Initial Environment Examination (IEE)

Project Number: 46392-002
August 2020

Islamic Republic of Afghanistan: North-South Power Transmission Enhancement Project (Additional Financing)

Prepared by Da Afghanistan Breshna Sherkat (DABS) for the Asian Development Bank.

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CURRENCY EQUIVALENTS
(as of August 2020)

Currency unit	–	Afghani (AF)
AF1.00	=	$0.013
$1.00	=	AF76.76

ABBREVIATIONS

ACEP	–	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
BOD	–	Biochemical Oxygen Demand
CBD	–	Convention on Biological Diversity
CC	–	Construction Contractor
CEO	–	Chief Executive Officer
CITES	–	Convention on International Trade in Endangered Species
COD	–	Chemical Oxygen Demand
COI	–	Corridor of Influence
DABS	–	Da Afghanistan Breshna Sherkat (National Power Utility)
DPADM	–	Division for Public Administration and Development Management
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
GRC	–	Grievance Redress Committee
GoA	–	Government of Afghanistan
GIRoA	–	Government of the Islamic Republic of Afghanistan
GRM	–	Grievance Redress Mechanism
IA	–	Implementing Agency
IBA	–	Important Birds Area
ICIMOD	–	International Centre for Integrated Mountain Development
ICLES	–	International Conference on Law, Environment and Society

IEC	–	International Electro-technical Commission
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
IUCN	–	International Union for Conservation of Nature
IUFRO	–	International Union of Forest Research Organizations
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
MoMP	–	Ministry of Mines and Petroleum
MRRD	–	Ministry of Rural Rehabilitation and Development
MWh	–	Megawatt-hour
µT	–	Microtesla
NEPA	–	National Environmental Protection Agency
NEPS	–	Northern Electric Power System
NEQS	–	National Environment Quality Standards
NGO	–	Non-Governmental Organization
OHL	–	Overhead Line
PA	–	Protected Area
PAP	–	Project Affected Person
PCR	–	Physical Cultural Resources
PeK	–	Pol-e-Khumri
pH	–	Potential of Hydrogen
PIC	–	Project Implementation Consultant
PMO	–	Project Management Office
PMU	–	Project Management Unit
PUE	–	Transmission Line Standard for Soviet Union
ROW	–	Right of Way
SEA	–	Strategic Environmental Assessment
SF6	–	Sulfur hexafluoride
SMEC	–	Snowy Mountains Engineering Corporation
SPS	–	Safeguard Policy Statement
SS	–	Substation
STD	–	Sexually transmitted diseases
TL	–	Transmission Line
TOR	–	Terms of Reference

UN	–	United Nations
UNCCD	–	United Nations Convention to Combat Desertification
UNEP	–	United Nations Environment Program
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
USD	–	United States Dollar
WB	–	World Bank
WHC	–	World Heritage Convention
WWF	–	Worldwide 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., FY2017 ends on 21 December 2017.

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

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1. Executive Summary

1.1. Introduction

1. The Islamic Republic of Afghanistan (Afghanistan) with Da Afghanistan Breshna Sherkat (DABS) as the executing agency (EA), has requested the financial assistance of the Asia Development Bank to implement the North South Power Transmission Enhancement Project (the project). The planned transmission line Project Pul-e-Khumri to Kabul in Afghanistan comprises the construction of a double circuit 500 kV from Pul-e-Khumri to Kabul overhead line (OHL) with a total length of 238 km and one substation with 400 MVA 500/220 kV transformers in Kabul SW (Arghundy) and Construction of Incoming Line Bay and two Reactors inside Dashte Alwan 500 kV SS for connection of 500 kV transmission line from Turkmenistan to Dashte Alwan Substation. This project is part of a pool of several projects, which have the objective of importing electricity from Central Asian countries to Afghanistan (AFG).

2. The Project component in Afghanistan has been classified by the ADB as a Category B Project, for which an Initial Environmental Examination (IEE) has to be carried out.

3. The Present IEE has been updated due to the additional financed components (construction of line bay and two reactors inside the Dashte Alwan Substation) and subsequent change in scope of the project. The present IEE study assesses the environmental (ecological and social) impacts of the Project for the detailed design stage based on the IEE prepared by Fitchner in 2012 in accordance with the relevant ADB guidelines. The basis of this study was intensive field surveys but also collection and verification of information from secondary sources particularly the census statistics of the project location, interpretation of recent satellite pictures and other available maps and data for the investigation area was made.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 one 500/220 kV substation at Arghundy and Construction of Incoming Line Bay and two Reactors inside Dashte Alwan 500 kV SS for connection of 500 kV transmission line from Turkmenistan to Dashte Alwan.

4. The final approved detailed line routing design was determined regarding technical, economic, environmental and social aspects. The detailed design including final land survey is completed by the construction contractor and is approved by the Client/ Consultant and the ADB.

5. For the 500 kV line (first and second line sections), the Right of Way (ROW) is of 50 m (25 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.

6. 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.

7. Arghundy substation (SS) is located in east of the main road (highway) Kabul-Kandahar and the final tower is just about 30 m away from the road. For theArghundy sub-station, DABS has purchased additional land just adjacent to existing 220 kV (SMEC) Arghundysub-station. Therefore, the existing sub-station of Arghundy will be extended further. The area is uninhabited.

8. Therefore, the scope of this assessment is the planned double circuit 500kV overhead line with a total length of 238 km and the construction of one substation in Kabul SW (Arghundy) and construction of line-bay and two reactors at Dashte Alwansubstation). This assessment has been conducted at the detailed design stage based on the IEE prepared by Fitchner in 2012. And updated by Byuksun in 2017 and subsequently updated in 2020 May after the additional financial component (construction of line bay and two reactors inside the Dashte Alwan Substation.

1.2 Description of the Environment

9. The planned transmission line traverses three provinces of Northern Afghanistan - Kabul, Parwan and Baghlan. The characteristics of the Investigation area that have higher importance for the IEE are:

- According to the Scale of Richter, the earthquake hazard is of 6.0 local magnitudes (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.
- The line corridor crosses a semi-desert, mountainous and agricultural 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 legally unprotected IBA (Salang Kotal) with a diversity of at least 33 species of Himalayan breeding birds and passage birds.
- The villages passing by the line corridor are small and consist of 10 to 30 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.
- People suffer from food and water-borne diseases. The biggest concern is the high child mortality. The presence of drug problems in the investigation area cannot be excluded. Only 60 % of the population living along the line corridor has access to health facilities.
- The women has limited role in decision-making process at household level.
- The major occupation in the Investigation area is agriculture. Section 1 from Arghundy 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.

1.3 Environmental Impacts and Mitigation

10 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.

11 The following aspects decisively contribute to this assessment:

- The landscape of the investigation area consists of semi-desert, mountainous and agricultural area. Therefore, there is possibility of temporary air pollution; however, the towers and access road construction do not pose high risk regarding soil erosion and sand deflation.
- The groundwater in the Investigation area is located relatively deep. The Project is situated in a (semi-) desert and agriculture land; therefore, the transmission line does not cross-woodlands. The occurring small sized trees do not necessarily need to be cut during the land survey and the stringing procedure.
- The transmission line is not located in or near a protected area but trespasses a legally unprotected IBA.

12 The following potential impacts are highlighted:

- Surface water pollution and riverbed destruction due to river crossings (to be avoided);
- Impacts on worker's and community health and safety during construction and operation e.g. regarding work accidents, noise emissions, sanitary conditions, risk of electrocution, presence of land mines and natural disasters (management / clearance procedures to be established);
- Damages to crops and trees during land survey, construction of access roads, construction of towers and conductor stringing (to be minimized);
- Relocation of houses / households from the new ROW including impacts on women and other vulnerable people. This impact has been avoided and minimized during detailed design stage of this IEE and the remaining are planned to be fully compensated.
- Impacts on unknown historical and cultural sites due to the presence of a near branch of the Historical Silk Road (Chance find procedure to be implemented)
- Visual impacts on the landscape in scenic areas.

1.4 Analysis of Alternatives

No Project Alternative

13 This alternative would not cause any resettlement or environmental impacts but would also prevent electricity imports from Central Asia. If this line is not constructed, other lines will have to be connected to the substation and power plants of the present line in the near future.

Line Routing Alternatives

14 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.

15 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.

Substation

16 An optimization process similar to the line routing has been conducted for the substation at Arghundy.

17 For Arghundy this optimization 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.

Additional financing components

18 For additional financed components which include construction of a line bay and two reactors at Dashte Alwan Substation No Project Alternative option has been implied. The additional financed component will be constructed and installed inside the existing Dashte Alwan Substaion. This part of the project would not cause any resettlement or additional environmental impacts of the project.

1.5 Public Consultation and Information Disclosure

19 The consultation process was carried out during June and July/August 2017 with the potentially displaced people / public for sharing of information related with the project planning and execution activities and consultation will be carried out for the additional work/scope (additional

line bay and two reactors at Dashte Alwan substation) before contractor mobilize for work. This consultation will be part of appendix of the IEE study.

20 During the field survey for the completion of Rapid Environmental Assessment (REA) Checklist and specific public consultations for the IBA, various meetings were held with regional and local stakeholders. The focus of the meetings was on the collection of information with regard to the socio-economic conditions in the wider area of the newly planned / change line corridor. At the same time, information with regard to the project was provided to those stakeholders who so far were not informed.

21 Nobody showed concern with regard to the possible damages and losses by the construction of the HVTL. The only two concerns of the public were that the future supply would not be fair and the danger that compensation payments would not come at all or that the compensation money would not be paid adequately for the losses.

22 The majority of the people would not have any problems in facing land acquisition and compensation procedures. However, majority people also pointed out that there are vulnerable households in their communities.

1.6 Environmental Management Plan

23 The careful routing or siting optimization process for the power lines and the substations could avoid significant project impacts. 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.

Mitigation

24 The main mitigation measures defined in the EMP are:

- Land Mine Clearance,
- Avoidance of settlements in the ROW to minimize resettlement activities
- Full compensation of remaining resettlement affected APs (see LARP)
- Minimization of access road construction;
- Avoidance of damages to river ecosystems at river crossings (avoidance of soil run off and water pollution)
- Compensation for crop damages;
- Avoidance of historical and cultural sites and implementation of a chance find procedure; and
- Implementation of EHS Management Plans.

Monitoring

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

- Monitoring tasks during the construction phase will be related to material storage, location of work sites, noise emissions, waste disposal, traffic management, workers' safety, protection of physical cultural resources etc.

- Operation phase environmental monitoring will include regular substation and transmission line inspections to verify compliance with the EMP requirements and with

relevant laws and regulations.

- During operation it is recommended to measure the electric and magnetic fields under the lowest clearance and at houses located nearby the line (especially in case where limited houses are located within the ROW i.e. from AP 1 to AP 10/3, AP 45 to AP 46, AP 198 to AP 202 of the change route). The objective is to show that the internationally accepted permissible limits of 5kV/m and 100 mu T, respectively, are not exceeded.

Costs

25 The costs for the implementation of the EMP are presently estimated to be about ***117,000 USD***, with the detailed design of change route of overhead line (OHL) with a total length of 238 km and addition of additional financed components which include construction of a line bay and two reactors at Dashte Alwan Substation does not change this figure.

Implementation Arrangements

26 Internal environmental monitoring will be conducted by DABS-PMO, DABS Environmental Department. An EHS Consultant hired within the contract of the Project Implementation Consultant (PIC) during the construction phase will perform monitoring of EMP implementation. Monitoring results will be included in the Projects' quarterly progress reports, semiannual environmental reports during the construction phase and annual reports after commissioning. The detailed monitoring program will be subject to review and approval by ADB.

27 In addition, an international expert to ensure that all requirements as stipulated in the EMP to the project are fulfilled should perform construction site audits. Such an EHS Construction Site Audit shall be performed frequently through monitoring visits by the team of PIC with special focus to the period of performing the detailed land survey.

28 Environmental monitoring during the operation phase will be performed by DABS. The PMO will no longer exists 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.

29 At DABS there is Social / Environmental Department. The creation of Social / Environmental Department in DABS and training of qualified staff has made the process of project evaluations smoother.EHS staff for the Dashte Alwan Substation is responsible for the Environmental, Health and safety and upon award of the contract for the additional financed components contractor shall hire their own Environmental, Health and Safety staff which in coordination with DABS Social/ Environmental and Supervision Consultant's Environmental staff will be taking the environmental work forward.

Overall Findings and Recommendation

30 Although the Project will have no high but mostly site-specific impacts, some medium impacts on the environment may remain. Careful line routing during the final detailed design helped minimize resettlement needs and environmental impacts.

31 The impact on physical cultural resources (historical and cultural sites) has been minimized. Especially, the construction of access roads and the final location of towers were decided very carefully to avoid any sensitive historical and cultural area, making future excavation activities possible. However, in case of chance finds of historical artifacts during the construction process, the construction activities have to be stopped immediately and the local representative of the Ministry of Culture has to be contacted.

32 The proposed transmission line will not cross-protected areas but will trespass a legally unprotected Important Bird Area (IBA) in 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 riverbank erosion. An independent internationally experienced expert shall supervise the overall construction. 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.

33 Within DABS an Environmental and Social Department currently does exist. It is recommended to fortify these departments in order to comply to the ADB requirements. The EMP was the part of the tender documents and construction contracts. A review of the final detailed design by independent social and environmental experts has been done.

Conclusion

34 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, the most significant impacts, especially resettlement, has been widely avoided at this final detailed designed stage. If the contractor who conducts the detailed design follows this approach, resettlement could be further diminished.

35 For remaining impacts, mitigation measures are proposed to minimize social and environmental impacts.

36 If all proposed mitigation measures are implemented, the Transmission Line from Pul-e-Khumri to Kabul, Arghundy Substation (SS) and Incoming Line Bay and two Reactors (additional finance component) inside Dashte Alwan 500 kV 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 transmission line project comprises construction of a double circuit 500 kV overhead line (OHL) with the final approved detailed design length of ca. 238 km from Pul-e-khumri to Arghundy in Afghanistan and expansion of a one line-bay at Dashte Alwan substation. Included in the parallel project under Energy Sector Development Investment Program North South are the constructions of one substation in Arghundy with 400 MVA 500/220 kV transformers. The Project Executing Agency (EA) and Employer is Da Afghanistan Breshna Sherkat (DABS). 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 was assessed to be a Category B Project according to the ADB's Safeguard Policy Statement (2009), for which Fichtner GmbH has done an Initial Environmental Examination (IEE).The Project Implementation Consultant, Byucksan Power Co. prepared this updated IEE for the detailed design stage based on the IEE prepared by Fitchner in 2012.

3. The main objective of this study is the identification of significant environmental concerns that may interfere with the final planned project implementation. The study was carried out in compliance with the ADB's Safeguards Policy Statement (2009), 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 where applicable. A pre-feasibility study was conducted by FICHTNER in early 2012 and Byucksan Power Co and conducted environmental assessment for the detailed design stage in mid-2017. And it has been further updated after including the additional financed

components (line bay and two reactors at Dashte Alwan substation) in the scope of the project.

2.2 Scope of the Study

4. Within the scope of this updated IEE, the PIC investigated the potential environmental impacts of the planned 500kV transmission line from Pul-e-Khumri to Arghundy and one substation in Arghundy and construction of Incoming Line Bay and two Reactors inside Dashte Alwan 500 kV SS for connection of 500 kV transmission line from Turkmenistan to Dashte Alwan substation.. On the basis of the existing environmental situation in the Investigation area (The investigation area covers the corridor of 100m from all sides of proposed substation,corridor of 25 m was investigated on both sides of the planned transmission line during the field survey, as additional finance components is located inside the Dashte Alwan SS, corridor of 100m applies for the same. 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(Substations Included) in May2013 and separate baseline survey shall be conducted for additional financing components and will be a part of the IEE study as appendix after outbreak of COVID-19 ends which is resisting the same at the moment.

5. The investigation area is greenfield site catered to facilitate future expansion program under subsequent financing facilities by Afghanistan's international development partners, including construction of back to back convertor stations for import of power from Central Asia.

6. The site is marked by quaternary sediments and quaternary sands and dunes. There are important oil and natural gas reserves as well as sulphur, sand and gravel deposits. It is an earthquake hazardous area with assumed 6.0 local magnitude (ML) on Richter scale, meaning posing medium risk. The site is composed of several soil types, however sandy soils predominate.

7. The landscape comprises general features of the Afghan semi-desert and grass steppe. The site is not a touristic area and is characterized by a continental dry climate. The last few years have brought very little rain. The winds generally blow from northern direction in winter and from the south-west in summer. The major source of air and noise pollution is the heavy traffic load on adjacent the ring road.

8. The groundwater in site is located relatively deep and the water table (as stated by local communities) can be found at below100 meters (m) depth. The vegetation is negligible and rain fed. Not many wild animals are found in site due to the degraded habitat and sparse. Vegetation. Mammals, birds, reptiles, amphibians, freshwater fish and insects are the main animal groups in the province. There is no endangered plant or animal species in site area. Not does the site have any Protected Area. There is no population and settlements at the site area.

2.3 Summary

9. The results of the investigation demonstrate that the Project will have no high to medium impacts but mostly very low impacts on the environment if the proposed EMP is implemented and all proposed mitigation measures are accomplished.

2.4 Methodology

10 The field studies were undertaken by a team of International and National environmental and social experts, geo-technical specialists, and engineers. Primarily, the team consists of Ms. Saira Tajdar (International Environmental Specialist of Byucksan Power Co.), who provided leadership and guidance in planning the fieldwork, coordination with DABS Environmental staff Abdull Bashir Maroof, Senior Environmental Officer and analysis of results, report writing and finalization of the IEE Report. Mr. NoorulhudaOmerzai (National Environmental Expert) and Mr. Meraj (National Socio Economic Expert) in association with Byucksan Power Co., Ecological Expert and DABS site engineers conducted preliminary scoping, survey and assessment activities, coordinated the field sampling and analysis, and were also responsible to supervise collection of information. The team will be included expert of concern field to conduct field visit and compile IEE study. The environmental team also benefited from technical support and other information on the impacts of the proposed power works provided in engineering reports, socio-economic, resettlement, institutional aspects, designs prepared and reviewed by Byucksan Power Co. One basis for the study consisted of intensive field surveys conducted by the national environmental and socio-economic experts in June/July and August 2017. This survey had the objective of environmental assessment of the final detail design route proposed by the Contractor other than tender route (Fitchner). Due to security reasons and gloom of COVID 19 separate field survey after the additional financed components could not be conducted. For additional financed components which include new line bay and two reactors at Dashte Alwan substation Environmental Study team shall be investigating the area and experts shall be hired by concerned party.

11 Regarding the environment, a corridor of 25 m was investigated on both sides of the planned transmission line during the field survey. Baseline surveys were carried out for sample populations settled along the corridor of influence (COI, 1-1.5 km). Additionally, statistical census information has been collected from secondary sources and interpretation of satellite maps and other available maps and data for the Investigation area performed an evaluation of possible ecological and social impacts. For additional financing component a corridor of 100 m on each side of the substation will be surveyed for baseline data collection and IEE study will be updated accordingly.

12 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 used an own evaluation procedure in the preliminary IEE at feasibility stage. The focus of the used evaluation procedure was to decide whether the Project is likely to cause significant adverse environmental effects resulting from the design, construction, operation, and decommissioning phases. The same evaluation scale developed by FITCHNER is adopted by the PIC to conduct updated IEE.

13 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).

□□ = medium
□ = low

□	=	no impact
□	=	locally positive
		regionally
□□	=	positive

The Evaluation scale applied is showing the extent of impact as above.

3. Institutional and Legislative Framework

3.1. Institutional Framework and National Requirement

5.3.1. 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 BreshnaMoassassa (DABM) as the national power utility. DABS 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 theElectricity 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 (05) and twenty (20) districts;

- Provincial municipalities (*sharwaliwolayat*) – with each province in principle containing one provincial municipality and two rural municipalities (*sharwaliuluswali*) 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.[1]

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.[2]

5.3.2. National Legal Framework

8. Table 3-1 provides a summary of relevant NEPA's Environmental Regulations, Guidelines and Policies for the project, Table 3-2 provides Comparison of International and local Air Quality Standards and Table 3-3 provides Comparison of International and Local Noise Standards.

Table 3-1: NEPA's National Regulations, Guidelines and Policies

Regulation/ Guideline/ Policy	Date	Key areas
Interim Environmental Impact Assessment Regulations	Draft 2.3	These regulations govern the process of environmental impact assessment in Afghanistan on an interim basis pending the establishment of the EIA Board of Expert in terms of Article 20 of the Environmental Law and issuing of final regulations. These regulations provide the detailed process of EIA and list the projects into category A and B based on potential impacts.
Administrative Guidelines for the Preparation of Environmental Impact Assessments	June 2008 2007	The Director-General of NEPA issues this document in terms of Executive Order No. 1/87 dated 3 June 2008. 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 define the roles and responsibilities of various stakeholders' in the process.

[1] DPADM / UN (2006): Public Administration Country Profile) at http://unpan1.un.org/intradoc/groups/public/documents/un/unpan023299.pdf

[2] Afghanistan's Fifth National Report to the United Nation's Convention on Biological Diversity (2014) submitted by National Environmental Protection Agency (NEPA) on March 31, 2014 available at https://www.cbd.int/doc/world/af/af-nr-05-en.pdf

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 ofdevelopment and the procedures to addressenvironmental consequences and involve necessary institutions in the process of project implementation.
Environmental Impact Assessment Regulations	March, 2008	These Regulations are issued in accordance with Article 22 of the Environmental Law in order to govern the process for environmental impact assessment.
National Strategy of Environment	December, 2007	Afghanistan confirms the new era of environmental regulation. So, the strategy is that most of the development capacity of NEPA and its capabilities due to law enforcement activities & coordination should be increased. The policy focuses on existing scenarios to integrate the environment through environmental regulations including the National Development Strategy and Afghanistan Development Goals.
Multilateral Environmental Agreements: United Nations Environment Program Post-Conflict and Disaster Management Branch A Handbook for Afghan Officials	March, 2008	This handbook has been produced in both Dari and English and is an output of UNEP's Program for Institutional and Capacity Building for Environmental Management in Afghanistan, which was initially implemented in 2003 and is funded by the European Commission, the Government of Finland and the Global Environment Facility.

