of religious importance).	CC	Included in construction costs	Before starting construction and during construction period
Health and Safety (Chapter 6.2.8)	Injuries and death by explosion of mines	• Provide special assessment of mine clearance by Mine Action Coordination Centre of Afghanistan MACCA before any physical works	CC / DABS-PMO	Included in construction costs	Before starting construction

Health and Safety (Chapter 6.2.8)	Operational and Community Health and Safety Risks Transmission of diseases	• Development of Operational Health and Safety (OHS) and Community Health and Safety (CHS) Plans • Provision of HIV/AIDS protection equipment for workers. Implementation of health and safety workshops for construction workers. • Put in place sufficient sanitation facilities for workers. Implementation of health and safety workshops for construction workers. • Accommodation of workers in adjacent towns has the first priority. In the case that construction camps are necessary these will be located in accordance with relevant municipal authorities.	CC	Included in construction costs	Before starting construction and during construction period
Land Acquisition and Land Use (Chapter 6.2.9)	Resettlement	• see LARP Document	CC / DABS-PMO	Included in construction costs	Before construction
Gender Aspects and Vulnerable People (Chapter 6.2.10)	Gender disparities Sexual harassment	• see LARP Document • Implementation of a special livelihood program for vulnerable APs	CC / DABS-PMO	Included in construction costs	During construction
Local Workforce (Chapter 6.2.11)	General Health and Safety risks Social conflicts due to influx of workers	• Measures to prevent and sanction irregular behavior of the workers • Training of workers on Health and Safety measures in workers camps • Conflict mitigation / mediation training	CC	Included in construction costs	At the beginning of construction
Infrastructure and Traffic (Chapter 6.2.12)	Traffic disturbance Minimization of power cuts	• Ensure that traffic is not disturbed by construction through proper traffic management and signalization. • Respect of minimal ground clearance (9 m for 500 kV lines). • Ensure power supply for the population during construction. If necessary, power cuts will be done only at	CC	Included in construction costs	During construction

		day time with duration reduced to an absolute minimum.			
Physical Cultural Resources (Chapter 6.2.13)	Damage and destruction of cultural sites Impact on IBA bird species near Salang-Kotal	• Identification of cultural sites and sensitive areas for unknown historical sites (e.g. near the planned tower AP 7) together with local experts of the Ministry of Culture during final routing / land survey. • Reduction of vehicle movements as far as possible. • Shifting AP 3 about 100 m in direction of AP 2 thereby maximizing the distance to the site • By-passing or over-spanning of historical sites and graveyards. • Training of the construction workers to stop earth or foundation works immediately if there are any signs for historical or cultural sites. • Report of chance finds immediately to the Ministry of • Culture, Implementation of chance finding procedure. • Minimize construction activity impact through appropriate scheduling of construction activities in IBA and placement of towers for rerouting of line.	CC / DABS-PMO	Included in construction costs	During detailed land survey and during construction process

Classification of the impact					
High	Medium	Low	No impact	Locally positive	Regionally positive

10.1.3 Mitigation Measures for Operation and Decommissioning Phases

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for implementation
Soil and Water Resources (Chapter 6.3.1)	Soil and water pollution	• Fitting transformers with oil pits connected to a drainage system. • Provision of separate storage tanks for further treatment of the oily wastewater.	DABS	Included in operational costs	Before operation
Landscape and Visual Impacts (Chapter 6.3.2)	Permanent visual impact on the landscape	• Complete dismantling of the old transmission lines and substations without function. • Planting trees/ bushes around the new substations.	DABS	Included in operational costs	Before operation
Flora (Chapter 6.3.4)	Harm to flora and fauna through toxic substances	• For ROW clearing measures no herbicides will be used.	DABS	Included in operational costs	During operation
Fauna (Chapter 6.3.5)	Disturbance of animals during maintenance works	• Disturbance of animals shall be minimized during maintenance work by e.g. respecting breeding seasons.	DABS	Included in operational costs	During operation
Avifauna (Chapter 6.3.5)	Disturbance of the Avifauna in the area around Salang Kotal	• Placing bird diverters on the top wire to make the wires more visible to birds in areas with a high collision potential. • Placement of the conductor cables in one phase	DABS	Included in operational costs	Before operation

Waste production (Chapter 6.3.6)	Environmental pollution by solid and liquid wastes	• Development of a Waste Management Plan for the substations. • Waste water generated from staff quarters will be discharged into septic tanks. • Reduction of waste quantity. Recycling as much as possible. Proper dumping of remaining waste. • Adequate site drainage shall be performed. • Regular sewage treatment.	DABS	Included in operational costs	Before/ during operation
Health & Safety (Chapter 6.3.7)	Natural disasters	• Implementation of Emergency Response Plan	DABS	Included in design costs	During design/ construction /operation
Health & Safety (Chapter 6.3.7)	Noise emissions	• Using state-of the art conductors. • EHS Management System/ Plan shall be developed and implemented during operation of the substations to prevent health and safety risks from noise emissions.	DABS	Included in operational costs	During design/ operation
Health & Safety (Chapter 6.3.7)	Electric and Magnetic fields	• Training for workers and resident population with regard to EMF	DABS	Included in training costs	During operation
Health & Safety (Chapter 6.3.7)	Electrocution risks for maintenance workers and local people	• Installation of warning signs at towers and substations. • Installation of explanatory boards at towers that individual connection is not possible at the TL • Training of substation workers • Implementation of Operational Health and Safety (OHS) • and Community Health and Safety (CHS) Plans • Awareness raising activity among population and especially maintenance workers	DABS	Included in maintenance / operational costs	During construction/ operation