Table 3-2: Comparison of International and local Air Quality Standards*

Pollutants	USEPA		WHO/IFC		Afg. NEQS	
	Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
SO2	3 hrs	0.5 ppm	24 hr	20 ug/m^3	NA	NA
	1 hr	75 ppb	10 min	500 ug/m^3		
CO	8 hrs	9 ppm (11 mg/m^3)			NA	NA
	1 hr	35 ppm (43 mg/m^3)				
NO2	Annual Mean	100 ug/m^3 (53 ppb)	1 yr	40 ug/m^3		NA
	1 hr	100 ppb	1 hr	200 ug/m^3	NA	

O3	8 hrs	0.07ppm (148 ug/m^3)	8 hrs	100 ug/m^3	NA	NA
PM10	24 hrs	150 ug/m^3	1 yr 24 hr	20 ug/m^3 50 ug/m^3	Annual Mean 24 hrs	401 ug/m^{3**} 247 ug/m^{3**}
PM2.5	Annual Mean 24 hrs	15 ug/m^3 35 ug/m^3	1 yr 24 hr	10 ug/m3 25 ug/m3	NA	NA

* Afghanistan has not established its own ambient AQ standards and the Government is still in the process of adoption of standards (Urban Air Quality Management Report, ADB, 2006). Therefore the **standards highlighted in green** for each respective pollutant are the most **stringent** based on a comparison between two international regulations i.e. USEPA and WHO/IFC and thus shall be applicable for the proposed project.
** High PM10 concentrations have been measured in initial samples under the ADB Kabul Air Quality Management (KAQM) Project in 2004 and in previous short-term studies conducted during 2003 by an Environmental and Industrial Health Hazard (EIHH) Special Support Team (SST).

Table 3-3: Comparison of International and Local Noise Standards

Category of Area/Zone	**Limit in dB(A) Leq**			
	AFG- NEQS		**WHO/IFC**	
	Day Time	**Night Time**	**Day Time**	**Night Time**
Residential area (A)	NA	NA	55	45
Commercial area (B)	NA	NA	70	70
Industrial area (C)	NA	NA	70	70
Silence zone (D)	NA	NA	55	45

*The standards **highlighted in green** for each respective Area/Zone are the most **stringent** based on absence of local regulations and standards for Noise; therefore, international regulations shall be applicable for the proposed project.

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 would 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 Affairsare 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.

National Environment Strategic Documents

14. 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. Some of those agreements are as follows:

5.3.3. 3.2.1 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.

22. 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 (Fourth National Report to the CBD Secretariat, 2009).The Government of Afghanistan is expanding its practical field focus on environmental and biodiversity conservation through the National Priority Program(NPP) on Environmental Conservation and Natural Resources Management. In recognition of the need to address both poverty and resource overuse, a number of non-governmental organizations (NGOs) are carrying out poverty and environment initiatives

in nearly every province in the country (Fifth National Report to the CBD Secretariat, 2014).

23. In addition to complying with country safeguards requirements, the present Project will comply with ADB's SPS (2009) which sets out the policies and principles for protecting the environment and people by wherever possible avoiding impacts and mitigating and/or compensating for impacts that cannot be avoided.

5.3.4. ADB Policies

24. **Safeguard Policy Statement (2009).** SPS 2009 is ADB's safeguards policy document. It describes the common objectives and policy principles of ADB's safeguards and outlines the delivery process for ADB's safeguard policy. SPS 2009 promotes sustainability through protection of people and the environment from the adverse impacts of projects, and by supporting the strengthening of country safeguard systems. It presents a consistent, consolidated framework for environment, resettlement, and indigenous people's safeguards.

25. **ADB Operations Manual, Safeguard Policy Statement**, Section F1/BP (Bank policies) and Safeguard Review Procedures, Section F1/OP (operational procedures) (2013). These documents operationalize SPS 2009. The policy sets forth the scope of SPS 2009 applicability to ADB operations, and the procedures describes the safeguards process and outputs, including consultation and disclosure requirements, through the various stages of project preparation.

26. **Public Communications Policy (2011):** guides ADB's efforts to be transparent and accountable to the people it serves, which it recognizes are essential to development effectiveness. The policy recognizes the right of people to seek, access, and impart information about ADB's operations, and it aims to enhance stakeholders' trust in and ability to engage with ADB, through proactive disclosure, presumption in favour of disclosure, and recognition of the right to access and impart information and ideas, country ownership, limited exceptions, and the right to appeal.

5.3.5. ADB Guidelines

27. **Environmentally Responsible Procurement (2007)** provides guidance to ADB staff, consultants, and executing agencies on environmentally responsible procurement, defined as "a systematic approach to the purchase of goods and services that are thought to be less damaging to the environment than other goods and services that serve the same purpose," specifically, products that "reduce waste, improve energy efficiency, limit toxic by-products, contain recycled content or are reusable, and are produced with the least environmental impact, and services that help improve the environment, are rendered with minimum environmental and social impacts, and use resources and energy efficiently."

Complaint Handling in Development Projects - Grievance Mechanisms:
28. A Critical Component of Project Management (2010). This document presents definitions, concepts, rationale, and history relevant to the ADB project grievance redress mechanism.

Complaint Handling in Development Projects - Building Capacity for Grievance Redress Mechanisms (2010).
29. This document presents a framework and practical suggestions for building the capacity of an organization to manage an effective grievance redress mechanism.

Environment Safeguards, A Good Practice Sourcebook (2012).
30. This draft working document aims to add clarity, provide technical guidance, and recommend good practices in SPS (2009) implementation. It updates the Environmental Assessment Guidelines (ADB 2003).

Selected References for Good Practice in Environmental Safeguards Implementation (2014).
31. This internal Central and West Asia Department document presents internet hyperlinks to exemplary environmental safeguards documents (IEEs, EIAs, EARFs, etc.) prepared for projects in these countries.

5.3.6. Environmental Screening and Categories

32. ADB water resources projects and subprojects are screened using a rapid environmental assessment checklist filled out for the components. This checklist captures the type; location, sensitivity, scale, nature, and magnitude of potential environmental impacts, and availability of cost-effective mitigation measures. Based on the checklist findings, the project or component is assigned to one of the following ADB environmental categories.

33. **Category A** – likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An EIA, including an environmental management plan (EMP), is required. The raising of the Dahla Dam has been categorized as **Category A**, impacts are adverse and cannot be mitigated on site. An EIA report has been prepared accordingly. All hydropower developments are categorized as “Category A” according to ADB environmental assessment guidelines (2003).

34. **Category B** – Potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects. An initial environmental examination (IEE), including an EMP, is required.

35. **Category C** – A proposed project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

4. Description of the Project

4.1. Investigation Area

1. The Investigation area covers the transmission line corridor of the planned OHL and a substation in Arghundy with the TL perimeter of influence in the three provinces of Kabul, Parwan and Baghlanin Afghanistan including the two towns Pul-e-Khumri and Kabul as well as several small settlements between them and for Right of Way (ROW/ Potential Impact area for OHL and Substation please refer section 4.2.4 below.

2. The investigation area covers the corridor of 100m from all sides of proposed substation site and a corridor of 25 m was investigated on both sides of the planned transmission line during the field survey,as additional finance components is located inside the Dashte Alwan SS, corridor of 100m applies for the same. The entire TL route including the Arghundysubstation has been examined by Byucksan Power Co. in the survey for preparation of updated IEE. Additional financed component (construction of line bay and of two reactors at Dashte Alwan Substation) will be examined in the survey for preparation of updated IEE

3. The Investigation area map is provided in **Annex.**

4.2 Technical Description

4 The planned project comprises the construction of a double circuit 500 kV overhead line (OHL) with a length of 238 km from DashteAlwan to Arghundy, Construction of one 500 kV substation at Arghundyand construction of line bay including two reactors at the Dashte Alwan Substation. This project is the part of a pool of severalprojects, which have the objective of importing electricity from Central Asia to Afghanistan (AFG).

4.2.1 Line routing

4. The line routing, with a total planned length of ca. 238 km, was determined regarding technical and economic 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.

5. The overhead line will take the shortest route via the Salang Pass. It will, for the most part, share the corridor with the existing 220 kV line going from the existing PeK substation to the vicinity of Doshi, and the south part (angle points S1 to S108) from Doshi via Salang Pass to the Arghundy substation. The angle points A63 and S1 are identical. Most of the south part of the line passes altitudes higher than 1,500 m, with a 14 km section at Salang Pass being over 3,000 m.

6. In the line section between the newArghundy substation and the existing Pul-e-Khumri substation (angle points A1 to A23), the line generally follows the existing 220 kV corridors to Naibabad.

7. The proposed line termination at Kabul South West (Arghundy Substation) may need to be adjusted in order to articulate with another OHL leading from the Arghundy substation to Charikar.

8. Due to spatial constraints and terrain morphology the construction of the OHL will be difficult. The relatively narrow Salang Pass corridor and the approaching valleys already accommodate one existing 220 kV double circuit line.

9. Overcoming spatial constraints is one of the major challenges of the new tower design. The distance to the existing 220 kV OHL attempted by our line design is ca 50 meters. However, based on site-specific technical survey assessments a smaller distance is also considered at some places. Initial geometry assessments indicate that, where required, towers could be placed at minimum of ca 35 meters centre line to centre line.

10. The towers will be designed to support two circuits in order to meet potential future demand for more transmission capacity. However, initially only one circuit will be installed.

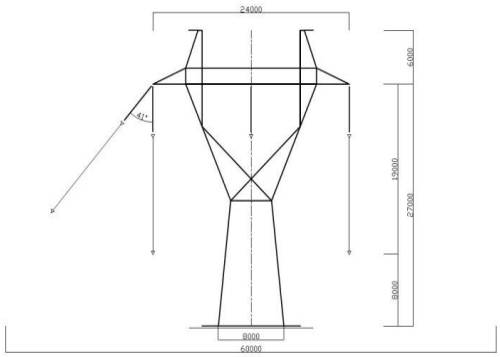
11. The line will pass through difficult mountainous terrain and high altitudes. New towers shall be of “barrel” type, double circuit, designed by the probabilistic design code (EN 50341 – 1: 2012).

12. The construction contractor completed the detailed design including final land survey . . In general, the average distance between the towers was planned around 450 m (mean span of 400-450 m). However, the constructing contractor has fixed the final location of the towers after conducting the final land survey.

4.2.2 Towers

13. 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)



14. 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

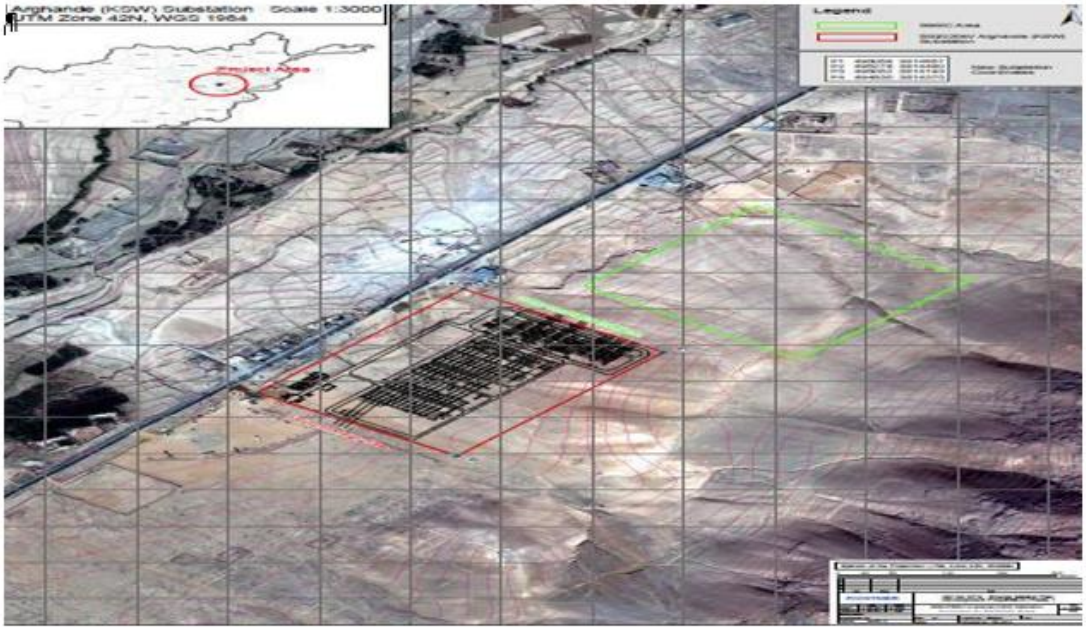
15. Arghundy SS is located east of the main road (highway) Kabul Kandahar and the final tower is just about 30 m away from the road. The new 500 kV substation at Arghundy (Kabul suburbs) will be sited adjacent to existing 220/20 kV substation site. The site is located at a west-exposed hillside, which 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. The land site is clear of any structures, irrigated farming or other economic activities and is barren with ground water table below 100 meters.

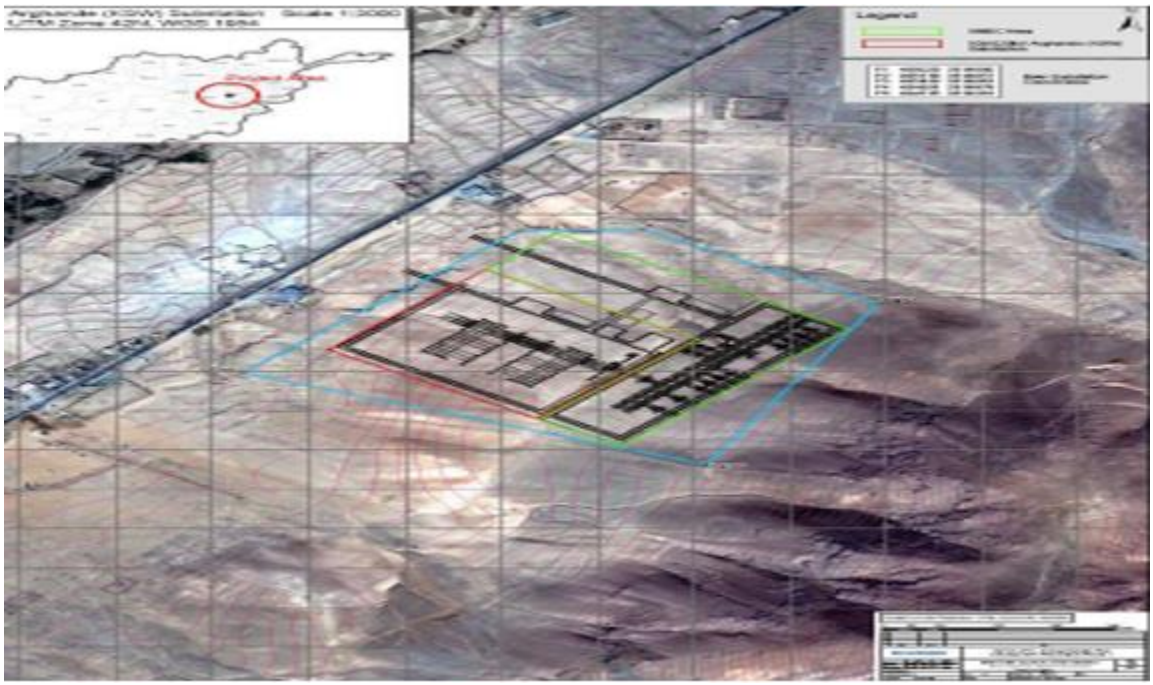
16. The new 500 kV Arghande substation shall include the construction and commissioning on turn-key basis of a 500 kV Substation with one 500/220/20 kV, 3 * 133 MVA 1 ph auto-transformer banks at Arghande (named also Kabul South West) placed near to Kabul city.

17. This substation shall be built nearby anexisting 220/20 kV Substation, at the moment in tendering stage. The 220 kV autotransformers side shall be connected directly to the new 220 kV bay.

18. From an environmental point of view the combination of the SNEC area with the planned SS Arghundy is the optimal solution as thus the land requirements are reduced to a minimum and the land is 100 Government owned.

Figure 4-3: Arghundy Substation





19. Individuals as lease and contract have operated the land for the past 35 years. People from the neighboring villages like Wakil Najmuddin village, Khoja Alwan village and Qarasai village, as well as other people from Pul-e-Khumri, can get the contract depending on the local government and social government system decision. Mostly relatives of Maliks (heads of specific tribes of the area) can get the contract. There has not been a single

20. This substation shall include the construction and commissioning on turnkey basis of a 500 / 220 kV Substation with one 500/220/20 kV, 3 x 133 MVA 1-ph autotransformer bank. It shall be built 25 km far from the existing Pul-e-Khumri 220/20 kV Substation and connected to the existing 220 kV Double Bus Bar system by means of the existing D/C line. This substation shall have a crucial role inside the Turkmenistan to Afghanistan interconnector; in fact it will be future Hub for the Converter Stations.

4.2.4 Right of Way and Clearance

21. The 500 kV line has an associated Right of Way (ROW) of 50 m (25 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.

22. 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).

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

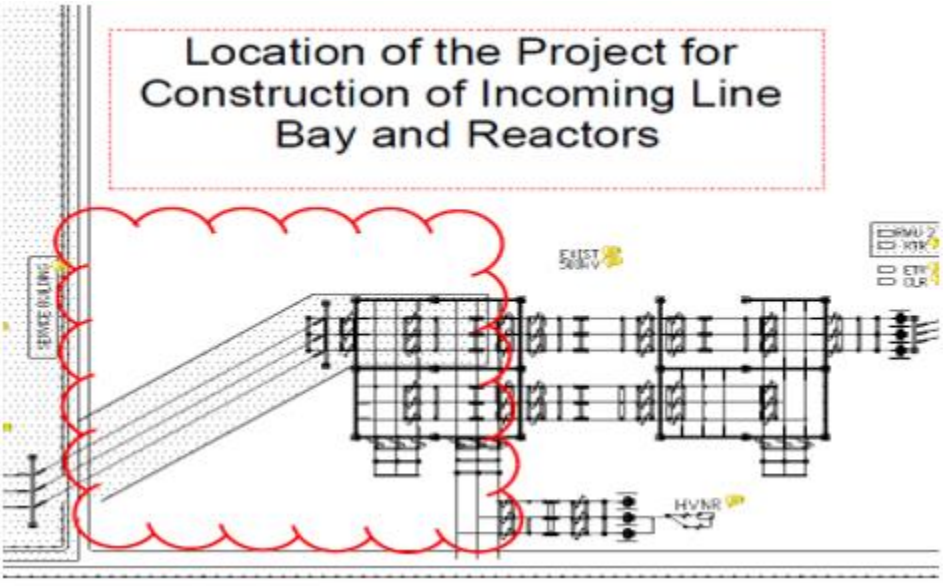
Clearance	500 kV Line
Above normal ground	8.0 m
To roads	9.0 m
To other OHLs	5.0 m

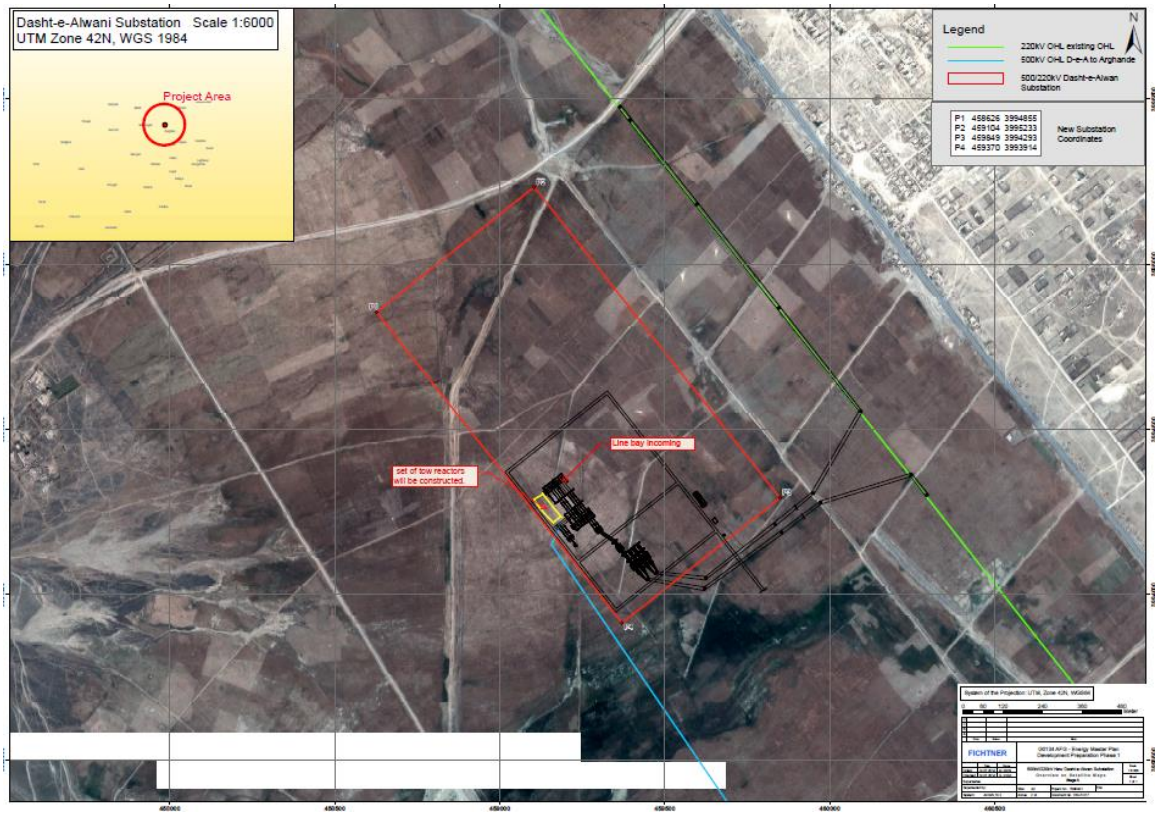
4.2.5 Additional financed component (Line bay and Reactor)

23. The Project consists of line bay and two Reactors inside Dashte Alwan 500 kV SS for connection of 500 kV transmission line from Turkmenistan to Dashte Alwan. The site is a new green field location outside the municipal limits of the city of Pul-e-Khumri to minimize any land acquisition and resettlement impacts. The site dimensions are 1.2 km X 0.4 km, located along the national highway and the 220 kV transmission line between Pul-e-Khumri with Mazar Sharif.