Health & Safety (Chapter 6.3.7)	Possible transformer fires	• Proper maintenance of the substations. • Installation of fire walls between the transformers. Installation of a sprinkler system. • Provision of a fire water collection system for the new switchyards. This system shall be separated from the waste water collection and treatment system of the substations. • Provision of mobile fire extinguishers, checked regularly. • Adequate training of the staff how to handle a SS fire	DABS	Included in design/ operational costs	During construction/ operation
Land Use (Chapter 6.3.8)	Restrictions on land use	• Land within the ROW can further be used for agriculture. • Compensations for damaged crops during maintenance. No herbicides will be used for ROW clearing Compensation for crop damages during maintenance	DABS	Included in operational costs	During operation
Impacts during Decommissioning Phase (Chapter 6.5)	Visual impact on the landscape Efficient resource use	• Complete dismantling of the transmission line after the life-span of minimum 50 years. • Complete dismantling of the substations after termination of operation. • Recycling of metal parts and selling as scrap metal. • Waste management procedures and disposal according to national and international standards	DABS	Included in operational costs	During decommissioning

Classification of the impact					
High	Medium	Low	No impact	Locally positive	Regionally positive

10.2 Monitoring Measures

10.2.1 Design Phase

1. 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 protected or ecological sensitive areas.
- Avoidance of settlements in the ROW to minimize resettlement activities
- Avoidance of historical and cultural sites
- Minimization of construction of access roads

2. 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.

3. 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

4. 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.

5. 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.

6. 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

7. Environmental monitoring during operation phase will be performed by DABS. The PMO will no longer exist after construction.

Monitoring results will be included in annual 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.

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

9. 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.

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

11. 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	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Line Routing (Chapter 6.1.1)	Compliance with ADB SPS Minimization of resettlement needs Avoidance of cultural sites Minimize impact on important bird area Compensation payments (see LARP) Access road design Design of river crossings	Avoidance of environmental and social impacts during line routing Avoidance of resettlement requirements Towers shall not be located near river banks and flooding areas Towers shall be located with minimum local environmental impact 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	Included in EHS Audit	EHS Consultant	During design phase, before the start of physical works
Soil and Erosion (Chapter 6.2.1)	Construction standards of access roads Temporary bridges Re-planting activities	Control of low impact construction standards Visual control of river crossings Visual control of re-planting activities	Entire line corridor	Visual control of record keeping of length built and length rehabilitated/ decommissioned after Project completion.	Periodically during construction	Included in EHS Audit	EHS Consultant	During construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Land Acquisition and Resettlement (Chapter 6.2.9)	Compensation payments Resettlement actions (see LARP)	Visual control and photo-documentation of resettlement activities and re- installation including GPS data (See LARP).	Entire line corridor and substation sites	Visual control Records Survey	After final design	See LARPF document	LARP consultant	Before construction
Air Pollution (Chapter 6.2.3)	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	Included in construction cost/ EHS Audit	EHS Consultant / PIC	During construction
Pollution of Surface Water (Chapter 6.2.4)	Good construction principles at river crossings Location of towers no closer than 50 m to flooding areas No pollution sources near rivers	Visual control of downstream water quality (turbidity) Regular measurements of up- / downstream basic parameters Plan for detailed analysis (e.g. for hydrocarbons) if pollution/ spills are suspected Visual control that any temporary bridges are properly constructed, do not cause deterioration of river bed and are dismantled after completion Control of Implementation of EMP measures	Line sections with river crossings Substation sites	Visual Control Measurements and analysis of basic surface water parameters (ph, COD, BOD, oil grease etc.) Sampling upstream and downstream of river crossings and substation sites	Periodically during construction	Included in construction cost/ EHS Audit	EHS Consultant / PIC	During Construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Pollution of Groundwater (Chapter 6.2.4)	Appropriate sewage treatment of workers camps Appropriate groundwater protection measures	Visual inspection of pollution sources Visual control of oil absorbers at SS and good construction practices during stringing, tower construction and substation construction Analysis and measurements of basic groundwater parameters	Substations Tower sites Work camps	Visual control Water analysis in wells	Periodically during construction	Included in EHS Audit	EHS Consultant / PIC	During construction
Flora and Fauna (Chapter 6.2.5)	Respect of minimal ground clearance (8 m for 500 kV lines) in design Extent of lay down areas and routing of new access roads Implementation of Avifauna protection measures	Monitoring of final design, including specifications of tower locations and height of towers, location and length of access roads Monitoring of tree cutting, enforcement of prohibition Monitoring of implementation of bird flappers/ markers	Entire line ROW	Regular visual inspection during construction Complete line survey after construction	Periodically during construction General survey after construction	Included in EHS Audit	EHS Consultant / PIC	During construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Waste Production (Chapter 6.2.7 Waste Management	Economic land use Proper topsoil management Erosion control and post construction	Visual control of economic land use, proper topsoil management, erosion control and post construction site restoration. 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 Yearly during construction, At end of construction phase	Included in EHS Audit	EHS Consultant / PIC	Before, during and after construction
Liquid Waste (Chapter 6.2.7)	Implementation of Sewerage Management Plan Septic tanks at each construction campsite 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 Sewerage Management Plan	Work camp sites Substations Lay-down Areas	Design compliance, Visual control	Regular monitoring during construction process EHS Audit	Included in EHS Audit	EHS Consultant / PIC	During construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Health and Safety (Chapter 6.2.8)	Compliance with EHS Management Plan (Work Safety / Sanitation, Noise)	Construction Site/ EHS Audit. Monitoring of noise level Protective equipment Workers camp sanitation Safe handling of hazardous materials (explosives at quarries etc.) Electrical accidents prevention Prevention of work accidents during construction	All work areas, Workers camps, Substation sites	Visual Control of EHS Management Plan implementation	Yearly during construction	Included in EHS Audit	EHS Consultant / PIC	During construction
Health and Safety (Chapter 6.2.8)	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	Included EHS Audit	EHS Consultant / PIC	During design phase, before the start of physical works
Local Workforce (Chapter 6.2.11)	Monitoring of Training of workers on Health and Safety measures in workers camps Conflict mitigation / mediation training	Monitoring of measures to prevent and sanction irregular behavior of the workers Monitoring of Implementation of Construction Manual Grievance Mechanism / related to conflicts and complaints	Workers camps Construction sites	Site visits and interviews No. of trainings conducted, content, participants Grievance Mechanism Settlement records	Yearly during construction, during EHS Audit visits	Included in EHS Audit	EHS Consultant / PIC	During construction