24. A **bay** is a power line within an electrical substation which connects a circuit (such as a power line or transformer) to a busbar. Each bay typically includes circuit breakers, disconnectors, instrument transformers and surge arresters and **reactors** are installed at substations to help stabilize the power system.

25. The civil work for the additional financed components shall include site preparation inside the substation, materials delivery and installation of structures such as 500kV Circuit Breaker with supporting structure ,500 kV disconnector with earth switch at one side with supporting structure ,500 kV Current Transformer, single phase 5 cores with supporting structure,500 kV Capacitor Voltage Transformer, single phase with supporting structure,500 kV Surge Arrester, single phase, with supporting structure, other equipment for 500 kV switchyard, 500 kV disconnector with earth switch at both side with supporting structure. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit, a disconnector, disconnect switch or isolator switch is used to ensure that an electrical circuit is completely de-energized for service or maintenance, A Current Transformer (CT) is used to measure the current of another circuit and a surge arrester is a device to protect electrical equipment from over-voltage transients caused by external (lightning) or internal (switching) events.




Dasht-e-Alwani Substation Scale 1:6000
UTM Zone 42N, WGS 1984
Project Area
Legend
220kV OHL existing OHL
500kV OHL D-e-A to Arghande
500/220kV Dasht-e-Alwan Substation
P1 468626 3994855
P2 469104 3995233
P3 469849 3994293
P4 469370 3993914
New Substation Coordinates
Line bay incoming
set of tow reactors will be constructed

5. Description of Environment

1. The provinces crossed by the transmission line and sitting 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 2017,As Components covered under additional financing (line bay and two reactors) is located in the Dashte Alwan Substation, it has been included under the third line Section: From Salang North to Dashte Alwan and every section contains description of the environment relating to additional financing (line bay and reactors) at Dashte Alwan SS. A brief description of the 3 sections is given as follows:

2. **First Line Section: from Arghundy to Salang South:** The first line section (Arghundy 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, Gul Dara, Qarabagh and Istalaf districts of Kabul province and as well as in Charikar. This section also passes some gardens (fruit and other trees and grapevines). There is a shrine called Astalef and second place cultural places called Gul Ghundai. According to the field survey estimates, both places lay outside of the1.5 km corridor of the line, so they are identified as non-affected areas. In addition,changes in the final route also do not 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, river and an existing 220 kV line and trees while passing from one hill to another.

4. **Third Line Section: from Salang north to DashteAlwan:** 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 can be mitigated through proper implementation of the mitigation measures, which has been given in updated EMP, however, the effects on agriculture cannot be easily mitigated. For this reason, more compensation should be paid to the AP's who bears agricultural losses.Additional financed components (line bay and two reactors) are located in this section.

5.1 Geography

5 Afghanistan is a landlocked country located in south-central Asia. The country is 249,935 square miles in area (647,500 square kilometers). Afghanistan is bordered by Iran in the west, Pakistan in the south and east, Turkmenistan, Uzbekistan, and Tajikistan in the north, and China in the far northeast. The country is mountainous, with plains in the north and southwest. The highest point is Mount Nowshak, at 24,557 feet (7,485 meters) above sea level. Afghanistan forms a crossroads between the East and West and has been an ancient focal point of migration and trade.

6 The climate varies considerably by region and tends to change rapidly. Large parts of the country are dry, and fresh water supplies are limited. The Sistan Basin is one of the driest regions in the world. Winters are severe in the central highlands, the glacierized

northeast (around Nuristan), and the Wakhan Corridor, where the average January temperature is below 5°F (-15°C). Summers are especially hot in the low-lying areas of Sistan Basin in the southwest, the Jalalabad basin in the east, and the Turkistan plains along the Amu River in the north, where temperatures average over 95°F (35°C) in July (Razia's Ray of Hope Foundation, 2018).[3]

7 The planned transmission line traverses three provinces of Afghanistan:

Baghlan Province

8 Baghlan Province is widely known as the second-grade province, Baghlan is located to the northeast of the country and considered one of the industrial provinces of Afghanistan. This province covers an area of 18,225 km2 with a total population of 890,000 individuals (Pajhwok Afghan News, 2014)[4].

9 Geographically, Baghlan is situated 29 degrees, 31 minutes of northern latitude and 58 degrees, 48 minutes of northern longitudes. The province is located 230-kilometers from Kabul at Kabul Mazar-e-Sharif highway. The strategic importance of Baghlan enhances as it connects with seven Northern provinces and the capital of the country. Panjsher, Takhar and Kundoz provinces are located to the northeast of Baghlan, Samangan and Bamyan to its west while Parwan is situated to its south. The Salang separates both Parwan and Baghlan provinces and the northern Salang is located in Baghlan province while the Southern Salang is situated in Parwan province (Pajhwok Afghan News, 2014)[5]

Parwan Province

10 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 East and with Bamyan in the west. This province covers an area of 5,715 $km^2$with a total population of 600,000 individuals and Charikar is its capital (Pajhwok Afghan News, 2014)[6].

Kabul Province

11 Kabul Provinceis situated in the northern part of Afghanistan, bordering with Parwan in the north, with Nangarhar and Kapisa in the east, with Logar and Maidan Wardak in the south and with Bamyan in the west. The province covers an area of 4,585 km2 where more than half (56.3%) contains mountainous area.

12 Situated in central zone of the country, Kabul province is the capital of Afghanistan and its provincial capital is Kabul city. Kabul is situated at an elevation of about 1,800 m (5,900 ft) above sea level, making it one of the highest capital cities in the world. The city has 1,053 villages which are divided into 22 municipality and 14 administrative units such as Bagrami, Char Asiab, Dehsabz, Farza, Istalif , Kalakan , Mir Bacha Kot , Mussahi,

[3] https://raziasrayofhope.org/geography-of-afghanistan.html
[4] http://elections.pajhwok.com/en/content/background-profile-baghlan
[5] http://elections.pajhwok.com/en/content/background-profile-baghlan
[6] http://elections.pajhwok.com/en/content/background-profile-Parwan

Paghman, Qarabagh, Shakardara, Guldara, Sorubi and Khak-i-Jabar (Pajhwok Afghan News, 2014).[7]

13 The Investigation area is located in most of the non-mountainous and some mountainous zones (i.e. Salang) of the three provinces. Table 5-1 shows some altitudes of major terrain points.

Table 5-1: Major Terrain Points

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

14 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 Arghundy
- Settlements in Paghman
- Settlement in the ShekerdaraGhorband 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 DashtKelagai,
- Doshi settlements
- Doshi River
- Dashte Alwan substation

5.2 Topography

15 Although the average altitude of Afghanistan is about 1,200 m (4,000 ft), the Hindu Kush mountain range rises to more than 6,100 m (20,000 ft) in the northern corner of the Wakhan panhandle in the northeast and continues in a southwesterly direction for about 970 km (600 mi), dividing the northern provinces from the rest of the country. Central Afghanistan, a plateau with an average elevation of 1,800 m (6,000 ft), contains many small fertile valleys and provides excellent grazing for sheep, goats, and camels. To the north of the Hindu Kush and the central mountain range, the altitude drops to about 460 m (1,500 ft), permitting the growth of cotton, fruits, grains, ground nuts, and other crops.

16 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. There are few lakes also. North and east of Gardez,

[7] http://elections.pajhwok.com/en/content/kabul-province-background-profile

the river system forms part of the Indus 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.

17 Southwestern Afghanistan is a desert, hot in summer and cold in winter. The four major river systems are the Amu Darya (Oxus) in the north, flowing into the Aral Sea; the Harirud and Morghab in the west; the Helmand in the southwest; and the Kabul in the east, flowing into the Indus. [8]

5.3 Geology and Seismicity

5.3.7. Charikar Kabul–Poli-Alam–Gardez

18 The geology of the central-eastern region is complex. A broad northeast trending belt of Tertiary siltstones, sandstones, conglomerates, limestone 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.

5.4 Geology and Soil

5.4.1 Geology

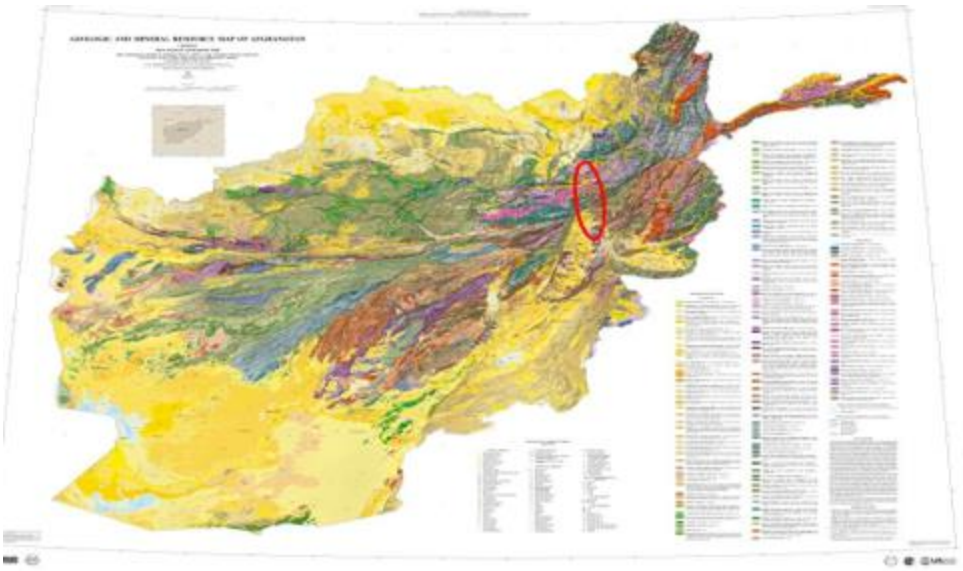
19 Afghanistan has some of the most complex and varied geology in the world (Figure 5-1). The oldest rocks are Archean succeeded by rocks from the Proterozoic and every Phanerozoic system up to the present day. The country also has a long and complicated tectonic history, partly related to its position 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.

20 Historical mining concentrated mostly on precious stone production, with some of the oldest known mines in the world from Egyptian Pharaohs i.e. Lapis Lazuli. More recent exploration in the 1960s and 70s resulted in the discovery of significant resources of metallic minerals, including copper, iron and gold, and non-metallic minerals, including halite, talc and mica. The bedrock geology of Afghanistan can be thought of as a jigsaw of crustal blocks separated by fault zones, each with a different geological history and mineral prospectively. This jigsaw has been put together by a series of tectonic events dating from the Jurassic (Afghanistan Geological Survey, 2017).[9]

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

[8] http://www.nationsencyclopedia.com/asia-and-oceania/afghanistan-topography.html#ixzz56IVAqs9D retrieved on 06-02-2018

[9] https://www.bgs.ac.uk/afghanminerals/geology.html



Source: United States Geological Survey (1997)

21 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. Quaternary sediments, quaternary sands and dunes mark the geological situation of the Investigation area.

5.4.2 Soil[10]

22 Soil conditions vary from place to place in Afghanistan, and they are largely dependent on the environmental conditions of the location. The site is marked by quaternary sediments and quaternary sands and dunes. There are important oil and natural gas reserves as well as sulphur, sand and gravel deposits. It is an earthquake hazardous area with assumed 6.0 local magnitude (ML) on Richter scale, meaning posing medium risk. The site is composed of several soil types, however sandy soils predominate.The central highlands are generally very dry and cold, so the soil conditions are desert-steppe to meadow-steppe. The southern plateau, due to the dry and barren land, has generally infertile land. The only fertile land in this region lies along the southwest rivers. The northern plains contain the Amu River along the edge of its foothills. This water source contributes to a much more fertile soil in this area.

23 Soil erosion is a huge factor of Afghanistan ecology, and its presence is largely the result of its geography and climate. Heavy tectonic activities lead to large slopes, folds, and valleys in Afghanistan's landscape. Furthermore, the soil most common to Afghanistan is very porous and fragile. This makes it very vulnerable to erosion during periods of heavy rainfall. On top of this, over-cultivation of plants and trees contributes to Afghanistan's barren landscape, so there is very little to prevent erosion from taking place. A combination of a hilly geography, weak soil, and a barren landscape results in about 80

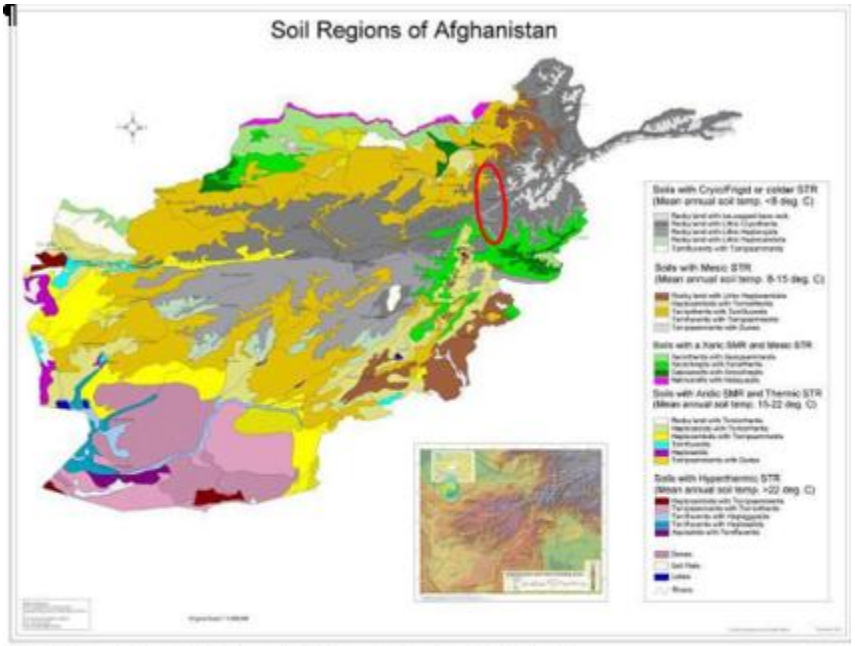
[10](http://faculty.college-prep.org)

percent of Afghanistan's land being subject to soil erosion. Such a high amount of soil erosion contributes to the inability to farmland or sustain life.

24 Climate also contributes to desertification, especially in the arid and semi-arid regions of the west, north, and center of the country. Although human impact is partly to blame for the increase in the amount of dry desert, Afghanistan has also suffered a drought in recent years. A dryer climate has resulted in sandier, more fragile soil in many regions. This has resulted in the loss of vegetation, farmland, and consequently livable conditions.

25 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).

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



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

26 Areas with gentle slopes bear their primary soils, which are course textured admixed without stones. Valleys I contains 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

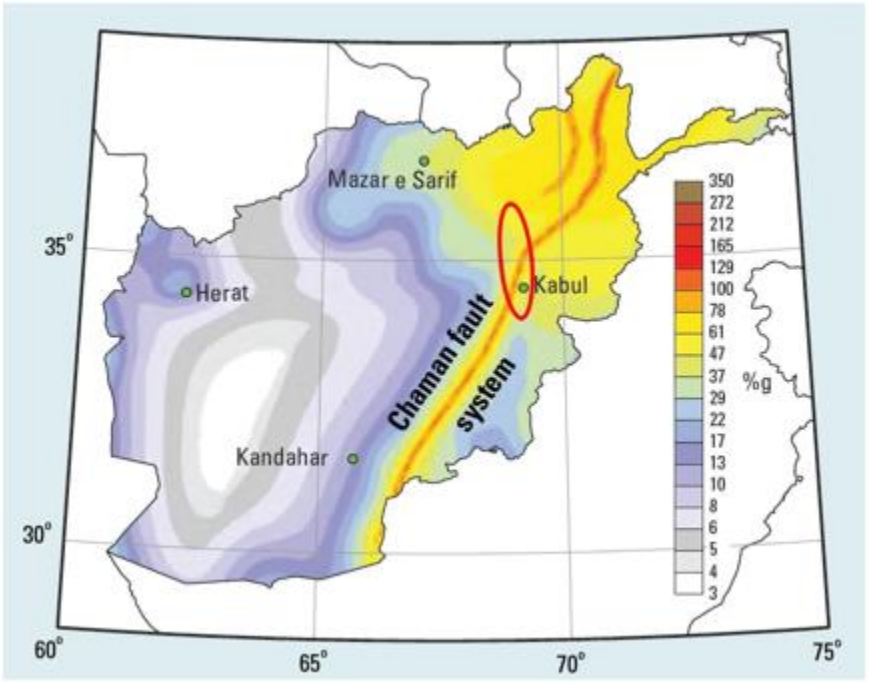
slopes are from pediment materialswith medium to textured structure (very fine sand and very fine sandy loam). Soils of these plain areas having access to water are fertile and suited for agriculture. Other plain areas are rain fed. The semi-desert areas are characterized by moving sands.

5.4.3 Mineral Resources

27 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).

28 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.

Figure 5-3: Generalized seismic-hazard map of Afghanistan with indication of the project area (USGS, 2016)



29 The specific mineral resources in the three provinces of investigation area are as follows:

Kabul Province[11]

30 The following are the famous mineral sources and mines that exist in Kabul Province:

1-Missjawhar copper mine:

31 According to Ministry of Mines & Petroleum (MoMP), this mine is 1.5 - 32 m thick, 150 m long and 300 m deep and is situated in the southern part of Kabul, which has 33 to 56.2 percent pure copper. This mine is up to 300 meters deep.

2-Darband copper mine:

32 Darband mine is located in Khak-i-Jabbar district of Kabul, which has more than one million copper. Its thickness ranges from 100 to 1,000 m while it is said to be 07km long. According to Sahak, the mine contains 0.58 to 1.55 percent of copper.

3-Talc mine:

33 This mine is located in Tangi area of Lalandar. The area is not properly surveyed but Sahak said that this mine was divided into four zones. Each zone is about 100 to 800 m long.

4-Ruby mine:

34 Ruby mine is situated in Jagdalak area of Sarobi district on 15 square kilometers. Russian experts had worked on the mine but the exact amount of ruby could not be identified. It is determined that 2/122 to 3/157 grams of ruby could be found in each square meter.

5-Decorative stones:

35 There are several mines containing decorative stones in Kabul. Each of the sources is listed as follow.

- Madan Laghawi: Containing decorative stones, this mine is known as Madan Laghawi and is situated in the capital Kabul.
- Kipak mine is located in northern region of Kabul.
- Gok decorative mine is found in Kabul.
- Khwaja Rawash mine is situated in DehSabz district of the capital Kabul, which is close to the Kabul Airport.
- Shah-ri-Ara is another place containing decorative stones. This mine is located in Shah-ri-Ara area of the 4th police district in Kabul.
- Shakh Baranti decorative stones are located on the outskirts of Kabul City.
- Tazenistan Pachaniz is also a kind of decorative stones located on the outskirts of Kabul.

6-Marbles Sources

36 Gazak marble mine is located in Karokhel locality of Khak-i-Jabbar district in the capital Kabul. Anjeerak marble mine is found in Shakardara district of Kabul. Farman Bik marble mine is situated in eastern Sorobi district of Kabul. One of marble mine is found in Bibi Tandori area and another marble source is located in Rishkhor area, in the

[11] http://mines.pajhwok.com/news/mineral-resources-kabul-province

southwestern region of Kabul.A marble mine is found in Khak-i-Jabbar district. Qargha marbles mine is situated in Qargha area, in western Kabul. Badam Bagh marble mine is located in northern region of Kabul City.Madan-i-Gharib Ghaz marble mine is found on the outskirts of Kabul and Madan-i-Qalam Kar and Madan-i-Tarakhail marble mines are situated on the outskirts of Kabul (Pajhwok Afghan News, 2014).

Parwan Province[12]

37 Parwan province has vast rich land and is known for natural reservoirs of quality plumbum and zing. Parwan has 15 kinds of natural resources such as coal, gems, zing, plumbum, copper, iron, chromites, marble and quartos in SurkhParsa, Ghor band, Syahgird, Kohi Safi, Salang and Jabal Saraj districts.In addition, large-scale mine of pegmatite exists in Charikar, the provincial capital. The mines of zing, plumbum and kohl have been identified for the last 80 years while rests of mines are newly discovered. Meanwhile, the extraction of precious stone is among the first deal of demining (Pajhwok Afghan News, 2014).

1-Mines of plumbum and zing

38 The mines of plumbum and zing with gray color can be found in Franjal area of Syahgird districts in large quantity. Research shows that quality stones of zing and plumbum exist in Parwan where 26 different kinds of stones have been identified in 65 different points in Syahgird district.The volume of these two mines is not clearly indicated, however, research has shown that 221,000 tons of quality zing and plumbum exist in these mines.

2-Coal

39 Coal mine is situated in Turkaman valley and Taikhan area of Syahgird district, however, decision is yet to be taken regarding its extraction.

3-Mines of precious stones such as copper, iron and chromites:

40 The mine exists in Turkman valley and Hawza-e-Khas areas of Surkhparsa district. In addition, provincial mines department has recently discovered more natural reserves in Ghorbandvalley. Among the precious stones, Trawtrin is a kind of stone that is used in constructions.

4- Chromites mines:

41 MoMP has recently discovered chromite mine. This mine is situated in Gadakhai land Nazdarah areas of Kohi Safaid district.The gray colorchromites stone can be found in different shapes and its volume is estimated to be 180,000 metric tons in Parwan province.

5-Pegmatite mines:

42 The pegmatite stones' mines are located in Hofyan Sharif, Khwaja Syaran, Alya, Topdara, Sanjedara areas and Charikar, the provincial capital. Pegmatite stone has white color and precious beads inside.

6-Marble, quartos and iron mines:

43 The MoMP has identified these mines last year that are situated in district Salang. The mines of marbles are found in Kohlami valley, Jafarak, Qalatak and Ahangaran localities while mines of iron located in Taghma and Baba Mardan areas of Salang district.

[12] http://mines.pajhwok.com/news/mineral-resources-parwan-province

Similarly, the mines of garnet (a kind of silicate mineral) are located in Salang and Jabal Saraj districts. Garnet stones are red in color and quartz has white and pink color.

Baghlan Province[13]

44 Baghlanprovince is considered an impassable province of the country, which is rich in precious underground reserves.Natural resources, in particular coalmines of Baghlan have greater fame that includes Karkar, Dodkash, Ahan Dara, Khurd Dara, Chinarak, Shin Dara, Alogak, Tala war and Barfak. As prices of other fuel items surges day by day, coal is being used in houses, brick kilns, public baths and industrial factories because of affordable prices.