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Infrastructure and Traffic Safety (Chapter 6.2.12)	Traffic Safety Plan included in EHS Plan 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	Included in EHS Audit	EHS Consultant / PIC	During construction
Physical Cultural Resources (Chapter 6.2.13)	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	Included in EHS Audit	EHS Consultant / PIC	Before, during and after construction
Physical Cultural Resources (Chapter 6.2.13)	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	Included the in EHS Audit	EHS Consultant / PIC	During construction
Grievance Mechanism (Chapter 9)	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	Included in EHS Audit	EHS Consultant / PIC	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	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Soil and Water Resources (Chapter 6.3.1)	Removal of temporary infrastructure Replanting of unneeded access roads, lay down areas, and other work sites Fitting transformers with oil pits connected to a drainage system. Provision of separate storage tanks for further treatment of oily wastewater at SS	Visual control of downstream water quality (turbidity) Regular measurements of upstream / downstream basic water parameters, Plan for detailed analysis (e.g. for hydrocarbons) if pollution / spills are suspected. Visual control that any temporary bridges are properly constructed, do not cause deterioration of river bed and are dismantled after completion.	All work areas	Visual inspection	Once after construction	Included in operation cost	NEPA	After construction
Landscape and Visual Impacts (Chapter 6.3.2)	Complete dismantling of the old TL and SS without function. 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	Included in operation cost	DABS Environment Department (ED)	After construction
Flora (Chapter 6.3.4)	No use of herbicides for ROW clearing	Supervision of maintenance procedures	Entire ROW	Periodical Inspection	Yearly during operation	Included in operation cost	DABS Environment Department / NEPA	During operation

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Fauna (Chapter 6.3.5)	Disturbance of animals during maintenance work Prohibition of hunting	Supervision of maintenance procedures	Entire ROW	Periodical Inspection	Yearly during operation	Included in operation cost	DABS ED / NEPA	During operation
Waste Production (Chapter 6.3.6)	Development of a Substation Waste Management Plan Reduction of waste quantity, recycling as much as possible. Proper dumping of remaining waste. Regular sewage treatment. Run off	Monitoring of Waste Management Plan and control of implementation	Substation Sites	Periodical Inspection	Yearly during operation	Included in operation cost	DABS ED/ NEPA	During operation
Health and Safety (Chapter 6.3.7)	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	Included in operation cost	NEPA / DABS ED EHS Auditor	During operation
Health and Safety (Chapter 6.3.7)	Electric and Magnetic fields	Regular EMF measurements (after purchase of EMF meters and related training for handlers) Control of encroachment of safety zone	Substation Sites	Regular measurements under full load	Yearly during operation	Included in operation and training cost	DABS ED	During operation

Issue / Potential Impact	Parameters to be monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Land Use ROW clearing and maintenance (Chapter 6.3.8)	Further agricultural land use in the ROW Use rights and use practices Compensation payment for damaged crops during maintenance. No use of herbicides for ROW clearing	Monitoring of land use possibilities, compensation payments, grievance mechanism	Entire line ROW	Periodical Survey	Yearly during operation	Included in operation cost	DABS ED	During operation
Impacts during Decommissioning Phase (Chapter 6.4)		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)	Provision for decommissioning included in operation costs	DABS	After life span of the project

10.3 Costs of EMP Implementation

A preliminary cost estimate of the EMP is given in Table 10-3.

Measure	Costs
Mitigation measures during design	10,000
Mitigation measures during construction	To be included in the construction cost
Mitigation measures during construction for compensations and resettlement needs	See LARP
Mitigation measures during operation and maintenance	To be included in operation budget
Baseline ornithological survey in vicinity of Salang-Kotal to rationalize line routing to minimize/avoid impact on birds	20,000
Planting of trees and other landscaping activities	20,000
Mitigation measures during construction including construction of storage tank for oil	10,000
Monitoring Measures EHS Audit	200,000
Monitoring Analysis of Water, Noise, Air	20,000
Training for DABS EHS staff	50,000
Sub-Total	**330,000**
Contingency 10%	**33,000**
Total Cost	**363,000**

Table 10-3: Cost of the EMP implementation (preliminary estimation)

The costs for the implementation of the EMP will be part of counterpart financing by the EA..

11. Implementation Arrangements and Capacity Building

11.1 Institutional Arrangements and Responsibilities

1. 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*.

2. 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.

11.1.2 DABS

3. 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).

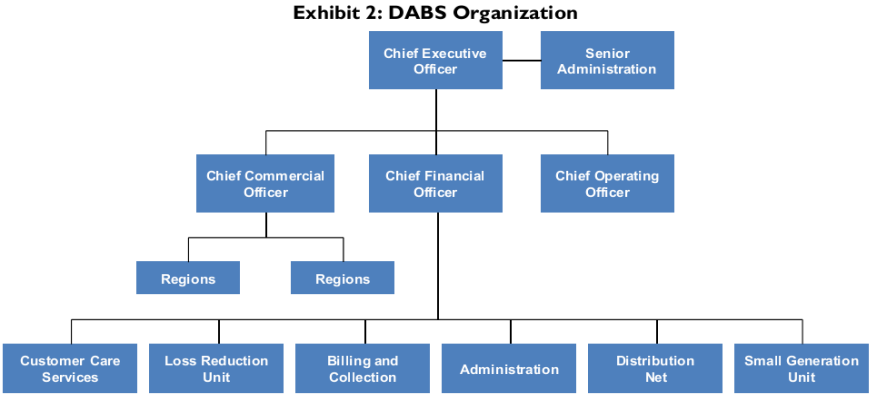


Figure 11-1: Organizational structure DABS

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

11.1.3 NEPA

12. 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.

11.1.4 ADB

13. 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.

14. 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.

15. 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.

11.1.5 Construction Contractor (CC)

16. 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.

17. 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.

11.1.6 Project Implementation Consultant

11. 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

12. 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).

13. 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.

12. Overall Findings and Recommendations

1. 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 and substations (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.

2. 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.

3. The impact on physical cultural resources (historical and cultural sites) shall be minimized. 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.

4. The proposed transmission line including the suggested bypasses will not cross Protected Areas. At river crossings special care must be exercised in order to avoid water pollution and river bank erosion. The line will cross an unprotected Important Bird Area. In this crossing section protection measures (bird diverters, electrocution protection, and power lines in one level) shall be implemented. It shall also be considering the possibility for a deviation of the line routing during the detailed engineering phase.

5. 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 and Social 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.

6. 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.

7. Within DABS an Environmental and Social Department does not currently exist. It is recommended to establish 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 substation.

8. In cooperation with the ADB and the design monitoring experts, DABS will give the directive to redesign sections that have been identified within the EIA or are identified during the course of the design process.

9. 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.

10. 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/ LARP as integral part of the tender documents. A review of the final design by independent social and environmental experts is recommended.

13. Conclusion

1. Due to an elaborate line routing and substation siting process in close cooperation between the technical and the environmental survey experts, and based on recent high-resolution (50 cm) satellite scenes, most significant impacts, especially resettlement, could be widely avoided in these early planning stages. If the contractor who conducts the detailed design follows this approach, resettlement could be further diminished.

2. One of the key recommendations of the IEE and the provisions of the EMP are that no SF_6 containing equipment should be used for transformers and switchgears in the Arghandy substation.

3. The impact mitigation measures are proposed to minimize social and environmental impacts. If all proposed mitigation measures are implemented, the Transmission Line from Dashte Alwan to Arghandy Substation (SS) can be constructed with a minimum of adverse effects on the natural and human environment.

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15. Annexes

15.1 Rapid Environmental Assessment (REA) 2012

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:	AFG: North South Power Transmission Enhancement Project
Sector Division:	Energy Division (CWEN)

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site	**X**		Silk road route is crossed at some occasions, known historical monuments are located nearby, chance find procedure to be implemented.
▪ Protected Area		**X**	
▪ Wetland		**X**	
▪ Mangrove		**X**	
▪ Estuarine		**X**	
▪ Buffer zone of protected area		**X**	
▪ Special area for protecting biodiversity		**X**	
B. Potential Environmental Impacts Will the Project cause…			
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?		**X**	More than 90% of the transmission line will be parallel to existing 220 kV line alongside the highway corridor. Landscape is already impacted.
▪ encroachment on precious ecosystem (e.g. sensitive or protected areas)?		**X**	
▪ Alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?	**X**		River systems and several streams are crossed by the proposed transmission line, construction of temporary bridges, avoidance/mitigation possible.

Screening Questions	Yes	No	Remarks
▪ Damage to sensitive coastal/marine habitats by construction of submarine cables?		X	
▪ Deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	X		Short term workers camps to be constructed. EHS management required to prevent pollution of rivers and streams
▪ Increased local air pollution due to rock crushing, cutting and filling?	X		Construction of access roads, towers, foundations will have a temporary impact.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		In particular, risks related to electrocution/ EMF and work accidents during construction and maintenance. Also at some points existing 220 kV towers might need to be displaced.
▪ Chemical pollution resulting from chemical clearing of vegetation for construction site?		X	
▪ Noise and vibration due to blasting and other civil works?	X		The line crosses some 20 kms in Salang mountain pass in Hindukush mountains, where some blasting work might need to be undertaken for civil and construction works
▪ Dislocation or involuntary resettlement of people?	X		The proposed line will cross some settlement areas between Dashte Alwan and Kabul, although both substations are in suburbs.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?		X	
▪ hazardous driving conditions where construction interferes with pre-existing roads?	X		The proposed line would cross existing road and is located along the existing highway. Signalization of construction sites is necessary, changes of construction site as work progresses.
▪ creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?		X	
▪ dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?	X		Resettlement of all people from 60m ROW required.
▪ Environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?		X	No. The proposed line crosses desert landscape and mountain ranges with less high vegetation.
▪ Facilitation of access to protected areas in case corridors traverse protected areas?		X	
▪ Disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		X	
▪ Large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Special workers camps will be established for short time construction in each section. Local labor will be employed in most cases.
▪ Social conflicts if workers from other regions or countries are hired?	X		Social conflicts between skilled workers and local unskilled labor cannot be ruled out but will be mitigated as has been done in earlier and ongoing construction of such transmission lines in AFG