1 – Karakr and Dodkash coal mines:

45 Located 15 km northeast of Pul-i-Khumri city, a shepherd detected these two mines back in 1938 and today they are considered one of the biggest coalmines of the country.Karkar mine is estimated to have 15 million tons of coals; with its layer thickness is three meters. It's is declared excellent coal for use.Its geographic location and proximity to Kabul-Kunduz highway and Pul-i-Khumri industrial centres, contributed to the mine's importance.

2 – Ahan Dara and Khurd Dara coal mines:

46 These mines are located about 05 kilometers east of Pul-i-Khumri city. Extraction process of coal from the mines had been initiated in 1999 and still underway.

3 – Chinarak and Shin Dara coal mines:

47 These mines are located 75 km east of the provincial capital in Nahrin district. The mines had been detected in 2001 and come under the framework of North Coal Enterprise in the years between 2007 and 2012.

4 – Alogak coal mines:

48 Located 120 km of the capital city of Pul-i-Khumri in Deh Salah districts.

5 – Tala WaBarfak coal mines:

49 Located 110 km southwest of Pul-i-Khumri city in Tala WaBarfak district, coal extraction from this mine continues since its inclusion in north coal enterprise in 2007.It shares border with Kahmard district of central Bamyan province, while Kahmard district also comprised similar rich resources of coal.

6 – Gold mine:

50 Located 80 km southwest of the provincial capital in Doshi district, QaraZakhan gold mine is detected in years between 1992 and 1995. However, the survey of the mine is still underway by a company over the past three years.

7 – Plumbum or lead mine:

51 Known as Sheikh Safid, the mine is located 80 km northeast of Pul-i-Khumricity in Jalga district.

8 – Batch mine:

[13] http://mines.pajhwok.com/news/mineral-resources-baghlan-province

52 This mine is located 54 km of the provincial capital in Sheikh Jalal area of Baghlan-i-Markaz district.

9 – Granite mine:

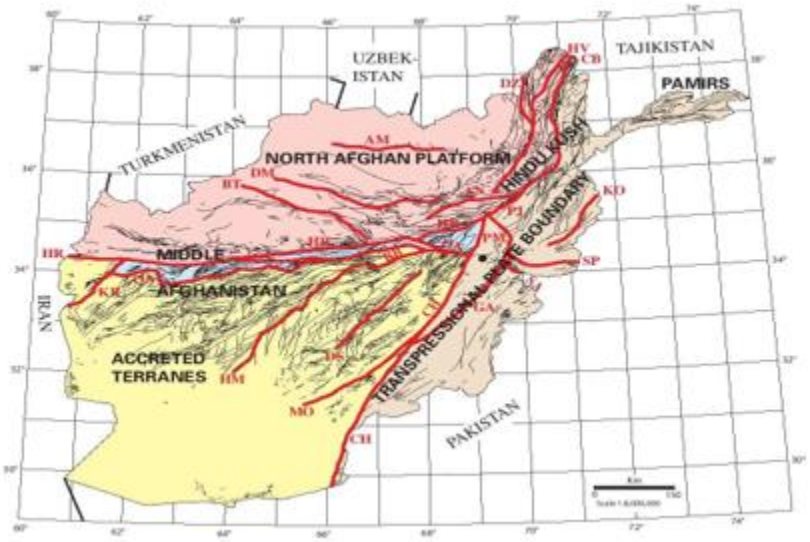
53 Located 90 km south of Pul-i-Khumri city in Khinjan district, this mine is detected by locals in 2013.

5.5 Seismicity

54 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.

55 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, 2016). 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).

Figure 5-6: Seismotectonic Map of Afghanistan, with Annotated Bibliography, tectonic regions of Afghanistan



Note: Pink, North Afghan platform; blue, Middle Afghanistan; yellow, terrenes that were accreted to the platform; tan, left-lateral transpersonal plate boundary between the Indian and Eurasian plates; Black dot south of "PM" shows location of Kabul.

5.6 Landscape

56 In Afghanistan, the Hindu Kush Mountains run from the eastern border with China and Pakistan, extending west across Afghanistan, separating the northern provinces from the rest of the country. Afghanistan's highest peak is called Noshaq and is 7,492 meters high. The capital city Kabul lies at 1,800 meters above sea level, nested between high mountains that are snow-capped well into spring. Afghanistan is landlocked, with long and porous borders to Pakistan and Iran. In the north, Afghanistan borders with the Central

Asian republics of Turkmenistan, Uzbekistan and Tajikistan and a thin stretch of mountainous land, the Wakhan corridor, connect Afghanistan with China (Norwegian Afghanistan Committee, 2018).

57 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 (USAID Country Profile, 2015).

58 The general features of the Afghan semi-desert, agriculture land, mountains and grass steppe mark the landscape of the Investigation area. Settlements and agricultural fields characterize the river valleys. 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.

59 Further southeastern 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 substation, 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.

5.7 Climate and Air

5.7.1 Climate

60 In Afghanistan, the climate is usually **arid continental**, with cold and relatively rainy winters (and a rainy peak in spring) and hot and sunny summers. However, there are substantial differences depending on area and altitude: the south is desert, many areas are rather cold because of altitude, and the far east is relatively rainy even in summer, since it is partly affected by the Indian monsoon.

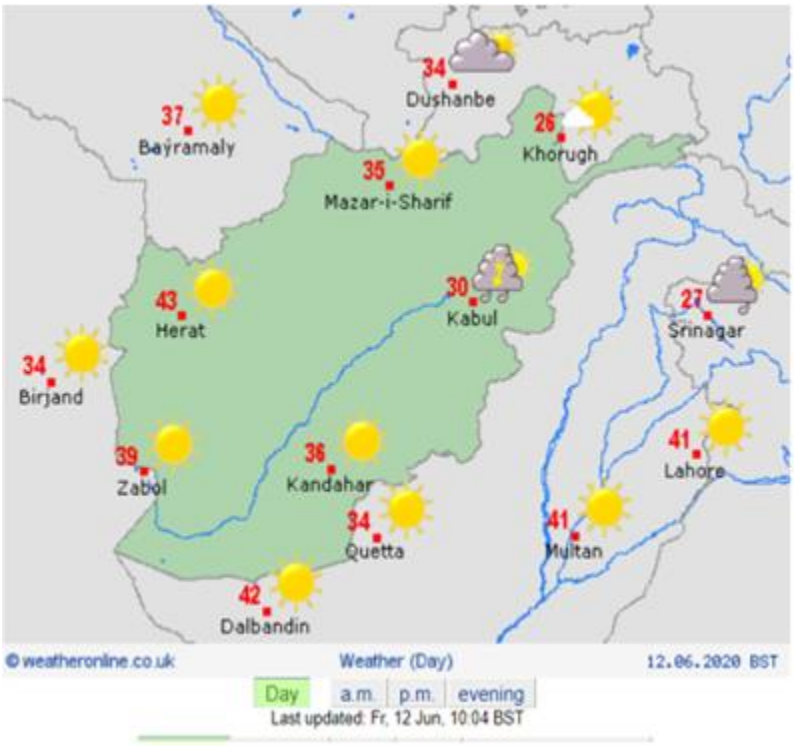
61 **Precipitation** is generally scarce, at semi-desert or desert levels, except in the eastern regions, where it exceeds in some areas 500 millimeters (20 inches) per year, while in the far east, near the border with Pakistan (Kunar and Nurestan provinces), it even reaches 1.000 mm (40 in).During winter, the center-north of the country (and more rarely the south) is reached by disturbances of Mediterranean origin, which bring a bit of rain, and even snow, more likely in the mountains. In early spring, when the southern Asian landmass starts to warm up, the clash between air masses becomes stronger, so rainfall increases; in fact, March is often the wettest month. Later, the rains decrease, and from June to September, it usually never rains. Only in the easternmost region, east of Kabul, owing to the last offshoot of the monsoon that affects India and Pakistan, there is a certain increase in rainfall in July and August.

62 Afghanistan is a **mountainous** country, and it's crossed by the range of **Hindu Kush** in its various chains, but also by the Pamir in the far north-east, in the frigid Wakhan Corridor, near the border with China. Many cities, starting from the capital, are located in narrow valleys, shaped by rivers between the mountains, at higher or lower elevations. In

the country, there are many very high peaks, among which Noshaq, 7,492 meters (24,580 feet) high, Shar Dhar, 7,038 meters (23,090 ft), and Lunkho e Dosare, 6,901 meters (22,641 ft), all three at the border with Pakistan; we can also mention Kohe Bandaka, 6,843 meters (22,451 ft), which is 25 km (15 mi) away from the border with Pakistan. At high altitudes, above 4,000 meters (13,000 feet), there are vast glaciers.

63 In the **south** of Afghanistan, the climate is warmer, and snowfalls in winter are rare. In **Farah**, located in the south-west at 750 meters (2,460 feet) above sea level, the average temperature ranges from 8 °C (46.5 °F) in January to 33 °C (91.5 °F) in July.

Figure 5-4 shows a precipitation map for Afghanistan



5.7.2 Air Quality and Noise

64 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. The main environmental concerns during construction of the substation are noise, dust, and air pollutant emission from the construction equipment and earth moving equipment. 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. Air quality and noise level data for establishment of baseline condition of the investigation area need to be carried out and these data will be collected before mobilization of contractor to site and will include as appendix with IEE study Electricity shortages and lack of fuel-wood result in households burning packaging materials, which causes toxic fumes emission. A combination of drought and loss of vegetation along with a rapidly growing vehicle density are contributing

to a worsening of the air quality in the country. Furthermore, in rural Afghanistan the roads are frequently degraded or unsealed which gives rise to a significant dust nuisance form passing traffic. Not only does the dust affect the air quality of rural communities and agricultural areas close to the roadside, but it also presents a major visibility hazard for traffic. An on-going program of rehabilitation of the main traffic routes is currently underway, which should result in a reduction of dust impacts from traffic.

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5.8 Water Resources

5.8.1 Water Resources in Afghanistan

66 Water is Afghanistan's most precious natural resource, although water management systems country wise has 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).

67 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.

68 Groundwater has traditionally been utilized for irrigation purposes through the use of *karezesmer*, springs and shallow hand dug open wells. In Kabul, 18,270 ha area is irrigated from ground water. 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. The population dependent on these systems has suffered badly due to failure or reduction in discharges of these systems. The main reason for the low discharges is low precipitation and consequently low recharge to the groundwater. In addition, boring of deep wells in the vicinity of karezes and shallow wells had adversely affected the production of these traditional irrigation systems. This has threatened the sustainability of these systems in the future too.[14]

69 In most of the urban areas, shallow wells are used to get water for drinking and other household activities. As the water levels continue to fall, around 0.5 to 3 meter each month

[14] http://www.cawater-info.net/afghanistan/afg7_e.htm

depending on the place, the poorer families are unable to dig their wells deeper and thus are forced to get water from communal wells. Many of these wells are already dried up and people (often women and children) are forced to walk miles to meet their daily water demands.

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

5.8.2 Project Area Water Resources

71 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 watercourses. 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 m3 (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 m3 and in March it is normally reasonably full. Groundwater has traditionally been utilized for irrigation purposes through the use of *karezes mer*, springs and shallow hand dug open wells.

72 South of the Kabul River, Catchment Rivers are small and often turbulent in their upper reaches with widths of 10 m and depths of less than 1 m in the mountains. The riverbanks 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.

5.8.3 Groundwater

73 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 Arghundy 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.

74 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. 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.

5.9. Flora and Fauna

75 Plant life in Afghanistan is sparse but diverse. Common trees in the mountains are evergreens, oaks, poplars, wild hazelnuts, almonds, and pistachios. The plains of the north are largely dry, treeless steppes, and those of the southwestern corner are nearly uninhabitable deserts. Common plants in the arid regions include camel thorn, locoweed, spiny rest-harrow, mimosa, and wormwood, a variety of sagebrush.

76 The wild animals of Afghanistan include more than 100 mammal species, some of which are nearing extinction. The most seriously endangered are the goitered gazelle, leopard, snow leopard, mark or goat, and Bactrian deer. Other wild animals of Afghanistan include Marco Polo sheep, urials, ibex, bears, wolves, foxes, hyenas, jackals, and mongooses. Wild boar, hedgehogs, shrews, hares, mouse hares, bats, and various rodents also occur. More than 380 bird species are found in Afghanistan, with more than 200 breeding there. Flamingo and other aquatic fowl breed in the lake areas south and east of Ghazni. Ducks and partridges are also common, but all birds are hunted widely and many are becoming uncommon, including the endangered Siberian crane (Afghanistan Forum, 2018).[15]

77 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.

78 The desert and semi-desert biome comprises 252,044 km or about39% 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 tigrisvirgata*), cheetah (*Acinonyx jubatusvenaticus*) and wild goat (*Capra aegagrus*) (WWF, 2010).

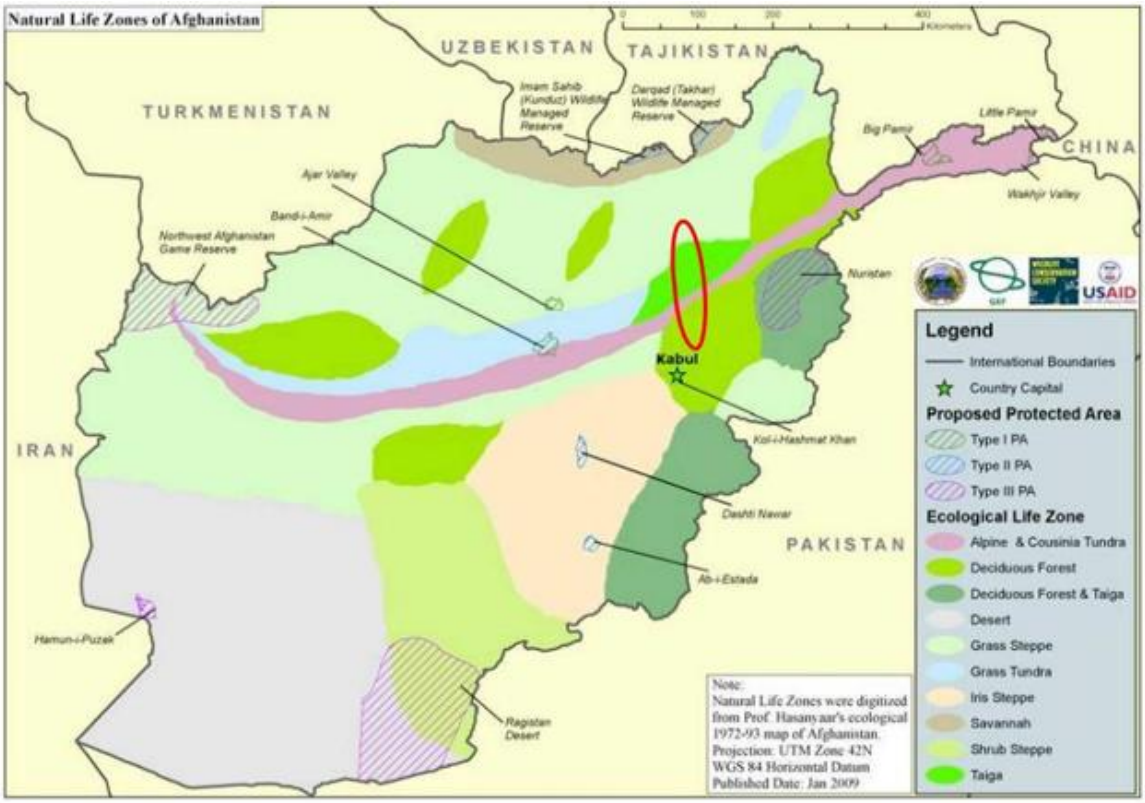
79 During REA checklist survey, it has been observed that in limited locations some flora and fauna will be affected through the implementation of the project, as most of the area from section one and two of the project is agricultural land that will be adversely impacted due to construction work. Furthermore, some of the towers are located near and inside the IBA where migrant birds are crossing way in Salang South i.e. AP 73, AP73/1, AP 74are placed near 40-50 m away from IBA and AP 70, 71 and AP 75 are placed inside the migrant birds crossing way. Not Many considerable number of fishes are available in the investigation area as the river and other water bodies are located in a significant distance from the proposed investigation area though the details shall be incorporated after the baseline survey of the investigation are is completed.

80 During REA survey, it was also observed that on top of the Salang Tunnel there is a pool that is a temporary birds habitat in daytime, therefore, it is concluded that the transmission line will disturb those birds. On the other hand, construction of those towers will cause surface water pollution by blasting and rocks sliding, thus, implementation of

[15] http://www.afghanistans.com/Information/PlantAnimal.htm retrieved on Feb 05, 2018

mitigation measures should be strictly observed. A map of the natural life zones of Afghanistan is shown in Figure 5-5.

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



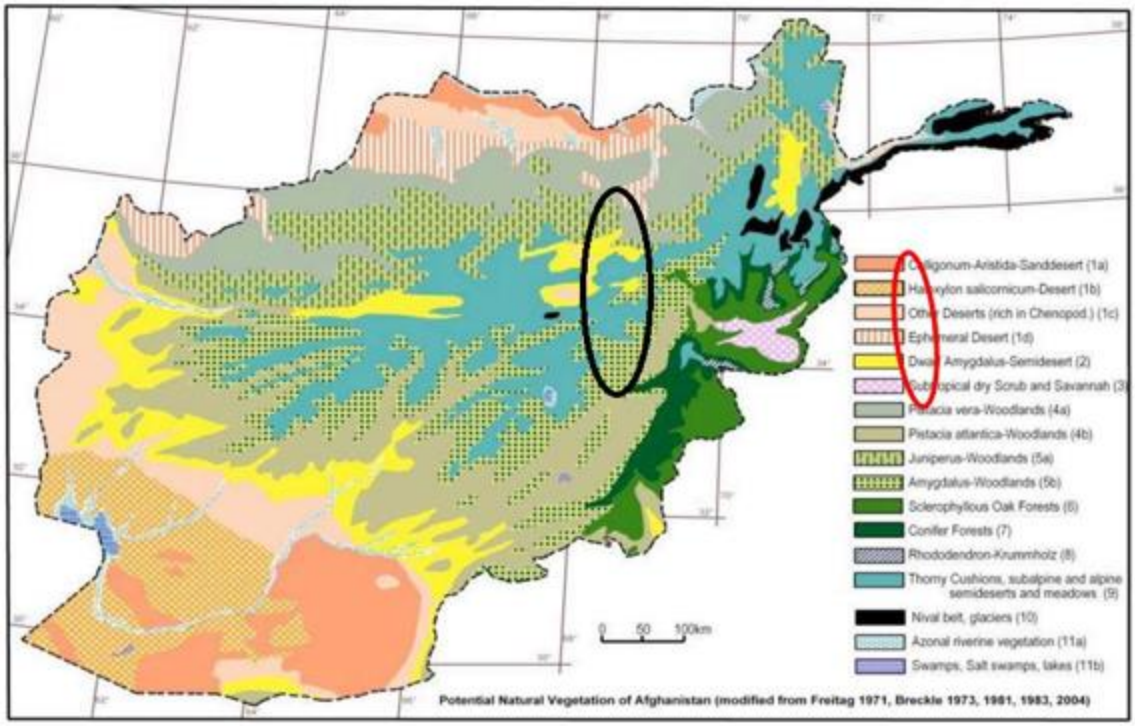
Source: The Ecoregional Approach to Identifying Afghanistan's Protected Area Network Christopher Shank, Nina Kanderian, McKenzie Johnson & Haqiq Rahmani (Wildlife Conservation Society – WCS) December 2009

81 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.

5.9.1. Flora

83. 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.**Figure 5-6** shows the natural vegetation zones of Afghanistan andindicates the Investigation area.

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



84. 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.

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

Common English Name/	**Scientific Name**	**Remarks**
Deodar cedar/ Lemanz or Archa	*Cedrusdeodara*	Tree
Morinda spruce/ Surp	*Piceasmithiana*	Tree
East Himalayan Fir/ Bejor	*Abiesspectabilis*	Tree
Blue pine/ Neshtar	*Pinus wallichiana*	Tree
Chilgoza pine/ Jalghoza	*Pinus gerardiana*	Medicine and fruit tree
Hinmalayan penciljuniper/ Obakht	*Juniperussemiglobosa*	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	*Haloxylonammodendron*	Medicine tree
White saxaul/ White saksawol	*Haloxylonpersicum*	Medicine tree
Pistachio/ Pesta	*Pistacea vera*	Fruit tree

Walnut	*Juglans regia*	Fruit and medicine tree
White Acacia	*Robiniapseudoacacia*	Tree
Elm/ Pashakhana	*Ulmus campestris*	Tree
Tree of heaven	*Ailanthus glandolsa*	Tree
Afghan redbud/ Arghawan	*Cercisgriffithii*	Tree
Russian olive/ Sorbs	*Elaeagnus Angustifolia*	Fruit tree
Bolle"s poplar/ Chenar-e-ArAr	*Populus pyramidalis*	Tree for fire

85. 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 (*Carexpachystylis*), bulbous bluegrass (*Poabulbosa*) and ephemeroid (perennial) plants. The largest remaining pistachio grove can be found in the Badghyz Reserve and covers 76,000 ha (760 km). There are over 1,100 species of vascular plants, of which 75 are endemic to this ecoregion (such as *Cousiniabadghysi*, *Ferulabadrakema*, *Tulipakuschkensis*). 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 speci belonging to *Poaceae*, *Brassicaceae*, j*Asteraceae*, *Caryophyllaceae*, and*Boraginacaeae*. Most perennials aretypical desert or arid foothill species WWF, 2008[16].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.[17]

86. The vegetation along the line route varies according to the fertility and humidity of the local soil. The line corridor crosses a semi-desert, agriculture and hilly landscape. The area is marked by grape garden, trees, bushes, mountains, alternate grassland savannah 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 Veral 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. The plain areas fromPul-e-Khumri to Doshi are covered by savannah and grass vegetation.

87. Further southeast 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. In Section 1 the line corridor passes through agricultural land and dry arid habitats. In 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.

88. 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.