Screening Questions	Yes	No	Remarks
▪ Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		EHS management system including training for workers required.
▪ Risks to community safety associated with maintenance of lines and related facilities?	X		Risks of electrocution therefore safety measures for operation phase required.
▪ Community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?	X		No permanent human presence within ROW will be allowed due to EMF
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		X	No particular increase in safety risks with normal construction principles currently implemented in AFG
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., high voltage wires, and transmission towers and lines) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	X		Risks of electrocution/EMF to be considered during operational phase, no self-made local connections to the proposed transmission line are possible.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?	X		General earthquake risk in country but no particular risk for project area. However, some 20 kms line pass through Salang pass at 3500 m where possibility of avalanches in winter months (Nov-Mar) cannot be ruled out.
▪ Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost?	X		Work in 20 kms of Salang pass would be undertaken during summer months (Apr-Oct) to avoid unnecessary delays due to harsh weather conditions
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?	X		Incidence of vulnerability and tense social relations between different population groups and security challenges created by Taliban and other anti-state elements.
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)?		X	

Environment	Natural Hazards and Climate Change
Arid/Semi-arid and desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.
River valleys/ deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.
Small islands	Small islands generally have land areas of less than 10,000km^2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.

15.2 Electric and Magnetic Fields

15.2.1 General Considerations

Considering low frequent (50 Hz) alternative currencies (AC) as used in power transmission, not electromagnetic waves are of interest but we have to look at the strength of the generated electric and the magnetic field separately. A short calculation shows that in case of a 50 Hz alternative currency the wavelength of the electromagnetic wave is 6,000 km.

$c = \lambda \times f \quad \Rightarrow \quad c / f = \lambda \quad \Rightarrow \quad 300{,}000\ \text{kms}^{-1} / 50\ \text{Hz} = 6{,}000\ \text{km}$

c = speed of light, λ = wavelength, f = frequency

Such wave lengths are not of relevance for men. An electromagnetic wave of such a length cannot interfere with a human body that is only about 1.80 m.

However, considering mobile phones, using frequencies in the range of GHz, the associated wavelengths are of some mm and have to be considered as electromagnetic fields.

Being in operation the strength of electric and magnetic fields is one of the permanent effects on the environment especially for people living e.g. along transmission lines or working in substations (mainly open air substations). These fields can have effects on organism but can also interfere with other technical installations.

Because at present extensive discussions take place about effects of electromagnetic fields on the health all over the world especially related to the use of mobiles, this issue should be considered comprehensively in HSE studies to such projects. Doing so, it has to be clarified that we are talking about electromagnetic fields only in high frequency ranges as used by mobiles.

In power transmission 50 Hz (low frequency) is used. Here, the generation of electromagnetic fields is not relevant because of its large amplitude. Using 50 Hz we have to consider both electric fields and magnetic fields separately. The electric field exists permanently if voltage is impressed, whereas the magnetic field only results if actual current is flowing.

In Annex 0 some results of recent scientific researches concerning biological and health effects of electric and magnetic fields are given. Annexes 0 describes internationally used standards and limit values and in Annex 0 an excerpt is given about the guideline of the internationally accepted International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Regarding the Project, it has to be stated very clearly that the selected design of the proposed GIS indoor substations is directed to reduce electric and magnetic fields to an absolute minimum. Through their metal-clad construction, GIS substations

Effectively shield the electrical field from the surroundings. Thus, the electrical field outside GIS substations is practically negligible. There is no exceedance of electric and/or magnetic field, as discussed in the Annexes, expected. According to measurements in other similar projects the fields around the substations will be far below any internationally excepted standard. The standards stipulated below, however, can become relevant in case of high voltage overhead lines if, settlement are closely bypassed and within high voltage substations for workplaces.

Internationally used standards/limit values concerning electric and magnetic fields (50 Hz) for the public and at working places

Source	El. Field strength [kV/m]	Magn. Flux density [µT]
ICNIRP recommended 50/60 Hz Reference levels for exposure to time-varying electric and magnetic fields (unperturbed r.m.s. values) occupational exposure general public	10	500
Limit values according to the European Directive 2004/40/EC	10	500
Limit (r.m.s) value as per 26. BimSchVer 12/96 general public up to 24 hours /day		
Limit values as per VDE V 0848 Part 4/A3 at 50 Hz r.m.s. values for equivalent field strength in exposure range 1 for exposure times up to 1 h/d	30	4,240
r.m.s. values for equivalent field strength in exposure range 1 for exposure times up to 2 h/d	30	2,550
r.m.s. values for equivalent field strength in exposure range 1 for continuous exposure	21.32	1,360
r.m.s. values for equivalent field strength in	6.67	424

r.m.s. = root mean square (value)

Exposure range 1 includes monitored areas, e.g. operating zones, areas monitored by operators generally accessible areas, in which, owing to the operating mode or the length of stay, it is guaranteed that exposure only occurs for a short period of time.

Exposure range 2 includes all areas in which not only short-term exposure can be expected, for example: areas containing residential and social buildings, individual residential sites, parks and facilities for sport, leisure and relaxation, operating zones where a field generation is not expected under normal conditions

(ICNIRP=International Commission on Non-Ionising Radiation Protection, BimSchVer=German Bundesimmissionsschutzverordnung, VDE=Verband Deutscher Elektrotechniker e.V., Cenelec=European Committee for Electrotechnical Standardisation)

As it can be seen from the data given above, limit values arising from different organizations and used in different countries can vary. The core problem is that up to now nobody knows exactly what the effects of electric and magnetic fields on the biology are and what the best limit values are to protect human health as discussed in Annex 0.

However, some generally accepted recommendations can be given. At the moment, it is internationally agreed that for the public and for permanent exposure, the electric field must not exceed 5 kV/m and the magnetic flux density must not exceed 100 µT. This means, outside the fence of substations 5 kV/m and 100 µT respectively is the limit. The same is valid for settlements/houses along transmission

lines. The corridor for transmission lines has to be wide enough that the electric and magnetic field strength at the edge of this corridor is less than the limits mentioned above.

15.2.2 ICNIRP Guidelines and Statements (Excerpt)

Guidelines for Limiting Exposure to Time-varying Electric, Magnetic, & Electromagnetic Fields

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionizing radiation (NIR), which examined the problems arising in the fields of protection against the various types of NIR. At the IRPA Congress in Paris in 1977, this working group became the International Non- Ionizing Radiation Committee (INRC).

In co-operation with the Environmental Health Division of the World Health Organization (WHO), the IRPA/INIRC developed a number of health criteria documents on NIR as part of WHO's Environmental Health Criteria Program, sponsored by the United Nations Environment Program (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR.

At the eighth International Congress of the IRPA (Montreal, 18-22 May 1992), a new independent scientific organization – the International Commission on Non- Ionizing Radiation Protection (ICNIRP) – was established as a successor to the IRPA/INRC. The functions of the Commission are to investigate the hazards that may be associated with the different forms of NIR, develop international guidelines on NIR exposure limits, and deal with all aspects of NIR protection.

Biological effects reported as resulting from exposure to static and extremely low frequency (ELF) electric and magnetic fields have been reviewed by UNEP/WHO/IRPA. Those publications and a number of others provided the scientific rationale for the Guidelines for limiting Exposure to time varying Electric, Magnetic, and Electromagnetic Fields.

The main objective of the guidelines is to establish the limiting of EMF exposure that will provide protection against known adverse health effects.
An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect.

Studies on both direct and indirect effects of EMF are described; direct effects result from direct interaction of fields with the body, indirect effects involve interactions with an object at a different electric

potential from the body. Results of laboratory and epidemiological studies, basic exposure criteria, and reference levels for practical hazard assessment are discussed, and the guidelines presented apply to occupational and public exposure.

The guidelines will be periodically revised and updated as advances are made in identifying the adverse health effects of time-varying electric, magnetic, and electromagnetic fields. In establishing exposure limits, the Commission recognizes the need to reconcile a number of differing expert opinions. The validity of scientific reports has to be considered, and extrapolations from animal experiments to effects on humans have to be made.

There is insufficient information on the biological and health effects of EMF exposure of human populations and experimental animals to provide a rigorous basis for establishing safety factors over the whole frequency range and for all frequency modulations. In addition, some of the uncertainty regarding the appropriate safety factor derives from a lack of knowledge regarding the appropriate dosimetry.

The restrictions in the guidelines were based on scientific data alone; currently available knowledge, however, indicates that these restrictions provide an adequate level of protection from exposure to time-varying EMF. Two classes of guidance are presented:

Basic restrictions
Restrictions on the effects of exposure are based on established health effects and are termed basic restrictions. Protection against adverse health effects requires that these basic restrictions are not exceeded.

Reference levels
Reference levels of exposure are provided for comparison with measured values of physical quantities; compliance with all reference levels given in these guidelines will ensure compliance with basic restrictions. If measured values are higher than reference levels, it does not necessarily follow that the basic restrictions have been exceeded, but a more detailed analysis is necessary to assess compliance with the basic restrictions.

Basic restriction
Basic Restrictions on exposure to time varying electric, magnetic, and electromagnetic fields are based directly on established health effects.

Depending upon the frequency of the field, the physical quantities used to specify these restrictions are current density (J), specific energy absorption rate (SAR), and power density (S). Only power density in air, outside the body, can be readily measured in exposed individuals.

Different scientific bases were used in the development of basic exposure restrictions for various frequency ranges. For electric power transmission and distribution only the low frequency (50 Hz) fields are relevant which are indicative of much more slighter biological effects than fields caused by high-frequency energy. This is the

reason that the basic restrictions for the range of frequencies between 1 Hz and 10 MHz are provided exclusively on current density to prevent effects on nervous system functions. The basic restrictions for current densities,whole body average SAR, and localized SAR for frequencies between 1 Hz and 10 GHz are presented in Table 5-1.

The occupationally exposed population consists of adults who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions. By contrast, the general public comprises individuals of all ages and of varying health status, and may include particularly susceptible groups of individuals.

In many cases, members of the public are unaware of their exposure to EMF. Moreover, individual members of the public cannot reasonably be expected to take precautions to minimize or avoid exposure. It is these considerations that underlie the adoption of more stringent exposure restrictions for the public than for the occupationally exposed population.

Table 0-1: Basic restrictions for time-varying electric and magnetic fields for frequencies up to 10 GHz

Exposure Characteristics	Frequency Range	Current Density f. Head and Trunk ($mA\ m^{-2}$) (rms)	Whole-Body average SAR ($W\ Kg^{-1}$)	Localized SAR (Head + Trunk) ($W\ Kg^{-1}$)	Localized SAR (limbs) ($W\ Kg^{-1}$)
Occupational	up to 1 Hz	40	-	-	-
Exposure	1 – 4 Hz	20/f	-	-	-
	4 Hz – 1 KHz	**10**	-	-	-
	1 -100 KHz	f/100	-	-	-
	100 KHz-10MHz	f/100	0.4	10	20
	10 MHz- 10 GHz	-	0.4	10	20
General Public	up to 1 Hz	8	-	-	-
Exposure	1 – 4 Hz	8/f	-	-	-
	4 Hz – 1 kHz	**2**	-	-	-
	1 –100 kHz	f/500	-	-	-
	100 kHz-10MHz	f/500	0.08	2	4
	10 MHz- 10 GHz	-	0.08	2	4

*** Notes:**

1. f is the frequency in hertz.