[16]WWF2008 Federal Register, Volume77 Number152/Tuesday, August 7 Proposal Rules
[17] UNEP2009 USAID Country Profile, Property Rights and Resource Governance, Profile 1

89. Fruit plants growing in different locations of the line corridor include grape, apple, 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.

5.9.2. Fauna

90. The Eco region 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 (*Vulpesvulpes*), 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*), wheat eaters (*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, Fediral Register, Volume 77 Number 152 /Tuesday august 7 proposal rules)). Due to the degraded habitat and sparse vegetation, not many wild animals live in the Investigation area. Mammals, birds, reptiles, amphibians, freshwater fish and insects are the main animal groups there.

91. Mammals: Along the line corridor several mammal species were Found (Table 5-3).

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

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	*Hystrixindica*
Squirrel	*Funambulus pennant*
Indian Mongoose	*Herpestes edwardsii*
Forest dormouse	*Dryomysnitedula*
Turkistan rat	*Rattus rattoides*
Rat	*Rattus rattus*
House mouse	*Mus musculus*
Long tailed hamster	*Calomyscuslailward*
Gray hamster	*Cricetulusmigratorius*
Common white toothed shrew	*Crocidurarussula*

Common pipistrelle	*Pipistrelluspipistrellus*
Medius Bat	*Pterousmedius*

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

93. Birds: The Investigation area is not very rich regarding the avifauna and its diversity due to the lack of suitable habitats. The only placeswhere 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 (*Acridotherestristis*), Great grey owl (*Strixnebulosa*), House sparrow (*Passerdomesticus*), Common teal (*Anas crecca*), Eagle Owl (*Bubo bubo*), Chukarpartridge (*Alectoris chukor*), Shikra (*Accipeter badius*), Peregrine falcon/ Behri (*Falcon peregrine*), Kestrel (*Falco tinunculus*), Bulbul (*Pycnonotuscafer*), crows, kites, ducks, quails, and sand grouses.

94. 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 colored 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.

95. 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.

5.10 Protected Areas

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

Table 5-4: Protected Areas in Afghanistan

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

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

97. The transmission line corridor and the construction of line bay and two reactors crosses none of the protected areas described in Table 5-4 .

98. On the southeastern 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 former110 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

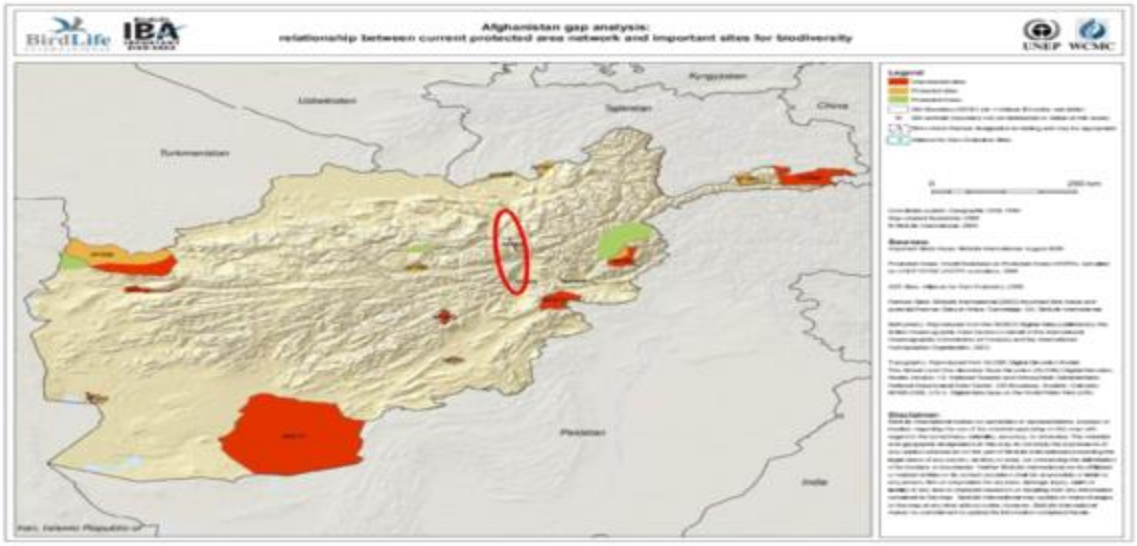
a hunting ground since Moghul times and was declared a waterfowl reserve by king Zahir Shah in the 1930s. Currently designated as the kola Hashemite khan waterfowl sanctuary (IBA code AF 009 by BirdLife International), the site has great recreational value for the Kabul residents and is important for 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.

5.11. Important Bird Habitat Salang Kotal (not protected)

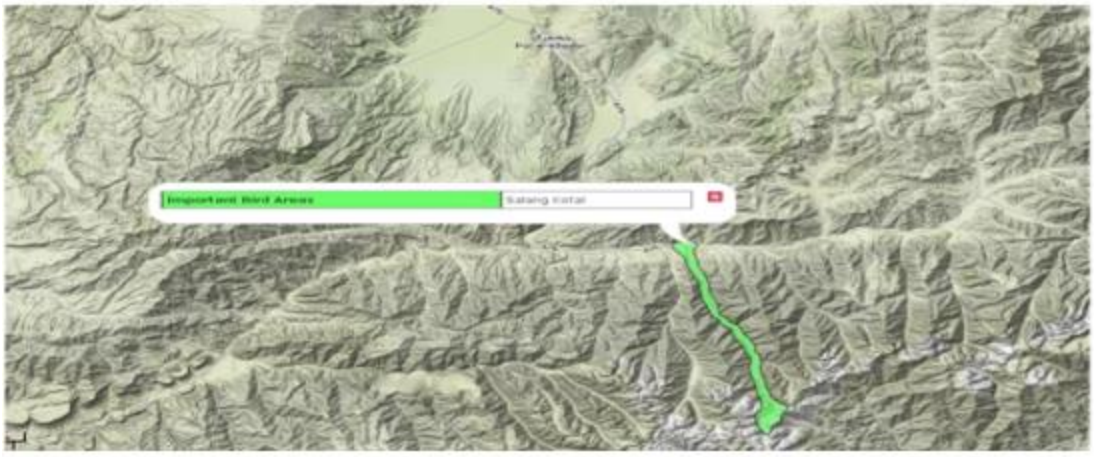
99. Figure 5-8 shows that the investigation area trespasses one legally unprotected IBA (Salang Kotal - AF 005) with a total of 2,000 ha and a diversity of at least 33 species of Himalayan breeding birds and passage birds. One passage bird is the critically endangered Siberian Crane (*Leucogeranusleucogeranus*).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

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



Legend

- Unprotected sites
- Protected sites
- Protected Areas
- IBA Boundary (KE001 etc = Unique IBA code, see table)
- IBA centroid (boundary not yet delineated or visible at this scale)
- IBAs where Ramsar designation is lacking and may be appropriate
- Alliance for Zero Extinction Sites



100. 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).

101. In Salang South, the TL passes inside this valley and the installation of towers and TL will disturb the migrant birds which are passing through this route and crosses the valley in spring season.

102. Based on the survey at the detailed design stage, PIC team found that AP 70, AP 71, AP 73, AP 73/1, AP 74 and AP 75 are placed on the way of migrant birds thus these towers and TL will disturb the migrant birds, which pass from this route, and their descriptions are as follows:

- AP 70 is located exactly on the passing way of migrant birds in SamuchShameer village of Salang south.
- AP 71 is located exactly on the passing way of migrant birds in SamuchShameer village of Salang South.
- AP 72 is located exactly on the passing way of migrant birds in SamuchShameer village of Salang South.
- AP 73 has been placed 50 m away from migrant birds crossing area in SamuchShameer village.
- AP 73/1 has been located 40 m away from migrant birds crossing area in Girarati village.
- AP 74 has been placed 40 m away from migrant birds crossing area in Girarati village.
- AP 75 is selected exactly on the passing way of migrants' birds in Taghma village.
- AP 80 is placed 100 m away from migrant birds crossing area in Taghma village and AP 89 is placed about 300 m away from the passing way of migrant birds.

Therefore, mitigation measures are proposed in the EMP to avoid and minimize the adverse impacts on the migrant birds due to the above-mentioned towers.

5.12. Population

103. As of February 2018 estimates, the total population of Afghanistan is 36,103,100 individuals. Household's composition in urban area of Afghanistan is 7.7 % and in rural areas is 8.2 % (Afghanistan Health and Demographic Survey, 2015).

5.12.1. Population and Settlements in Project Area

104. According to the City Population report (2017), the Parwan Province has a total population of 687,200 habitants. The urban population of Parwan province estimated 57,746 habitants; however, the rural population estimated 86-95 % (OCHA, 2015).[18] Around 51% of the population is male and 49% is female. National Rural Water Supply, Sanitation &Irrigation of MRRD (2013) reported that there are 65,577 households in the province, and households on average have 7 members.

105. The Kabul Province has a total population of 4,679,600 persons (City Population, 2017). [19] Estimated urban population of Kabul city is 3,678,034 however less than 20 % of Kabul people living in rural area (OCHA, 2015). [20]

106. Baghlan Province has a total population of 943,400 habitants (City Population, 2017) with an average have 7 members each. Estimated urban population of Baghlan province is 108,385 habitants however 76 - 85 % of population living in rural areas of Baghlan province (OCHA, 2015). Baghlan maintains an ethnically diverse population, which includes Tajiks, Pashtuns, Uzbeks, Hazara and Tartars.

[18]http://www.refworld.org/pdfid/55eedf694.pdf
[19]http://www.citypopulation.de/Afghanistan.html
[20]http://www.refworld.org/pdfid/55eedf694.pdf

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

- 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 Arghundy, Paghman, Shekerdara and Guldara.

108. 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.

109. 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.

5.12.2. Land Ownership

110. 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 updated LARP).

5.12.3. Education

111. Afghanistan total literacy rate is 38.2%, where male literates are 52% and female literates are 24.2% with a gender difference of 27.8 % (UNESCO Institute for Statistics, 2015). The education arrangement and literacy rate in the project investigation area is as follows:

Kabul Province

112. Kabul has been known as Afghanistan's center of education. The female literacy rate in Kabul is 33.2 % however 65.7 % of the men are literate (Afghanistan Health and Demographic Survey, 2015).

113. Due to the continuous conflict since decades, the education sector has been adversely affected, however, there are still 437 schools in the city, where 225 are primary, 78 are secondary and 125 are high schools. In addition, 24 schools are under construction in Kabul. Thousands of students from 170 schools get education under tents. A total of 253,772 students, who study in various educational institutions in Kabul city with 86,555 of them are girls' students. Around 5,299 teachers impart education to the students with 1,629 of them are female teachers. As many as 31 public and 80 private universities are functioning in Kabul while 150,000 students are enrolled in higher education in public and 100,000 others in private institutions and among them 25 % of the students are girls. In

the last nomads' population (Kochi), 2.8% of the men are little educated but women are not educated at all. (Pajhwok Afghan News, 2014).[21]

114. 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.

Parwan Province

115. The numbers of total schools in Parwan is 410; out of which 159 are high, 126 intermediate and the rest 125 are primary schools. The literate men in Parwan are estimated 56.7 % and literate females are 12.2 % (Afghanistan Health and Demographic survey, 2015).

116. Simultaneously, 34 religious institutions including four Dar-ul-Ulums, nine Madrassas offer religious education with another 21 religious institutions provide systematic education from class 1st to 12th.489 teachers impart education to 13,794 males and 3,321 female students in religious institutions. 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.

117. The province has a well-established state-run university, Parwan University, established in 1961, is located in Charikar, capital of Parwan province where a total of 4,300 students with 430 female students get higher education. The University has eight faculties including Economics, Journalism, Languages and Literatures, Education, Computer Science, Social Science, Law, Agriculture and Education. (*Parwan University website, 2017*). In addition, a private university and three private high schools also disseminate education in the province (*Pajhwok Afghan News, 2014*). Primary schools are located less than five km from home for about three-fifths (58.3%) of the primary school students.

118. The overall literacy rate in Investigation area 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 24the 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 and0.3% of women being able to read and write.

119. 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. The data has been retrieved from secondary data already existing study from IEE for ESDIP – Tranche 5 Substation at Dashte Alwan.

Baghlan Province

120. Baghlan province has number of higher education facilities. Women literacy rate in Baghlan province has estimated 13.8 %, however, 58.8 % of male are literate (Afghanistan Health and Demographic Survey, 2015).

[21] http://elections.pajhwok.com/en/content/kabul-province-background-profile

121. Overall, there are 277 primary and secondary schools in the province for 247,313 students where 87% of the schools are only boys' schools. There are nearly 8,000 teachers working in schools in the Baghlan province, one fifth of who are women (21%). High schools are located more than 10 km 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%).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.

122. Baghlan University was established in 1993 in Pul-e-khumri, city of Baghlan Province. The University has six faculties including Economic, Journalism, Literature, Education, Engineering, and Agriculture (*Baghlan University website, 2017*).

5.12.4. Occupations and Sources of Income

123. Today, 75% of Afghans rely on agriculture as a primary source of income. Afghanistan has an excellent reputation for high-value agricultural products, such as almonds, pomegranates, pistachios, raisins, and apricots (Afghanistan Country Profile, 2015). Industry is also based on agriculture and pastoral raw materials. More than 80% of Afghanistan's population is involved in farming and/or herding.

124. 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. Agriculture, livestock, trade, civil services, industries are among the main sources of income of the citizen of the Kabul city. The main agriculture products include wheat, potato, barley and other grains; however, wheat product is not sufficient for Kabul residents (Pajhwok Afghan News, 2014).[22]Additional information will be included after field visit for additional financing component.

5.13. Health Situation

5.13.1. Diseases and Health Problems

125. 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 & sand flies can be found in

[22]http://elections.pajhwok.com/en/content/kabul-province-background-profile

the country. Malaria, which is acquired through the bite of an infected female Anopheles mosquito, is the major vector-borne risk that exists countrywide (including urban areas) below 2,000 meters elevation.

126. Regarding the Investigation area, educated nurses attainment of female household in Kabul is 6%, and 1-3 % is in Baghlan and Parwan provinces (Afghanistan Health and Demographic Survey, 2015). In the project area, frequent 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 Centers (BHC) and 24 Comprehensive Health Centers (CHC) are supported by different NGOs.

127. Only 14% of Afghan women in rural areas had access to skilled birth attendants, however, by 2012, 46% did. This work has a tangible impact – adult life expectancy has risen by 22 years, under-5 mortality has decreased by 62%, and maternal mortality has dramatically decreased to 327 deaths per 1,000 live births (USAID- Afghanistan Country Profile, 2015).[23]

128. 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). According to MoPH, lack of access to health services, malnourishment, early marriages and multiple pregnancies are the main reasons for Afghanistan's high maternal mortality rate.

129. 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 the virus might have infected 6900 people, who are living with AIDS/HIV and 600 are died from HIV/ AIDS in Afghanistan (Wikipedia, 2015). 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. [24]). 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.

130. 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

[23] https://www.usaid.gov/sites/default/files/documents/1871/Afghanistan%20Country%20Profile%20%28English%29.pdf

[24] http://www.unodc.org/documents/data-and-analysis/Studies/Afghan-Drug-Survey-2009-Executive-Summary-web.pdf

and 147 nurses employed by the Ministry of Health working in the province, which represented a decrease of about 15% in the number health service personnel compared to 2003. The province also has 156 pharmacies of which 154 are owned privately and 2 are run by the government. The majority of communities do not have a health worker permanently present in their community. Eighty four percent of men's *shura* and 72% of women's *shura* reported that there was no community health worker present, and both groups most commonly said that they did not know what their closest health facility was. Out of 1,365 villages, only 38 have a 5-13 health center 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. The data has been retrieved from secondary data already existing study from IEE for ESDIP – Tranche 5 Substation at Dashte Alwan. Additional information will be included after field visit for additional financing component.

5.13.2. Health Infrastructure

131. In Kabul, Parwan and Baghlan provinces, a basic infrastructure of health services exists (MRRD, 2007).[25]

Kabul Province

132. Kabul currently has s basic health care system in place. According to the announced released report about Kabul province on the website of Kabul Governor's office (2017), there are 48 basic health centers, 4 sub health centers, 51 comprehensive health centers, 4 comprehensive health centers (+) and 8 hospitals to district level.

133. 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.

Parwan Province

134. 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 the government runs 3. 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 center or dispensary within their boundaries.

Baghlan province

135. 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

[25]"Provincial Development Plan", Ministry of Rural Rehabilitation and Development (MRRD), 2007

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.

136. 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 center 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. Additional information will be included after field visit for additional financing component.

5.13.3. Access to Safe Drinking Water

137. There are various sources of drinking water in Afghanistan including Rivers, Streams, Canals and springs, which provide non-potable water for the majority of the population. Most residents must walk a considerable distance to access safe drinking water. The availability of potable water is 7%, defines as Piped Water, Public Tap, Public Well, Protected Spring, or Rain source (*Program for Culture and Conflict Studies, 2017).* [26]

138. Most Afghans do not have access to safe drinking water. This, in combination with a lack of sanitation and hygiene has serious consequences for the health and well-being of the population. An estimated 99% of developed water resources of the country are used for irrigation. Groundwater has traditionally been utilized for irrigation purposes through the use of *karezes mer*, springs and shallow hand dug open wells. In more recent years, deep drilled wells have become a more common means of extraction. Today, all traditional groundwater irrigation systems have reduced or dried up completely (source: http://www.cawater- info.net/Afghanistan/afg7_e.htm).

139. 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.

Kabul Province

140. 70 percent of the Kabul residents do not have access to safe drinking water; so only 30 percent of Kabul residents drink safe water (Tolo news report, *2011*). [27]

141. More than 3 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%

[26]Program for Culture and Conflict Studies, 2017, Naval Postgraduate School (NPS), 2017) at https://my.nps.edu/web/ccs/baghlan

[27]http://www.tolonews.com/business/70-kabul-residents-dont-have-access-drinking-water

of the families are facilitated from that. 81-96 % households of Kabul province have access to improved water sources (Afghanistan Demographic and Health Survey, 2015)

Parwan Province

142. In this 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 have to travel up to 6 hours to drinking water access. 51-70 % households of Parwan province have access improved water sources (Afghanistan Demographic and Health Survey, 2015).

Baghlan Province

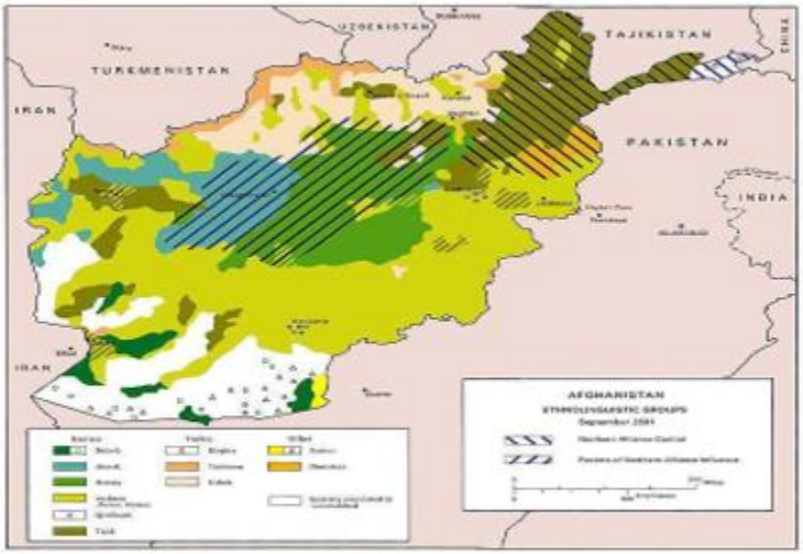
143. In Baghlan, on average only 19% of households use safe drinking water. This rises to 35% in the urban area and falls to 16% in rural areas. Nearly three quarters of households have direct access to their main source of drinking water within their community, however one in five households has to travel for up to an hour to access drinking water, and for 4% travel to access drinking water can take up to 6 hours. 31-50 % households of Baghlan province have access improved water sources. (Afghanistan Demographic and Health Survey, 2015).

144. 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. Additional information will be included after field visit for additional financing component.

5.14. Ethnic Groups/Minorities

145 Afghanistan is a multi-ethnic country where several ethnic groups inhibit in the northwestern region (Figure 5-9)

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



Source: US Army 2001-2009

Kabul province

146 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 speak 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.

Kabul city

147 The population of the city reflects the general multi-ethnic, multi-cultural, and multi-lingual characteristics of Afghanistan. The is no official government report on the exact ethnic makeover. 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.

Parwan Province

148 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, many armies including Persians, Mongols, etc. have fought it, 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.

Baghlan Province

149 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. The data has been retrieved from secondary data already existing study

from IEE for ESDIP – Tranche 5 Substation at Dashte Alwan. Additional information will be included after field visit for additional financing component.

5.15. Gender Aspects

150 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 have the primary responsibility 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. Additional information will be included after field visit for additional financing component.

5.16. Agriculture and Lands Ties

151 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**.** The data has been retrieved from secondary data already existing study from IEE for ESDIP – Tranche 5 Substation at Dashte Alwan. Additional information will be included after field visit for additional financing component.

152 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 cereal 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 much 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.

153 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. Additional information will be included after field visit for additional financing component.

5.17. Land Use Pattern and Agriculture

Baghlan Province

154 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 rain fed 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

155 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

156 Kabul is an agricultural province with 90 % of its population's income is associated with agriculture and livestock. Its agriculture products include wheat, barley, corns, onions and potatoes with fruits such as grapes, apple, apricots and cherry. Its fruits are exported to other provinces as well. The livestock in Kabul is estimated at around one million. There are 125, 563 hectares of agriculture land in Kabul and the number of farmers is said to be around 60,000. Agriculture product of Kabul is estimated at around 72 % fruit, 17 % grains, 10 % vegetable and one % other crops (Pajhwok Afghan News, 2014).[28]

[28] http://elections.pajhwok.com/en/content/kabul-province-background-profile

157 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.

158 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 products of the country which grow in Farza and Shakar Dara, Paghman district.

159 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 QaraQol 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.

160 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

161 Parwan has total of 75, 000 hectares agricultural land. The farmers abundantly produce wheat, potatoes, corn, beans, grapes and raspberries. The province is known for producing various kinds of vegetables, which are being sent to Kabul. The majority of the SurkhParsa, Shikh Ali, SyahGardah and Kohi Safi people associate with the livestock profession.