2. Because of electrical inhomogeneity of the body, current densities should be averaged over a cross- section of 1 cm2 perpendicular to the current direction.

3. For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by 2 (1,414). For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated as f = 1/(2t).

4. For frequencies up to 100 kHz and for pulsed magnetic fields, the maximum current density associated with the pulse can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.

5. All SAR values are to be averaged over any 6-min period.

6. Localized SAR averaging mass is any 10 g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure.

7. For pulses of duration tp the equivalent frequency to apply in the basic restrictions should be calculated as f = 1/(2tp). Additionally for pulsed exposures in the frequency range 0.3 to 10 GHz and for localized exposure of the head, in order to limit or avoid auditory effects caused by thermoelastic expansion, an additional basic restriction is recommended. This is that the SA should not exceed 10 mJ Kg-1 for workers and 2 mJ kg-1 for the general public, averaged over 10 g tissue.

Reference levels

These levels are provided for practical exposure assessment purposes to determine whether the basic restrictions are likely to be exceeded. Some reference levels are derived from relevant basic restrictions using measurement and/or computational techniques, and some address perception and adverse indirect effects of exposure to EMF.

The derived quantities are electric field strength (E), magnetic field strength (H), magnetic flux density (B), power density (S), and currents flowing through the limbs (l).

Quantities that address perception and other indirect effects are contact current (lc) and, for pulsed fields, specific energy absorption (SA). In any particular exposure situation, measured or calculated values of any of these quantities can be compared with the appropriate reference level.

Compliance with the reference level will ensure compliance with the relevant basic restriction. If the measured or calculated value exceeds the reference level, it does not necessarily follow that the basic restriction will be exceeded. However, whenever, a reference level is exceeded it is necessary to test compliance with the relevant basic restriction and to determine whether additional protective measures are necessary. The reference levels are intended to be spatially averaged values over the entire body of the exposed individual, but with the important proviso that the basic restrictions on localized exposure are not exceeded.

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.

Table 0-2 shows the related reference levels for occupational and for general public exposure. ICNIRP notes that the industries causing exposure to electric and magnetic fields are responsible for ensuring compliance with all aspects of the guidelines.

Table 0-2: Reference levels for occupational and general public exposure to time- varying electric and magnetic fields (unperturbed rms values)

	Frequency Range	E-FIELD Strength ($V\ m^{-1}$)	H-FIELD Strength ($A\ m^{-1}$)	B-FIELD Strength (μT)	Equivalent plane wave power density S_{eq} ($W\ m^{-2}$)
Occupational	up to 1 Hz	-	1.63×10^5	2×10^5	-
Exposure	1 – 8 Hz	20000	$1.63 \times 10^5 / f^2$	$2 \times 10^5 / f^2$	-
	8 – 25 Hz	20000	$2 \times 10^4 / f$	$2.5 \times 10^4 / f$	-
	0.025 – 0.82 kHz	**500/f**	**20/f**	**25/f**	-
	0.82 – 65 kHz	610	24.4	30.7	-
	0.065 – 1 MHz	610	1.6/f	2.0/f	-
	1 – 10 MHz	610/f	1.6/f	2.0/f	-
	10 – 400 MHz	61	0.16	0.2	10
	400 – 2000 MHz	$3f^{1/2}$	$0.008f^{1/2}$	$0.01f^{1/2}$	f/40
	2 – 300 GHz	137	0.36	0.45	50
General Public	up to 1 Hz	-	3.2×10^4	4×10^4	-
Exposure	1 – 8 Hz	10000	$3.2 \times 10^4 / f^2$	$4 \times 10^4 / f^2$	-
	8 – 25 Hz	10000	4000/f	5000/f	-
	0.025 – 0.8 kHz	**250/f**	**4/f**	**5/f**	-
	0.8 – 3 kHz	250/f	5	6.25	-
	3 – 150 kHz	87	5	6.25	-
	0.15 – 1 MHz	87	0.73/f	0.92/f	-
	1 – 10 MHz	$87/f^{1/2}$	0.73/f	0.92/f	-
	10 – 400 MHz	28	0.073	0.092	2
	400 – 2000 MHz	$1.375f^{1/2}$	$0.0037/f^{1/2}$	$0.0046f^{1/2}$	f/200
	2 – 300 GHz	61	0.16	0.20	10

1. f is the frequency in hertz..
2. Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz. Seq, E2, H2, and B2 are to averaged over any 6-min period.
4. For peak values at frequencies up to 100 kHz see Table 13-1, note 3.
5. For peak values at frequencies exceeding 100 kHz see Figs.1 and 2. Between 100 kHz and 10 MHz, peak values for the field strengths are obtained by interpolation from the 1,5-fold peak at 100 kHz to the 32-fold peak at 10 MHz. For frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width does not exceed 1000 times the Seq restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz, Seq, E2, H2, and B2are to be averaged over 68/f 1.05–min period (f in GHz).
7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields.
Electric shock from low impedance sources is prevented by established electrical safety procedures for such equipment.
Perception of surface electric charges will not occur at field strengths less than 25 kVm-1. Spark discharges causing stress or annoyance should be avoided.

15.2.3 Biological and Health Effects of Electric and Magnetic Fields

In precise physical terms when speaking about electrical facilities, a distinction has to be made between two types of fields: the electric and the magnetic field.

The **electric field** denotes the difference in electric potential measured as a voltage between two points one meter apart. If an electric current flows in a conductor, a magnetic field will always build up around it. The electric field is generated by the line voltage on the conductors. The electric field of power lines depends on the voltage, on the circuit numbers, on the design of the circuits and on the design of the cable

itself. Its strength lessens rapidly according to the distance. Normally, the field is strongest in the middle of the line span where the phase conductors have the greatest slag. The strength of the electric field is expressed in volts per meter, and in the power-line context usually in kV/m. Strong 50 Hz electric fields occur mainly in high voltage installations, i.e. inside switchyards and below transmission lines. Electric fields are shielded by objects which are earthed, such as trees, buildings etc.

The magnetic field around a power line is generated by the current in the conductors. Since the current is proportional to the line‟s load, the magnetic field often varies both over 24 hours and from one season to another. The magnetic field under a power line is strongest in roughly the same areas as the electric field.

The magnetic field is expressed in terms of teslas [T] (1 T = 1 Vs/m2), which is a measure of the field‟s flux density. In the context of power lines, microteslas [µT] are used. An older unit, Gauss [G], is used in e.g. USA (1 mG = 0.1 µT). Magnetic fields are not shielded by walls and roofs. Around power lines they are often weaker than those one may come into contact with in many other context in everyday life at work.

There follows a brief discourse on the status of knowledge concerning the influence of 50 Hz electromagnetic fields on the environment. Investigations and research on these effects of low frequency electromagnetic fields have been more intensive worldwide since the early seventies.

In the Federal Republic of Germany, with the establishment of the subcommittee “Electric and magnetic fields” in the Association of German Electricians (VDE), a forum for discussions has been created, in which an intensive exchange of experience and ideas takes place.

The International Radiation Protection Association (IRPA), a body working under the auspice of the World Health Organization (WHO), has initiated activities concerned with non-ionizing radiation by forming a working group in 1974. At the IRPA Congress in Paris in 1977, this working group became the International Non-Ionizing Radiation Committee (INRC). An excerpt of the “Guidelines for limiting exposure to time varying electric, magnetic, and electromagnetic fields” is given in Annex 0**.**

Magnetic fields have the property of penetrating the human organism. Low- frequency fields which arise in connection with 50 Hz alternating current can cause tissues and cells to enter into an excited state due to energy absorbed by the human body. If fields are intense, this can result in stimulation of nerves, muscles and organs.

The above effects are felt especially in the higher frequency range.

The general rule is the higher the cycling rate of the alternating electromagnetic field, the more its effects become relevant to health.

High-frequency fields in the range above 30,000 Hz, which occur, for example in communications in the form of radio waves, have a disproportionately high significance for the human organism, as these give rise to heating effects.

The biological effects of electric and magnetic fields depend primarily on their field strengths. Greater biological impact is ascribed to magnetic fields than to electric fields. Electric fields can be screened relative easily, whereas magnetic fields are highly penetrating. Though electricity has intensively been used in industry and household for more than a century, as shown above, thorough scientific research on biological effects of electromagnetic fields have been conducted only in the last 25 years.

Today, among scientists there is still a considerable difference of opinion as to the degree of possible detrimental health influence caused by these fields. There are several investigations and publications reporting a severe influence of electromagnetic fields, but the discussion about biological and health effects is still going on. The International Council on Large High Voltage Electric Systems (CIGRE), a permanent non-governmental and non profit-making international association based in France, publishes from time to time summaries of latest researches on bio- and health effects of electric and magnetic fields. An excerpt of the actual results is given below:

Cancer
In October 1996 a large-scale evaluation was published in the U.S. (U.S. National
Research Council EMF Committee, 1996) reviewing more than 500 studies from 1979 on. The report came to the conclusion that „no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields (EMF) are a threat to human health“.
The same conclusion was drawn by WHO (Radiation and Environmental Health Department of Protection of the Human Environment) in 2002 as discussed in the publication „Establishing a Dialogue on Risks from Electromagnetic Fields“

Some other epidemiological studies have demonstrated statistical associations between childhood cancer, especially leukemia, and proximity to power lines. However, childhood leukemia is a rare illness and the number of cases is very small, what makes statistical statements very difficult. In addition, a statistical association is not synonymous with proof that a causal connection exists.

Although several studies show that leukemia and brain tumors are more common in „electrical occupations“, animal-experiment studies have failed to link exposure to electric or magnetic fields with an elevated cancer risk.

However, electric and magnetic fields have an influence on melatonin rhythm. Melatonin is a hormone formed in the pineal gland of the brain and from that hormone it is known that it plays a role in the

development of certain hormone- dependent types of cancer, such as breast cancer.

Reproduction

There is no evidence that electric or magnetic fields have any impact on fertility, miscarriage, malformations or other reproduction parameters in either animals or human beings.

Effects on nervous system

Soviet and Swedish studies suggest various symptoms, such as headache, tiredness, insomnia, mild depression, etc. arise among male switchyard workers. A possible mechanism can be the proven influence of electric and magnetic fields on melatonin excretion. Melatonin also controls sleep, wakefulness, and mood. One entirely new research field is the possible connection of magnetic fields and certain forms of dementia, such as Alzheimer's disease. However, no actual direct influence of magnetic and electric fields on the diseases in human beings noted above has yet been demonstrated in scientific experiments or investigations.

Conclusion

The descriptions given above show that much research has been undertaken with contradictory results and results that are often hard to interpret. However, some large scale research is now underway in Germany, USA, Canada, UK, and Sweden, and it is expected that knowledge in this field will be grow substantially over the next few years.