162 Most of the people with special reference women of Jabal-e-Saraj, Salang, Sayed Khel and Bagram have expertise in making of tomato paste, drying up tomatoes, onion and peppers and then they sell it in the open market (Pajhwok Afghan News, 2014).[29]

163 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

[29] http://elections.pajhwok.com/en/content/background-profile-parwan

(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	62	84	62
Irrigated			
Land			
Access rain-	6		6
fed land			

Fifty-five percent of rural households and 81% of Kuchi households in the province own livestock or poultry.Additional information will be included after field visit for additional financing component.

5.18. Electricity and Transport Infrastructure

Baghlan Province

Electricity & Transportation

164. 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.

165. In Baghlan, the estimated population with access to electricity is 17%. The province has one power generation station. The majority of residents rely on public electricity. Access to electricity is much greater in the urban area where 65% of households have access to electricity (Program for Culture and Conflict Studies of Baghlan Province, 2017).[30]

166. 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. Field data shall be added after the survey is conducted at the end of the COVID 19 outbreak.

Kabul Province

[30](Program for Culture and Conflict Studies of Baghlan Province, Baghlan Provincial Overview" Naval Postgraduate School (NPS), 2017) on https://my.nps.edu/web/ccs/baghlan

Electricity

167. Approximately, 90 % of Kabul population has access to electricity (Pajhwok Afghan News, 2014), 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.

Transportation

168. Only 60 % of the city's roads are asphalted (Pajhwok Afghan News, 2014). The basic infrastructures 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.

ParwanProvince

Electricity

169. On average 22% of households in Parwan province have access to electricity with the majority of these (16%) relying on public electricity.

Transportation

170. 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.

5.19. Physical Cultural Sites

171. 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.

172. In the investigation area, Parwan is bestowed with historical places while the province gave birth to several leading personalities. The great Imam and Islamic Scholar Imam-a-Azam originally hail from Parwan. Similarly, Bagram and Jabal-e-Saraj are among the other historical places that contributed to the beauty of the province. Jabal-e-Saraj was constructed in 1907 during the reign of Ameer Habibullah Khan, which is a famous palace and known as Saraj-ul-Amsar and used as official thrown until the kingdom of Amir Amanullah Khan in 1919. Most of the historical palaces were damaged during the decades of war that needs government attention for rehabilitation. Another historical the Hofyan region--- located to the west of Charikar is the martaydom place of 72 companion of Prophet Muhammad including Shah Yousaf Qatal and their tombs can be seen in Hofyan.Similarly, the tombs of great Sayed Jafar, Jan Agha, Sayed Jaffar Mujarad and Mir Jahan also exist in the province.

173. Bargram district was the capital city of Kabul Kings while the Kachri Shmlatar tall minarets of Koshanis kingdom located in the Top valley to the west of Charikar. However, the minarets were destroyed in 1993 during the civil war, and it is imperative for the incumbent government to rehabilitate the entire historical sites. The Sayad region has the historical antiquities of 16 fire worship places and residencies of Kanishka the king of Koshyanies from 120 to 160 AD.The biggest ever-military Bagram Airport and Corrigan of the country currently used by the U. S. forces exist in the district (Pajhwok Afghan News, 2014).[31]

174. Historical monuments are located in 26 locations elsewhere in the Baghlan province. The historical sites include Tapazar, Tapa Safari, Shurtapa Shamruq, Tapa Rustam, Shur Baba, Tila Tapa, Zardkamar, Masjid Safid, LalaQadaq, Qandrayona and SurkhKotal. The historical monuments are located in Pul-i-Khumri, Khost, Doshi, Baghlan, Markazi, and Ghori districts. The monuments discovered in SurkhKotal and Rabatak shows the periods of King Kanishka Kabir and small Koshani. The Buddhists (Koshanis) were living there from second to 5th centuries. The monuments show Baghlan province has a 2,000 years' history before Islam when Kotal Rabatak and SurkhKotal were fire worship places (Pajhwok Afghan News, 2014).[32]

5.19.1. Unknown Cultural Resources

175. 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 the relevant authorities have not yet systematically conducted excavations. However, there is one graveyard (between AP 15 and AP 16) in the line corridor in Qala-e-Burjak village of Paghman district in Kabul province. Moreover, this aspect should be included in the Chance Find Procedure. Additional information will be included after field visit for additional financing component.

[31] http://elections.pajhwok.com/en/content/background-profile-parwan
[32] http://elections.pajhwok.com/en/content/background-profile-Baghlan

6. Environmental Impacts and Mitigation

1. Environmental impacts have been assessed considering present environmental settings of the ROW of OHL corridors and substation subprojects, nature and extent of the proposed activities. Particular emphasis is given to the activities to be implemented during the construction of the facilities for the OHL.

2. The impact assessment of the project components was structured into the
   1) Design / Pre-construction Phase
   2) Construction Phase
   3) Operation Phase
   4) Decommissioning Phase

3. Mitigating measures are recommended to avoid or minimize adverse environmental impacts.

4. **Some medium impacts** remain in view of the line routing and the substations during the design phase. However, further medium impacts may be generated during the construction phase regarding surface water, health & safety aspects, land acquisition, resettlement, gender aspects, vulnerable people and historical and cultural sites. Other medium impacts will occur during operation regarding visual impacts and health & safety aspects. Medium impacts are also anticipated concerning downstream impacts. Regarding the environment, a project site was investigated on either side of the planned transmission line during the field survey. 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.

5. 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 valuation 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, and operation and decommissioning

6.1. Impacts during Design Phase

6.1.1. Line Routing and Substation Sitting

6. The present design is prepared by the civil work contractor with the supervision of PIC and is finally approved from ADB that is significantly changed from the preliminary design prepared by FITCHNER in Phase 2 (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 220 kV transmission line, in a distance of 50 m, which nevertheless will result in a completely new corridor causing land acquisition. However, in the present approved transmission line, in some of the locations the rivers will be crossed. However, it was verified that towers should not be placed too close to the rivers and creeks (i.e. avoid flooding areas) and fragile riverbanks shall not be damaged. Dashte Alwan is a dry land located in North West of Puli-Khumri city about 25 km of existing Puli-Khumri substation. Alwan is located along Mazar Sharif-Puli-Khumri highway. North of the road is a settlement called Dashte Alwan refuges city and south of the road is an open area, dried rainfed land belongs to government. The land gets cultivated on biyearly basis (once per two year) which gives

less production as it is totally dependent on the level of rain fall during the year. The land has been operated by individuals as lease and contract for the past 35 years. People from the neighboring villages and other people from Puli-Khumri can get the contract depending on the local government and social government system decision. Mostly relatives of Maliks (head of specific tribe of place) can get the contract. There has not been a single person holding the contract so with acquisition of this land no long term specific adverse effects are perceived on any specific family or household. There are clear evidences that the land belongs to government the necessary influence of government does exist to occupy the land for any development intervention purposes as they have been able to change the contract in yearly base this shows the level of government influence and ability to occupy the land with no problem and whenever they want. Under consideration of the above-mentioned facts and mitigation possibilities.

7. Additional line bay and two reactors at Dashte Alwan is a dry land located in North West of Puli-Khumri city about 25 km of existing Puli-Khumri substation. Alwan is located along Mazar Sharif-Puli-Khumri highway. North of the road is a settlement called Dashte Alwan refuges city and south of the road is an open area, dried rain-fedland belongs to government. The land gets cultivated on biyearly basis (once per two year) which gives less production as it is totally dependent on the level of rain fall during the year. The land has been operated by individuals as lease and contract for the past 35 years. People from the neighboring villages and other people from Puli-Khumri can get the contract depending on the local government and social government system decision. Mostly relatives of Maliks (head of specific tribe of place) can get the contract. There has not been a single person holding the contract so with acquisition of this land no long term specific adverse effects are perceived on any specific family or household. There are clear evidences that the land belongs to government the necessary influence of government does exist to occupy the land for any development intervention purposes as they have been able to change the contract in yearly base this shows the level of government influence and ability to occupy the land with no problem and whenever they want. Under consideration of the above-mentioned facts and mitigation possibilities, the extent of impact regarding line routing is assessed to be Medium.

8. Refining of line routing has been 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 was completed under the responsibility of the construction contractor, PIC has done careful monitoring.

9. The following mitigation measures of the EMP were the parts of the EPC contract:

- Towers shall not be erected too close to rivers and creeks and fragile riverbanks shall not be damaged.
- Selection of a transmission line corridor that bypasses settlements so that only minimum resettlement actions/ relocation of households is required.
- Designing the TL with a 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.

10. 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
Arghundy Substation	□□= Medium
Dashte Alwan Substation	□□= Medium
Line bay and reactor	□□=Medium

6.1.2. Access Roads

11. In Section 1, starting from Arghundy to Salang south, there is 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 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 very few places that may need to be improved with access roads. Site is adjacent to main the highway (ring road) linking Pul-e-Khumri to Mazar Sharif. There will be little need, if any, for constructing access roads, as the area is flat to project site there is a fair road that allows getting the material to the site with little improvements in some places.

12. For Additional line bay and two reactors, the site is located inside the existing substation and the existing road/track will be used. The substation site is adjacent to main the highway (ring road) linking Pul-e- Khumri to Mazar Sharif. There will be little need, if any, for constructing access roads, as the area is flat to project site there is a fair road that allows getting the material to the site with little improvements in some places.

13. The final line routing is selected with focus on minimizing the need to build new access roads, while design along existing paved roads or tracks. Existing roads/tracks will be used to the greatest extent possible. The following points were particularly considered during detailed design phase:

- Minimization of the number and length of access roads.
- Careful selection of location of access roads.
- No construction of access roads near Astalef Shrine, although it is too far.
- Implementation of a chance findsprocedure, when 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 were maintained and will be planted with appropriate vegetation.
- Design consideration also included protection using retaining structures such as gabions.

Impact of/on	Extent of impact
Construction of access roads	□= low

up gradation of existing access roads for Additional financed components (if any)	□=low

6.2. Impacts during Construction Phase

6.2.1. Soil and Erosion

14. Based on detailed design stage, 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 roadside plantation with bushes (in view of the operation phase) will have to be implemented. The project site is characterized by flat semi-desert section with no major risk for erosion during construction. 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).The main environmental concerns during construction of the additional financed components are noise, dust, vibration and air pollutant emission from the construction equipment and earth moving equipment. 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, impacts of noise on the population during the construction activities will be low.

15. Previous report of Fitchner (2013) in feasibility stage has indicated that there might be risk of accelerated sand deflation during the construction process, however, in the updated detail design all those areas has been avoided where there was possibility of accelerated sand deflation.

Impact of/on	**Extent of impact**
Erosion	□= low
Sand Deflation	□= low
Erosion and Sand delflation for additional financed components	□= low

6.2.2. Landscape and Visual Aspects

17. Based on detailed design phase, in Sections 1 and 2 the impact was hardly mitigated in most of the places, especially in agricultural field. Where there was space and possibility to erect the towers in open spaces, this was utilized to avoid the impact in house buildings. In Sections 1 and 3 the mitigation measures does not work much but in Section 2 the impacts were better mitigated. As the additional financed components will be locating inside the existing substation therefore no more additional landscape and visual Aspects are expected.

Impact of/on	**Extent of impact**
Visual aspects/ landscape	□= low
Visual aspects/ landscape for additional financed components	□= low

6.2.3. Air Quality and GHG Emissions

18. 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 during monitoring visits by Consultant to minimize exhausted pollutants.

19. 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.

20. For additional financed components which include construction of one line bay and two reactors the impacts on climate is nil and air quality is low based on the limited construction activities to be carried out during project implementation.

21. 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 (SF6) taken from electrical equipment”;
- IEC 61634 “High-voltage switchgear and control gear – Use and handling of sulfur hexafluoride (SF6) in high-voltage switchgear and Control gear”.

22. Following these guidelines and considering the recommendations of the International Council on large Electric Systems (CIGRE: SF_6 Task Force).

23. 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
Climate (additional financed components)	□= nil
Air quality (additional financed components)	□= low

6.2.4. Water Resources

24. During detail design phase, there is a general risk of surface water and groundwater pollution by e.g. oil/ fuel of machines and trucks was observed. This can be avoided by proper maintenance and construction site control.

25. The groundwater table in the proposed line corridor is assumed to be at minimum 15 m depth between Dashte Alwan and Arghundy, 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.

26. Towers are not placed close to rivers and creeks (i.e. avoid flooding areas) and riverbanks were not damaged. In addition, AP 69 that was planned in flooding area and AP 159 that has been placed inside the river during detailed design stage was reported after REA survey. Therefore, investigation team was assigned to relocate these two towers along with few adjacent towers to reduce adverse impact on water resources.

27. Soil run-off with oil/ fuel during construction may pollute surface waters. However, the Arghnady substation is planned be located far away from major surface waters. In order to avoid impacts from construction of the towers, the tower sites are planned to 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.

28. Also, the construction of temporary bridges (if riverbeds are not dry) may cause deterioration of riverbeds 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.

29. Pollution of rivers by vehicles and waste shall be forbidden and controlled, (e.g. no car washing in the rivers, no oil spills, etc.).**There are some locations, where the rivers will be crossed by the planned 500 kV transmission line are as follow:**

30. The locations where the rivers crossed by transmission line are between AP 34 and AP 34/1, between AP 43/2 and AP 43/3, between AP 61 and AP 61/1, between AP 66C and AP 66D, between AP 66D/1 and AP 67, between AP 70 and AP 71, between AP 72 and AP 73, between AP 119 and AP 119/1, between AP 132/1 and AP 133, between AP 143/1 and AP 143/2, between AP 154 and AP 155, between AP 159 and AP 159/1, between AP 159/1 and AP 160, between AP 160 and AP 161, between AP 162 A and AP 162 B, between AP 163 and AP 164, between AP 165 and AP 166, between AP 166 and AP 167, between AP 167 and AP 168, between AP 172 and AP 173, between AP 174 and AP 175, AP 180 E and AP 180 F, between AP 180 F and AP 180 G, between AP 180 G and AP 180 H and between AP 180 H and AP 180 I.

31. 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. 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.

32. For additional financed components which include construction of one line bay and two reactors the impacts on Ground water and surface is low as they are located inside existing substation.

Impact of / on	**Extent of impact**

Ground water	=Low
Surface water	=Medium
Ground water (additional financed components)	=Low
Surface water (additional financed components)	=Low

6.2.5. Flora and Fauna

33 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. Exact Number of Trees to fell down shall be provided after detailed field study.

34 For additional financed components which include construction of one line bay and two reactors the impacts on Flora and Fauna is low as its located inside the existing substation.

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

Impact of / on	**Extent of impact**
Flora and Fauna	=Low
Flora and Fauna (additional financed components)	=Low

6.2.6. Protected Areas

36 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 in Salang Kotal, which, although not being registered as protected, contains a rich diversity of migrant and breeding birds.

37 Since there is a chance that the workers from the construction camps want to improve their meat diet by poaching activities, these shall be strictly forbidden, controlled and punished in the area around the Salang Kotal. For additional financed components which include construction of one line bay and two reactors the impacts on Protected Areas is low because the additional financed component is located inside the existing substation.

Impact of/ on	**Extent of impact**
Protected areas	=Low
Protected areas (additional financed components)	=Low

6.2.7. Waste Management

38 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.

39 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;
- Hazardous aaste like fuel, oil, Batteries etc.;
- General refuse.
- Medical Waste

40 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/camp like paper, plastic, drinks containers, food waste, etc.
- Medical waste, First aid kit used items such as bandages, injections, etc

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

- A waste management hierarchy of avoidance, minimization, reuse, recycling, treatment and disposal;
- All waste should be segregated by category on site, based on their nature, and ultimate disposal sites as per WMP;
- Staff training to increase awareness of waste minimization issues.

42 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.

43 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.).

44 For additional financed components which include construction of one line bay and two reactors the impacts from Solid waste and liquid waste is low. Additionally, additional component work will be very limited, on specific site and for short duration.

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

Impact on/ of	**Extent of impact**
Solid Waste	□=Low
Liquid Waste	□=Low
Solid Waste (additional financed components)	□=Low

Liquid Waste (additional financed components)	□=Low

6.2.8. Workers and Community Health & Safety

46 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.

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

48 Regarding the sanitary situation, the construction sites and camps shall be 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.

49 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.

50 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 has been carefully assessed before starting of civil works in September 2017. 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.

	Arghande 500 kV SS	500 kV Transmission Line from Dashte Alwan to Arghande	Extension of Line Bay and Installation of Reactors at Dashte Alwan 500 kV SS	**Total**
Labors	35	259	25	**319**
Staff	16	38	16	**70**

51 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.

52 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. For additional financed components which include

construction of one line bay and two reactors the impacts on Workers Health and safety and Community Health and Safety is expected low to medium.

Impact on/ of	Extent of impact
Workers Health and safety	□□=medium
Community Health and Safety	□□=medium
Workers Health and safety (additional financed components)	□□=medium
Community Health and Safety (additional financed components)	□=Low

6.2.9. Infrastructure and Traffic

53 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.

54 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.

55 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 shall be respected.

56 The activities for the additional financed components (a line bay and two reactors) will be limited/specific and for short duration and it's expected thatthe impacts on Infrastructure and Traffic is low.

There are some roads and other OHL's and highways that are crossed by this planned 500 kV transmission line are as follow:

Roads:

57 Transmission line crossed some roads between AP 20/1 and AP 20/2, between AP 23/5 and 23/6, between 41/1 and AP 42, between AP 43/9 and AP 10, between AP 45 and 45/1, between AP 43/2 and 43/3, between AP 51/3 and AP 51/4, between AP 55 and AP 55/1, between AP 61 and AP 61/1 and between AP 89 and AP 90.

Other OHLs:

58 In some places the new OHL have crossed other existing OHL's as 220 kV and 20kV.The new transmission line crosses 220 kV existing line in two places in Salang South; between AP 89 and AP 90 and between AP 97 and AP 98.

59 In addition, the 20 kV transmission line is crossed in the below places: Between AP 1 and AP 1A in Arghandi, between AP 20/2 and AP 21 in Paghman, between AP 41/1 and AP 42 in Qarabagh district of Kabul, between AP 45 and AP 45/1 in Qarabagh district of Kabul, between AP 52 and AP 52/1 in Charikar, between AP 250/3 and AP 251, between AP 255 and AP 255/1, between AP 265 and AP 266, between AP 267 and AP 268 and between AP 279 and AP 279/1.

Impact of/on	Extent of impact
Infrastructure and traffic	□□= medium

Infrastructure and traffic (additional financed components)	□=Low

6.2.10. Physical Cultural Resources

60 The transmission line corridor runs partly near to a branch of the Historical Silk Road. The investigation was completed through 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.

61 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.

62 Despite not having encountered evidence of cultural sites within the line corridor (including the 25km), 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 bypassing 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.

63 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.

64 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 ofHistorical and Cultural Sites immediately (within 24 hours or less)
f) 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.
g) 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.

h) 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
i) 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.

64. For additional financed components which include construction of one line bay and two reactors the impacts on Historical and cultural sites is low.

Impact of/on	Extent of impact
Historical and cultural sites	= low tomedium
Historical and cultural sites (additional financed components)	= low

6.3. Impacts during Operation Phase

6.3.1. Soil and Water Resources

66. 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 led into separate storage tanks for further treatment. Sanitary wastewater at substations will need to be treated.

67. 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.

68. The 25 km extension line between the original PeK SS location and the location B in Arghundy will cross the river Baghlan-Kunduz, where the two canals of Chashma-e-shir is located and Dand-e-Ghori, and 3 other streams.

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

70. For additional financed components which include construction of one line bay and two reactors the impacts on Soil and water resources is low, because the impact is localized, limited, very short time and activities will be in the existing substation.

Impact of/on	Extent of impact
Soil and water resources	= low
Soil and water resources (additional financed components)	= low

6.3.2. Landscape and Visual Impacts

71. 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.

72. 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.

73. For additional financed components which include construction of one line bay and two reactors the impacts on Visual impacts/ landscape is low.

Impact of/on	**Extent of impact**
Visual impacts/ landscape	□= low
Visual impacts/ landscape (additional financed components)	□= low

6.3.3. Climate

74. 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.

75. For additional financed components which include construction of one line bay and two reactors the impacts on climate is regionally positive.

Impact of/on	**Extent of impact**
Climate	□□regionally positive(increased energy efficiency)
Climate (additional financed components)	□□regionally positive(increased energy efficiency)

6.3.4. Flora

76. 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.

77. The vegetation under the towers, at the substation sites and along the access roads/ tracks will partly be destroyed permanently. Possible Number of Trees for the whole project can be obtained after the upcoming field study after the COVID 19 outbreak and for additional financed component As there are no trees growing in project site, the impact of the proposed Project on the flora during the operation phase is assessed to be low. 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 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.

78. For additional financed components which include construction of one line bay and two reactors the impacts on flora is low.

Impact of/on	Extent of impact
Flora	= low
Flora (additional financed components)	= low

6.3.5. Fauna

79. 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 death. 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.

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

81. 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.

82. 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 (*LandesbundfürVogelschutz*) 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, it is recommended to install 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

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

84. Other fauna is impacted significantly by the Project. Disturbance of animals shall be minimized during maintenance work particularly by respecting breeding seasons.

85. For additional financed components which include construction of one line bay and two reactors the impacts fauna is low.

Impact of/ on	**Extent of impact**
Avifauna	= Low
Other fauna	= Low
Avifauna/fauna (additional financed components)	= Low

6.3.6. Waste Production

86. 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. Additional financing component located in the existing substation and waste will be generated with minimum amount and for short period. Therefore, the impact of waste production during the operation phase is expected low

Impact of /on	Extent of impact
Waste production	=Low
Waste production (additional financed components)	=Low

6.3.7. Workers and Community Health & Safety

87. As the high voltage transmission line is forming the backbone of electricity supply into the southeastern region of the country, it is necessary to consider the risk of possible earthquakes. In general, Arghundy substation is 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.

88. 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

89. 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.

90. Also, noise emitted by the new substation 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:

Table 6-1: Limit values for noise regarding population

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

91. Noise levels for workers within the substation 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.

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

Electric and magnetic fields

93. 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).

94. 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.

95. With regard to Arghundy substation, 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 substation, 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.

96. Based on a recent in-depth review of extensive scientific literature (World Health Organization’s International EMF Project), the WHO has concluded, “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 outside of a 60 m ROW of a 500 kV line.

97. 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.

98. 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.

99. 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

100. 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.

101. Possible transformer fires. Firewalls 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 substation 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.

102. The extent of impact by additional component is expected from low to medium.

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

103. An area of 225 m^2 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 pastureland 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 updated LARP).

104. For additional financed components which include construction of one line bay and two reactors the impacts on Land use is nil because no addition land is required.

Impact of/on	**Extent of impact**
Land use	□= low
Land use (additional financed components)	NIL

6.3.9. Electricity Supply

104. 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. The extent of impact of additional financing component is locally and regionally positive as it will supply electricity locally or regionally.

Impact of/on	**Extent of impact**
Electricity Supply	□= locally positive
	□□= regionally positive
Electricity Supply (additional financed components)	□= locally positive
	□□= regionally positive

6.4. Impacts during Decommissioning Phase

105. 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, substation 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. The extent of impact of additional financing component is locally positive and low as it will be located in the existing substation.

Impact of/on	Extent of impact
Decommissioning	□= Low □= Locally positive
Decommissioning (additional financed components)	□= Low and □= 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 transmission line including Arghundy substation is not constructed, other lines will have to be connected to the substations that already exists in the vicinity through other projects 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.

3. The following aspects were considered in the optimization process of the new final alignment:

- Avoid traversing or close bypassing of urban areas, densely populated areas, settlements, schools, public buildings, and markets. For instance, there are many places where the following settlements, public building and markets are avoided in the detailed design stage:
    - Near AP 1A-AP19, Gantry shifted 500 meters from Tender route due to populated area of Arghande.
    - In the tender route near S 102, the new route is selected to avoid large number of houses due to extension of Paghman town.
    - From AP 48 to AP57/2, Charikar Town Extension has been avoided in the new detail design route.
    - There were a lot of houses between S98- S97 near the places DakowYapagyan, Quchi in tender route that has been avoided in new route.
    - AP 17 was also placed inside a public place i.e. School and the tower have been relocated etc.…
- Avoid traversing or close bypassing of religious or cultural sites, mosques, cemeteries, historical places, and protected areas. Such as there was one graveyard between AP 15 and AP 16 in the line corridor in Qala-e-Burjak village of Paghman district in Kabul province that has been avoided.
- Avoid traversing of forests and surface waters. There were no forests in the tender route as well as in the new route, however, AP 69 was placed in flooding area and AP159 has been placed inside the river in the new design stage that are now relocated.
- Avoid pollution of ground water and rivers where OHL crosses.
- Keep electrical field, magnetic field, audible noise and TV interference as low as possible by staying away from away from settlements or houses;
- Keep minimum impact on flora, fauna, nesting places, animal trails, migration zones and sensitive ecological areas;

- Avoid the adverse impact on other existing TL infrastructures such as from AP1A to AP19; 220kV D/C line is crossed from Arghande to Chimtala twice. Therefore, in the new detail design route this issue was considered.
- Avoid adverse environmental impacts on soil and ground conditions such as in the tender route between AP 1A to AP19, around 25Km (S103- S102) Quarry area was there in the Line. Therefore, this was avoided in the new design route.
- Consider accessibility in order to avoid new access roads.

4. Only the optimized line route with final approved Angle Point indications, and not the staged optimization process, which lead to this optimized line route of the detailed design, is shown in the report in order to save time and paper.

5. **Substation.** An optimization process similar to the line routing has been conducted for the substation at Arghundy. For Arghundy 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. As the Arghundy substation is already placed in the Government land, however, future expansion was constrained in prior site, which was in middle of settled area in Kabul.

6. In addition, the Construction Contractor has submitted a comprehensive information sheet with the optimum comparison of the tender route with the new final designed route along with details of reasons of change of route reasons of change and potential impact that has been avoided. In addition, the Construction Contractor to analysis the tender route and the new final route's reasons of change and potential impacts was summarized in a Comparison Sheet while mitigating potential adverse environmental impacts of the new route.

Expansion

7. The additional financed components (construction of a line bay and two reactors at Dashte Alwan Substation) No Project Alternative has been suggested /implied as this part of the project is located inside the existing substation and would not cause any resettlement or any significant potential environmental impacts.

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. The consultation process was carried out with the potentially displaced people/public for sharing of information related with the project planning and execution activities. The information shared included project activities and their expected impacts on the physical, biological and socio-economic conditions. Accordingly, the concerns/issues of the affected population/locals associated with the project were documented and understood.

3. In this respect, a series of consultations were made with the local population/those affected and other concerned stakeholders. The public consultations conducted in May 2013 by FITCHNER in feasibility stage included scoping sessions with stakeholders and focused group discussions with local communities. However, the consultations in this study at the detailed design stage during July – August 2017 on the site of the planned Arghundy substation and along the line extension routing were made.

8.1. Identification of Stakeholders

4. The stakeholders who may have a positive impact regarding project implementation in these provinces are the Ministry of Energy and DABS, the Ministry of Agriculture, Irrigation and Livestock, the Ministry of Rural Rehabilitation and Development, the World Food Programme, the National Solidarity Programme working with Community Development Councils, and the National Area Based Development Programme developed by District Development Assemblies.

5. Other stakeholders with some potential are 25 NGO working in Baghlan, 40 in Parwan and about 150 in Kabul, active mainly in the water and sanitation sector, in health care, education, women‘s empowerment, agricultural development, human rights, child care, socio-economic development, cultural and community development.

6. Community based organizations may be helpful too, although most are driven by local politicians. In all these three areas they can be more involved in development works, but most of them are based in the city itself with limited access to the districts.

7. The local government, the local electricity departments, and the Women departments on provincial level are quite active and it would be possible to involve them for supporting the project.

8. Local units of DABS and the Ministry of Energy are the overall responsible organizations for all electricity related issues: planning, development, and operation. They are also key players when addressing supply issues and conflicts.

9. Primary stakeholders are the people in the three provinces in general, when referring to the intended impacts of the project. If the adverse impacts of the project are taken into consideration, then much less households are the primary stakeholders. These people are affected in different ways according to the type of losses and the construction works itself. Most negative impacts are small and limited to a short period of time so that the positive impacts of the project most probably will compensate the people from the stress caused by the civil works (apart from the compensation payment for losses).

8.2. Stakeholder Consultation

10. During the field survey, various meetings were held with regional and local stakeholders. The focus of the meetings was on the collection of information with regard to all Potential issues condition in the wider areas of the planned line corridor and the proposed Arghundy substation. At the same time, information with regard to the project was provided to those stakeholders who so far were not informed.

11. As this project covers three provinces, current OHL traverses through the various districts of Kabul, Parwan and Baghlan provinces. The survey team held number of consultations with the local community in July - August 2017. With regard to the primary stakeholders, apart from many individual interviews, in total 10 focus group discussions were held in various districts of Kabul, Parwan and Baghlan province includingArghundy, Qala-e-Burjak, Shekerdara, Qarabagh, Guldara, Charikar, Jabalsiraj, Salang, Khinjan, Dushi).

12. Two public consultation meetings were held in Khinjan and Dushi districts of Baghlan province in August 2017. The first meeting in Khinjan 22 people participated and the major issues discussed in that meeting were the concern of community people about the loss of their property that they will loss due to the implementation of this project. However, the survey team has satisfied them that DABS will compensate them for the loss of their land/ property. The second consultation meeting in Dushi district was held with 30 participants from the local community and the only concern was about the compensation process of the losses of their property and any other assets. public consultation has not been conducted for the additional financing project due to COVID-19 outbreak. However, consultation will be conducted for the same, and their concern/results will be included as Appendix before commencement of the construction work.

13. Consultation was done with local elders, present people during the survey, farmers and shopkeepers along the way. There were reports that insurgents were looking for soft targets if they were not successful in accessing the main targets. So the survey team decided not to conduct women consultation as they are more exposed to threat.

Consultation Meeting in Kabul

14. In July 2017, the survey team had five consultations meetings in five various districts of Kabul. The first consultation meeting was held on July 3, 2017 in Arghandi village of Kabul province where 20 affected people participated. The key discussions of the meeting were about the implementation and its impact on the community and the environment etc. The people were concerned about the loss of their own property and the survey team convinces them that you will find compensation for those losses.

15. The second public consultation meeting was held in Qala-e-Burjak village of Paghman district on July 9, 2017, where number of participants was 15 and the major issue raised during the consultation was their concern about the Alfalah primary school where the AP 17 was placed and they requested for the relocation of that tower. Therefore, that tower has been to the CC and DABS and was relocated after their request.

16. The third public consultation meeting was held in the Shakardara district of Kabul with 19 participants on July 17, 2017 where the major concern of the community people was the adverse impact of the TL on their agriculture land and grape gardens etc.

17. The fourth consultation meeting was held in Guldara district of Kabul with 22 participants on July 23, 2017. The major issues discussed in that meeting was the adverse impact of OHL on their grape gardens and they were concerned about it. The fifth consultation meeting was held with the affected people of Qarabagh district on July 30, where 27 people participated. During this meeting the major issues raised were about the losses of their own land.

Consultation Meeting in Parwan

18. Three public consultation meetings were held in the month of August 2017 in Charikar, Jabalsiraj and Salang districts of Parwan province and the participants of the meeting were 26, 25 and 15 respectively. The major issues rose in these meetings in Jablasiraj and Salang districts were the loss of some trapped areas of migrant birds that is considered Important Bird Area (IBA) in the project feasibility study. In that area, the community people trapped some migrant birds for generation of income and therefore, the installation of these towers will lose their income from this business.

Consultation Meeting in Baghlan

19. Two public consultation meetings were held in Khinjan and Dushi districts of Baghlan province in August 2017. The first meeting in Khinjan 22 people participated and the major issues discussed in that meeting were the concern of community people about the loss of their property that they will loss due to the implementation of this project. However, the survey team has satisfied them that DABS will compensate them for the loss of their land/ property. The second consultation meeting in Dushi district was held with 30 participants from the local community and the only concern was about the compensation process of the losses of their property and any other assets.

8.3. Results from the Preliminary Consultation Process

8.3.1. Original transmission line routing

20. Based on the preliminary consultation process, the survey team found that the main sector problem of the community people is not the electricity supply connection rate, but the quality of the electricity supply. Nonetheless, there are many villages and especially areas with low population density cut off from the public grid. Where generators are used as an alternative, people complain about the high costs per kWh produced/consumed. The consequence is that both groups would be happy, if the project would not only supply electricity to the urban areas but also link the rural areas to the new HVTL or, where the networks already exists, provide 24/24-hour supply with a stable voltage.

21. People consider themselves as poor or at least not wealthy, but all group members never hesitate to declare that they themselves would pay for tariffs and for connections costs and just a few people would not be willing and/or able to use electricity if sufficiently available. One strong argument in favor of regular payment for the public supply is the current high costs for power produced by generators.

22. When asked who should organize the valuation of losses and fix the compensation, or who should conciliate in case of grievances, most people favor either

the traditional (tribal) *shura* or the new government-established *shura*. In two cases Community Development Councils were also mentioned.

23. Nobody showed concern with regard to possible damages and losses by the construction of the HVTL. The only two concerns were that the future supply would not be fair (i.e. that their village would not be included into the public network (as it was left out once before) and, as expressed by seven groups, the danger that compensation payments would not come at all or that the compensation money would not be paid adequately for the losses.

24. The majority of the people would not have any problems in facing land acquisition and compensation procedures. However, all people pointed out that there were vulnerable households living in their communities. In seven focus groups poor or extremely poor people were mentioned and in all 10 focus groups people referred to handicapped and women headed households as vulnerable: participants mentioned 150 poor hh, 50 hh depending on handicapped people, and 70 women headed hh.

8.3.2. Amendment

26. Two community consultations conducted at the new Arghundy SS site that clearly indicate that the land belongs to the government and is operated by the people from the nearby villages (according to evidences, the people using the land can also be from other places).

Consultation in Samot Shameer village, non-irrigated land:

27. Muhammad Gul, the AP from Samot Shameer village along with other community people, said that they have been hunting birds in the location of migratory birds as a.

28. They also mentioned that this is not their only source of income, given that they have their private land and other sources of income too. In case they stop this business, so they will not have much impact in their income level. Figure8-1 is the picture of consultation in IBA.

Figure 8-1: Consultations along the additional line corridor in IBA- non-irrigated land

Consultation along the line in irrigated land

29. Three farmers groups were consulted along the line corridor in the Shakerdara, Guldara and Paghman districts of Kabul province. The main crops on those lands are wheat and maize and some fruits i.e. grapes, apples, apricots and peach. The land cost, the average yield of a jirib of land and the types of crops were noted and the estimation was done based on it (**Figure 8-2**).

30. The people all agree and are willing to facilitate the project's development while devoting their agricultural land for the completion of this national level important project.

Figure 8-2: Field Data Collection- irrigated land along the line corridor in the Shakerdara, Guldara and Paghman districts of Kabul province

8.4. Conclusions and Further Proceedings

31. The conclusion from the social survey is that the implementation of the land acquisition and resettlement process requires an improved gender approach. As far as security conditions allow for the integration of female staff members into the contractor's and the consultant's teams, contacts with women as landowners and women as heads of households in general should be made by female social experts.

32. With regard to the next steps, after the initial consultations with various stakeholders and especially with members of the potential affected communities, the following activities needs to be carried out in which some activities are completed till date and some are remaining for the future:

- An agreement of the LARP has been signed between DABS and ADB, where both reports will be put onto the homepage of the concerned organizations;
- DABS has also in parallel provided a translation of the summary of the principles of the LARP, and the land acquisition and compensation process to the concerned district administrations for further distribution to the potential affected communities;
- After signing of the contract and in the start of the final HVTL design with the Detailed Measurement Survey, an elaborated leaflet is now required to print with a summary of the land acquisition and compensation process (including the grievance redress mechanism and all addresses of concerned institutions) and then it should be distributed to all persons identified as owners of affected land and other properties. A draft leaflet is shown in Annex 1.

33. The involvement of the affected population and their representatives will be ensured by their participation in the Provincial Valuation and Compensation Committees (PVCC) and in the Grievance Redress Committees (GRC), respectively. Apart from the institutional participation of representatives of the population, all affected persons are invited at any time to apply to the PMO and their Due Diligence Team (DDT). Phone numbers and other information about the concerned institutions will be provided in the project leaflet mentioned above.

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 including but not limited to that 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;
- 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 contractor, together with the IA, will be responsible to include a social and gender specialist to:

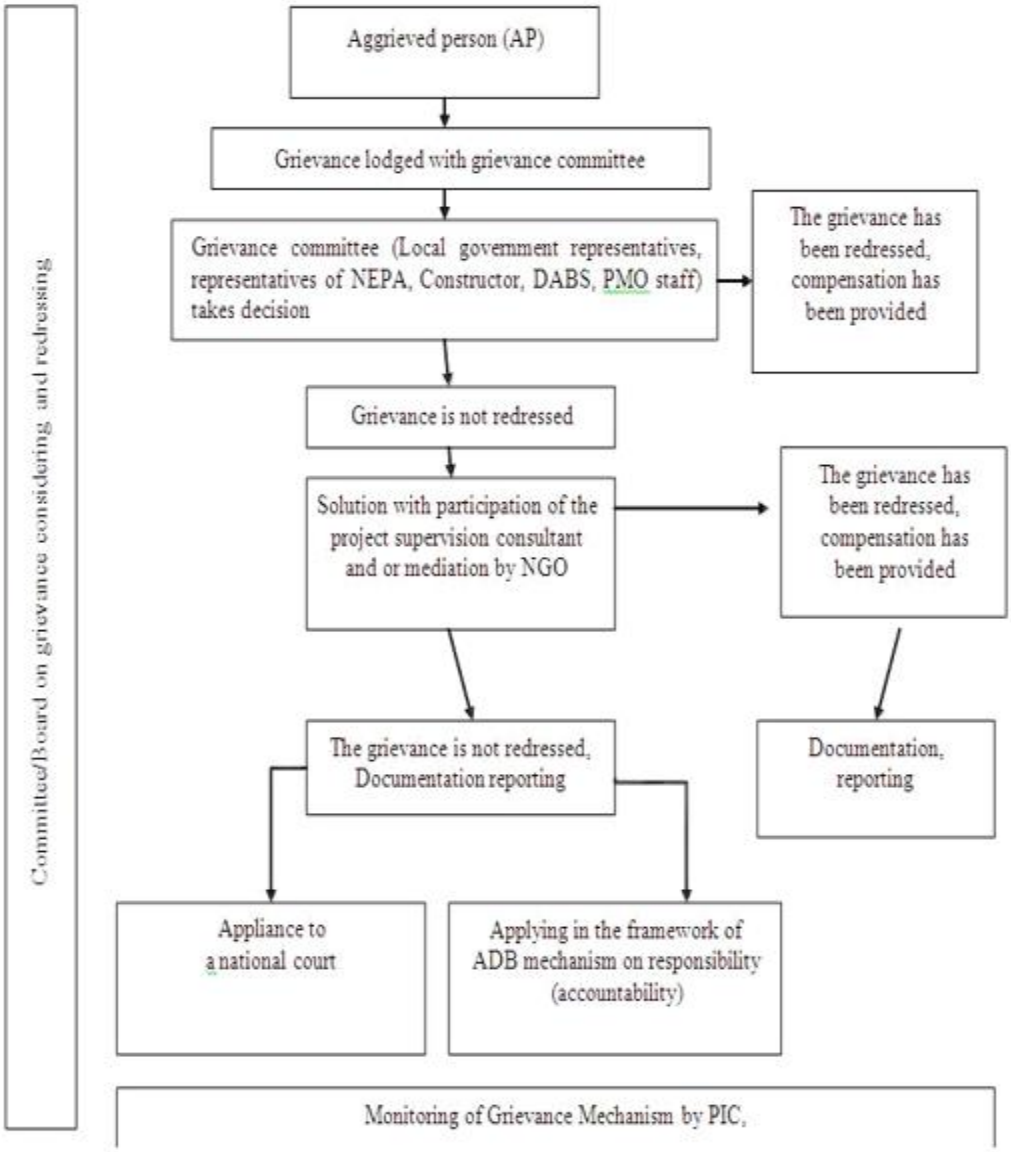
- Coordinate the grievance redress procedure;
- Arbitrate grievances with contractor, AP and local administration /Community leader
- Liaison with DABS
- Liaison with court
- Documentation of all grievances and resolution procedures

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.
Agree with the construction contractor on specific mitigation measures.
c) Agree with the contractor on a time limit for the grievance settlement.
d) Grievances have to be settled within two weeks, or as otherwise specified in scheduled agreement.
e) Sign if the mitigation measure has been implemented as agreed.
f) Seek redress from DABS if not satisfied with above-mentioned procedure.
g) Involve appropriate local authorities to liaison with DABS and constructor.
h) Involve NGOs or the construction supervision consultant to liaison with DABS and the constructor.
i) Seek redress from ADB, if not satisfied with response by DABS.
j) 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 contractor. 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	Implementation Agency	Costs [USD]	Date for implementation
Line Routing (Chapter 6.1.1)	Resettlement Damage of Physical Cultural Sites	• The new TL followed closely existing infrastructure. • Some of the Towers are placed on hilltops that were required to avoid human habitation. • Towers are not erected too close to rivers and • Creeks and fragile riverbanks are not damaged. • Selection of a transmission line and line bay corridor that • Bypasses settlements so that only minimum • Resettlement actions/ relocation of	PIC	Included in PIC contract	During final routing

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		households have been done. • Cultural, religious relics and graveyards are protected.			
Line Routing (Chapter 6.1.1) Additional Financing		• Bypasses settlements so that only minimum • Resettlement actions/ relocation of households have been done. • Cultural, religious relics and graveyards are protected.	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. • Cutting of vegetation and crops were limited, where feasible. • Compensation will be provided	PIC	Included in PIC contract	Before and during design phase / land survey

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		for all damages caused during land survey (see updated LARP).			
Line Routing (Chapter 6.1.1)- Additional Finance Component		• Mitigation Measures given for other parts of the project are sufficient and applicable	PIC	Included in PIC contract	Before and during design phase / land survey
Substations (Chapter6.1.2)	Land acquisition and resettlement Surface sealing Pollution through effluents	• Substations and the new line bay and two reactors are designed in order to minimize resettlement and land acquisition issues • Sealing of surface is minimized. • Sufficient sanitary structures are planned for employees • Fire-Safety equipment are planned for substations. • Construction of oil separators for maintenance of vehicles.	PIC	Included in PIC contract	During final routing

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		• Avoid asbestos-containing materials (ACMs) in new buildings;			
Substations (Chapter6.1.2)- Additional Finance Components		• Mitigation Measures given for other parts of the project are sufficient and applicable	PIC	Included in PIC contract	During final routing
Access Roads (Chapter 6.1.3)	Land Acquisition Damage of Physical Cultural	• Number and length of access roads are not minimized due to the tower placement on hilltops to avoid human habitation. • Careful selection of location of access roads. • No construction of access road near AquinaHuzi. • No construction of TL and access road near Istalif Shrine. • Implementation of chance finds procedure, if crossing	DABS-PMO and PIC	Included in PIC contract	During final routing

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		historical sites & graveyards. • Use of existing roads/ tracks wherever possible. • Design consideration includes protection using retaining structures such as gabions in some specific foundations in the hilly areas.			
Access Roads (Chapter 6.1.3)- Additional Finance Component		• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS-PMO and PIC	Included in PIC contract	During final routing
Health and Safety (Chapter 6.3.7)	Natural disasters	• The infrastructure is 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) Additional finance component		• Mitigation Measures given for other parts of	PIC	Included in PIC contract	During design

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		the project are sufficient and applicable			
Health and Safety(Chapter 6.3.7)	Impact of Electric & Magnetic Fields	• A minimum safety distance of 8 m from a house to the closest conductor is respected. • Maximized distance between TL and human Settlements except some limited areas where no other option was available. In those locations, the internationally accepted permissible limits of 5 kV / m and 100 μT, respectively should not be exceeded and it will be measured during operation phase.	DABS-PMO and PIC	Included in PIC contract	During final land survey
Health and Safety(Chapter 6.3.7) – Additional Finance Component		• Mitigation Measures given for other parts of	DABS-PMO and PIC		

Issue	Potential Impact	Mitigation Measures	Implementation Agency	Costs [USD]	Date for implementation
		the project are sufficient and applicable		Included in PIC contract	During final land survey
Water Resources (Chapter 6.2.4)	Pollution of Surface Water	• Design and Construction of Towers in distance from riverbanks (min 50 m is recommended) to avoid pollution of surface water.	PIC and CC	Included in Construction Cost	Before / during Construction period
Surface Water (Chapter 6.2.4) – Additional finance component		• Mitigation Measures given for other parts of the project are sufficient and applicable	PIC and CC	Included in Construction Cost	Before / during Construction period

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 is avoided by stripping and storing • Topsoil prior to construction (where appropriate i.e. on productive lands).	CC	Included in Construction costs	During construction

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		• 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, riverbanks, accessRoads and other work areas that are not needed anymore. • Sand deflation prevention measures at tower foundations and access roads. • Use of existing roads/ tracks wherever possible. •			
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 should be redeveloped as per standard procedure. Rehabilitation should 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 construction
Soil and Erosion for Additional financed components (Chapter 6.2.1)	The main environmental concerns during construction of the additional financed components (Line bay and two reactors) are noise, dust,	• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction costs	During construction

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
	vibration and air pollutant emission from the construction equipment and earth moving equipment 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, impacts of noise on the population during the construction activities will be low.				
Landscape and Visual Aspects (Chapter 6.2.2)	Visual impact on the landscape	• Proper storage of materials and recycling of metal and ceramic parts.	CC / DABS-PMO	Included in Construction costs	Before/ during Construction
Landscape and Visual Aspects for Additional Financed Components (Chapter 6.2.2)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction costs	Before/ during Construction
Air Quality (Chapter	Emissions from Vehicles Emissions	• Limitations of size, weight or axle loads of vehicles using particularly difficult roads. Reduction of speed and limited movement of vehicles.	CC	Included in	

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
6.2.3)	through burning of waste Dust emissions	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. • Instrumental Monitoring for Air Emissions		Construction costs	During construction period
Air Quality for Additional financed Components (Chapter 6.2.3)		• Mitigation Measures given for other parts of the project are sufficient and applicable	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 SF6.	CC	Included in Construction costs	During Construction period
Climate (Chapter 6.2.3) additional financing Components		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in	During construction period

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
				Construction costs	
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 / stream 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. • 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. • Sewage hangling and final disposal shall be conducted with minimal	CC	Included in Construction costs	During Construction period

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		impacts to environment to NEPA Approved Disposal sites.			
Surface Water for Additional Financed Components (Chapter 6.2.4)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction 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-fueling 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. once every 15 years, the oil in the transformer will be drained and replaced with new oil. The oil will be drained to the oil pan. When all the oil has drained out, the transformer is filled with new oil and the old oil is placed in drums for long term storage or sent to toxic and hazardous incineration facility for ultimate disposal. The used oil has a high heating 6-11 value and nominally toxic	CC	Included in Construction costs	During Construction period

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		so that incineration facilities including cement plants are willing to pay for the disposal rather than the other way around • Hangling and final disposal of hazardous waste in case of leakage or breakdown of vehicle or machinery shall be conducted with minimal impacts to environment to NEPA Approved Disposal sites. • • Staff training should be conducted to increase awareness of waste minimization and appropriate waste disposal for avoiding pollution of groundwater.			
Ground Water for Additional Financed Components (Chapter 6.2.4)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction costs	During Construction period
Flora and Fauna (Chapter 6.2.5)	Destruction / Disturbance of Flora and Fauna	• Respect of minimal ground clearance (8 m). • Skillful selective clearing towards tower location to further reduces 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.	CC / DABS-PMO	Included in Construction costs	During final land Survey and construction phase

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		• Minimization of number and length of access tracks. • Tree Management Plan will be prepared well before project implementation cost of which is included in the EMP management cost • During the construction phase • Appropriate training should 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 should be provided to the employees not to disturb animals; • Hunting of animals shall be prohibited in general and particularly migratory birds in the areas from Jabal-e-seraj to Salang North. • 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. • For ROW clearing measures no herbicides should be used.			
Flora and Fauna for Additional Financed Components (Chapter 6.2.5)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction costs	During final land Survey and construction phase

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
Protected Areas	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 in Salang Kotal, which, although not being registered as protected, contains a rich diversity of migrant and breeding birds. Since there is a chance that the workers from the constructioncamps want to improve their	• Inclusion of Ecologists for biodiversity conservation • Contiues supervision of staff on consumption of important animals. • As Peotected areas are not in the vicinity of the project, no certain mitigation measures are suggested.	CC / DABS-PMO	Included in Construction costs	During final land Survey and construction phase

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
	meat diet by poaching activities, these shall be strictly forbidden, controlled and punished in the area around the Salang Kotal.				
Protected Areas-Additional financing Components	For additional financed components which include construction of one line bay and two reactors the impacts on Protected Areas is low because the additional financed component is located inside the existing substation.	• As Peotected areas are not in the vicinity of the project, no certain mitigation measures are suggested.	CC / DABS-PMO	Included in Construction costs	During final land Survey and construction phase
Waste Production	Environmental Pollution through	• Development of a Waste Management Plan within the HSE Management Plan considering following principles:			Prior start of

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
(Chapter 6.2.6)	Waste	• (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 the Waste Management System. • Provision of construction sites and workers camps functional sanitary equipment. • Training of workers regarding proper waste and wastewater handling according to environmental management requirements. • All construction materials will be reused, recycled and properly disposed off. All worn out parts and equipment, 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 should 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	CC	Included in Construction costs	Construction and during Construction phase

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		• Any spoil generated by the construction activity should be disposed at an approved location. Providing adequate number of containers, which shall be emptied regularly, should prevent littering. • After completion of construction the site shall be properly cleaned and properly rehabilitated or re-vegetated.			
Waste Production for additional financed component (Chapter 6.2.6)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction costs	During final land Survey and construction phase
Liquid Waste (Chapter 6.2.7)		• Prior to work initiating the contractor presents a simple Sewerage			

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
	Sewage production at construction sites and workers' camps	Management Plan to DABS-PMO for approval • Sewerage to be properly collected and transported by municipality to NEPA approved locations. • • Septic tanks must be provided at each construction Campsite. • All work sites to be equipped with latrines. All toilet facilities should 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 once every 15 years, the oil in the transformer will be drained and replaced with new oil. The oil will be drained to the oil pan. When all the oil has drained out, the transformer is filled with new oil and the old oil is placed in drums for long term storage or sent to toxic and hazardous incineration facility for ultimate disposal. The used oil has a high heating 6-11 value and nominally toxic so that incineration facilities including cement plants are willing to pay for the disposal rather than the other way around • Vehicle maintenance and re-fueling 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

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
Liquid Waste for additional financed component (Chapter 6.2.7)		• Mitigation Measures given for other parts of the project are sufficient and applicable	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, line bay and two reactors 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 start and during construction
Health and Safety (Chapter 6.2.8)	General Health and Safety impact	• 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 should 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 Personal Protection Equipment (PPE) such as safety helmets, safety shoes, glasses, safety	CC	Included in Construction costs	Prior start of Construction

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		waistcoat, belts and air plugs and other protection devices. • General operational and community safety measures for blasting activities to be detailed in construction EHS management plan.			
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 nighttime. • 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 EHS Management Plan).	CC	Included in Construction costs	Before starting and during Construction period

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		• All equipment shall fulfill noise control requirements of the project. • Special attention shall be given to regular maintenance of construction equipment's 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 nighttime 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 AP's. • 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 receptors (schools, hospitals and places of religious importance).			
Health and Safety (Chapter 6.2.8)	Injuries and death by explosion of	• Provide special assessment of mine clearance by Mine Action Coordination Centre of Afghanistan (MACCA) before any physical work.	CC / DABS-PMO	Included in Construction Cost	Before starting Construction
Health and Safety (Chapter 6.2.8)	Operational and Community Health and Safety Risks	• Development of Operational Health and Safety (OHS) and Community Health and Safety (CHS) Plans included in EHS Plan.	CC	Included in	Before starting and during

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
	Transmission of diseases	• 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 case construction camps are necessary these will be located in accordance with • Relevant municipal authorities.		Construction Cost	construction period
Health and Safety for Additional financed component (Chapter 6.2.9)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction Cost	Before starting and during construction period
Land Acquisition & Land Use (Chapter 6.2.9)	Resettlement	• See updated LARP Document	CC / DABS-PMO	Included in Construction Cost	Before construction
Land Acquisition and Land Use for Additional financed component Chapter (6.2.9)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction Cost	Before construction
Gender Aspects & Vulnerable People (Chapter 6.2.10)	Gender disparities Sexual harassment	• See updated LARP Document • Implementation of a special livelihood program for vulnerable AP's.	CC / DABS-PMO	Included in Construction Cost	During construction

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
Gender Aspects & Vulnerable People for Additional financed component (Chapter 6.2.10)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction Cost	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 should be provided to workers.	CC	Included in Construction Cost	At the beginning of construction
Local Workforce for additional financed component (Chapter 6.2.11)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction Cost	At the beginning of construction
Infrastructure and Traffic 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 (8 m for 500 kV lines) • Ensure power supply for the population during construction. If necessary, power cuts will be done only at daytime with duration reduced to an absolute minimum.	CC	Included in Construction Cost	During construction
Infrastructure and Traffic for additional financed component (Chapter 6.2.12)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC	Included in Construction Cost	During construction
Physical Cultural		• Identification of cultural sites and sensitive areas for unknown historical			

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
Resources (Chapter 6.2.13)	Damage and destruction of cultural sites	sites together with local experts of the Ministry of Culture during final routing / land survey. • Reduction of vehicle movements as far as possible. • Bypassing 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.	CC / DABS-PMO	Included in Construction Cost	During detailed land survey and during construction process
Physical Cultural Resources for additional financed component (Chapter 6.2.13)		• Mitigation Measures given for other parts of the project are sufficient and applicable	CC / DABS-PMO	Included in Construction Cost	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
Soil and water Resources For additional financed components (Chapter 6.3.1)		• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	Before operation
Landscape and Visual Impacts (Chapter 6.3.2)	Permanent visual impact on the landscape	• Planting trees/ bushes around the new substations. • Complete dismantling of the old transmission line and substations and line bay and reactors without function.	DABS	Included in operational costs	Before operation
Landscape and Visual impacts on additional financed components (Chapter 6.3.2)	For the additional financed components During the operation phase, impact on soil and water resources, landscape and visual aspects, flora and fauna, noise emissions, electric and magnetic fields and possible transformer fires are low and extent of impacts due to Natural Disasters and Risk of electrocution are medium for measures such us close contact with Natural disaster management authority should be maintained and PPE shall be provided for labors and	• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	Before operation

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
	signage should be installed in the field as measures				
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
Flora For additional financed components (Chapter 6.3.4)		• Mitigation Measures given for other parts of the project are sufficient and applicable	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
Fauna For additional financed components (Chapter 6.3.5)		• Mitigation Measures given for other parts of the project are sufficient and applicable	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	During Operation
Avifauna For additional financed components (Chapter 6.3.5)		• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	During Operation
Waste Production (Chapter 6.3.6)	Environmental Pollution by solid and liquid wastes	• Development of a Waste Management Plan for the substations. • Wastewater generated from staff quarters will be discharged into septic tanks.	DABS	Included in operational costs	Before / during operation

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
		• Reduction of waste quantity. Recycling as much as possible. Proper dumping of remaining waste. • Adequate site drainage shall be performed. Regular sewage treatment. • Avoid asbestos-containing materials (ACMs) in new buildings (if any),			
Waster Production for additional financed components (Chapter 6.3.6)		• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	Before / during operation
Health & Safety (Chapter 6.3.7)	Natural disaster	• Implementation of Emergency Response Plan	DABS	Included in operational costs	During design / construction / operation
Health and Safety For additional financed components (Chapter 6.3.7)		Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational 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 operational costs	During operation

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
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 operational costs	During construction / operation
Health & Safety (Chapter 6.3.7)	Possible Transformer Fires	• Proper maintenance of the substations. • Installation of firewalls between the transformers. • Installation of a sprinkler system. • Provision of a firewater collection system for the new switchyards. This system shall be separated from the wastewater collection and treatment of the substations. • Provision of mobile fire extinguishers, checked regularly. • Adequate training of the staff how to handle a SS fire.	DABS	Included in 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.	DABS	Included in operational costs	During operation

Issue	Potential Impact	Mitigation Measures	Implementing Agency	Costs [USD]	Date for Implementation
Land use For additional financed components (Chapter 6.3.8)		• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	During operation
Impact during Decommissioning phase (Chapter)	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
Impact During Decommissioning phase For additional financed components	For the additional financed components during the decommissioning phase impacts are low	• Mitigation Measures given for other parts of the project are sufficient and applicable	DABS	Included in operational costs	During decommissioning
		• Mitigation Measures given for other parts of the project are sufficient and applicable	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 were ensured that the process of final line routing complies with the following mitigation measures:

- Avoidance of protected or ecological sensitive areas.
- Minimization of Agricultural lands i.e. From AP 37 to AP 44 / 4 the grape gardens are avoided.
- Avoidance of settlements in the ROW to minimize resettlement activities. i.e. From AP 45 to AP 47 the Qarabagh Bazar and sabzsang places are avoided and AP 48 to AP 57 in the new route the Charikar Town extension is avoided.
- Avoidance of historical and cultural sites.
- Minimization of construction of access roads.
- Minimization of adverse impact on Floura and Fauna

2. Due to the nature of the Project, the detailed line routing and selection of the tower sites are performed by the PIC. A strict monitoring by an external expert of re-routing to avoid resettlement and cultural sites has been done for all line sections.

3. The updated IEE has the Site Specific EMP (SSEMP) that is adequately updated during detailed design phase and EMP implementation was included in tender documents and contracts too.

10.2.2. Construction Phase

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

5. In addition, an international expert to ensure that all requirements as stipulated in this EMP are fulfilled shall perform construction site audits. Such an EHS Construction Site Audit shall be performed frequently throughout the construction period and its results will be reported in semi-annual environmental reports. 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.

6. 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 semi-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 lifespan of the transmission line, Substation and Line bay and two reactors (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 & Reporting Responsibility	Date for Implementation
Line Routing (Chapter 6.1.1)	Compliance with ADB SPS Minimization of resettlement needs Avoidance of cultural sites Compensation payments (see LARP) Access road design Design of river Crossings Minimization of Agricultural lands	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) Avoidance of agricultural lands	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 Cost of EMP Implementation	PIC	During design phase, beforethe start of physical works

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
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 Cost of EMP Implementation	PIC	During construction
Landscape and Visual Aspects (Chapter 6.2.2)	Recycling of metal and ceramic parts	Visual inspection of line corridor Records of recycling and disposal procedures	Line corridor	Visual control Control of records	Once at the end of Construction period	Included in Cost of EMP Implementation	PIC	Before start of Operation
Land Acquisition and Resettlement (Chapter 6.2.9)	Compensation payments Resettlement actions (see updated LARP)	Visual inspection of line corridor Records of recycling and disposal procedures	Entire line corridor and substation sites	Visual control Records Survey	After final Design	See updated LARPF document	LARP Consultant	Before construction
??? Air Pollution (Chapter 6.2.3)	Construction standards PM10 Monitoring	Monitoring of good construction standards Monitoring of correct implementation of construction manual, especially related to	Work areas Sensitive Receptors	Visual control Instrumental Monitoring for PM10	once before construction work and after each six months during	Included in construction cost/ EMP Cost	PIC	During construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
		vehicle use and maintenance			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 (i.e. possible physical, biological &chemical analysis i.e. ph, Turbidity, Electrical Conductivity (EC), oil grease and some chemical analysis etc.) Sampling upstream and downstream of river crossings and substation sites	Periodically during construction	Included in construction cost/ EMP Cost	PIC	During Construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
Pollution of Groundwater (Chapter 6.2.4)	Appropriate sewage treatment of workers camps Drinking water for labour/staff Appropriate groundwater protection measures	Visual inspection of pollution sources Monitoring of drinking drinking analysis for project staff Visual control of oil absorbers at SS and good construction practices during stringing, tower construction and substation construction Drinking water monitoring for labour/staff	Substations Project Site Tower sites Work camps	Visual control Drinking analysis Water analysis in wells	Periodically during construction After six months	Included in EMP Cost Included in EMP Cost	PIC PIC	During Construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
		Analysis and measurements of basic groundwater parameters						
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 EMP Cost	PIC	During Construction
Waste Production (Chapter 6.2.7 Waste Management	Economic land use Proper topsoil management Erosion control and	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	All work areas	Design compliance, Visual control	One time before start of works Yearly during construction,	Included in EMP Cost	PIC	Before, during and after construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
	post construction	checked in the field for design compliance.			At end of construction phase			
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	Included in EMP Cost	PIC	During construction
Health and Safety (Chapter 6.2.8)	Compliance with EHS Management Plan (Work Safety / Sanitation, Noise)	Construction Site, EHS Monitoring Monitoring of noise level Protective equipment Workers camp sanitation Safe handling of hazardous materials	All work areas, Workers camps, Substation sites	Visual Control of EHS Management Plan implementation	Regular monitoring during construction	Included in EMP Cost	PIC	During Construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
		(explosives at quarries etc.) avoid asbestos-containing materials (ACMs) in new buildings (if any), Electrical accidents prevention Prevention of work accidents 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 EMP Cost	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	Regular Monitoring during construction in EHS Monitoring visits	Included in EMP Cost	PIC	During construction
Infrastructure and Traffic	Traffic Safety	Short-term impact during construction,	Entire line corridor	Visual Control	Quarterly	Included in	PIC	During

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
Safety (Chapter 6.2.12)	Plan included in EHS Plan Implementation of measures to enhance traffic safety, road signs	no specific monitoring necessary.			During Construction	EMP Cost		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	Regular monitoring during Construction as per need	Included in EMP Cost	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 EMP Cost	PIC	During Construction
Grievance Mechanism (Chapter 9)	Implementation of an accessible	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 EMP Cost	EMP Cost	During Construction

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
	Grievance Mechanism for APs to address complaints at the local level							
Soil and Water Resources (Chapter 6.3.1)	Removal of temporary infrastructure Dismantling of unneeded access Roads & restoration of area, 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

Issue /Potential Impact	Parameters to be Monitored	Monitoring Action	Location	Measurements	Frequency	Costs [$]	Monitoring & Reporting Responsibility	Date for Implementation
Landscape and Visual Impacts (Chapter 6.3.2)	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
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

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

Issue / Potential Impact	Parameters to be Monitored	Monitoring action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
Waste Production (Chapter 6.3.6)	Development of a Substation Waste Management Plan Reduction of waste quantity, recycling	Monitoring of Waste Management	Substation Sites	Periodical Inspection	Yearly during Operation	Included in Operation cost	DABS ED/ NEPA	During Operation

Issue / Potential Impact	Parameters to be Monitored	Monitoring action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
	as much as possible Proper dumping of remaining waste Regular sewage treatment. Run off	Plan and control of implement ation						
Health and Safety (Chapter 6.3.7)	EHS Management System/ Plan development Implementation during Substation operation	Monitoring of Implementation of EHS Management Plan	Substation Sites Maintenanc e locations	Periodical Inspection Regular EHS Audits	Yearly during Operati on	Included in Operati on 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 Operati on	Included in Operation and Training cost	DABS ED	During Operation
Land Use ROW clearing	Further agricultural land use in the ROW	Monitoring of land use possibilities,			Yearly during	Included in	DABS ED	During

Issue / Potential Impact	Parameters to be Monitored	Monitoring action	Location	Measurements	Frequency	Costs [$]	Monitoring and Reporting Responsibility	Date for Implementation
andmaintenance (Chapter 6.3.8)	Use rights and use practices Compensation payment for damaged crops during maintenance No use of herbicides for ROW clearing	compensation payments, grievance mechanism	Entire line ROW	Periodical Survey	Operation	Operation cost		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. Cost of EMP Implementation (Updated)

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

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

Measure	**Costs (USD)**
Mitigation measures during design	10,000
Mitigation measures during construction	To be included in theConstruction costs
Mitigation measures during construction for compensations and resettlement needs	See updated LARPF
Mitigation measures during operation and maintenance	To be included in the operation budget
Training for DABS EHS Staff Provision of PPE's	30,000
-Monitoring Measures EHS Audit -Monitoring Analysis of Water, -Noise and air -Hiring of Environmental staff -Plantation of trees and other - landscaping activities	50,000
Sub-Total	*90,000*
Contingency 10%	27,000
Total Cost	**117,000**

The costs for the implementation of the EMP will be included in the loan.

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. An external Construction Contractor (CC) in two lots will carry out the construction as a turnkey contract: one for the transmission line component and one for the substations.

11.1.1. 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.

11.1.2. NEPA

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

11.1.3. ADB

6. ADB is responsible for screening sub-projects to specify its safeguard requirements, Reviewing due diligences, 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.

7. 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.

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

11.1.4. Construction Contractor (CC)

9. 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.

10. 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. The Construction Contractor is responsible for preparation of SSEMP Site Specific Environmental Management plan and Supervision Consultant is responsible for preparation of Semi-Annual Environmental Monitoring Reports (SAEMR) and final monitoring report.

11.1.5. 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 site-specific impacts on the environment if the proposed updated 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 helped to minimize resettlement needs. Involuntary displacement and relocation were mitigated to an absolute minimum. As the priority to avoid involuntary displacement is respected by the construction contractor and bypasses are carefully designed, involuntary displacement was avoided at maximum.

3. There has been no significant impact on physical cultural resources (historical and cultural sites), however, it can be further verified during construction as per chance finding procedure. 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 riverbank erosion as the TL is crossing river at several points. The line will cross a legally unprotected Important Bird Area (IBA) at some specific tower points and bird diverters should be strictly observed to install at transmission line to avoid any adverse impact on the migratory birds. In this crossing section protection measures, in addition to bird diverters, electrocution protection, and power lines in one level shall be implemented too. It shall also be considering the possibility for a deviation of the line routing during the detailed engineering phase.

5. Project Implementation Consultant (PIC) supervises and monitors the overall design and construction phase. The duty of such supervision and monitoring shall be to ensure that the requirements stipulated in the Environmental Management Plan (EMP) or SSEMP 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 and will be done by PIC throughout the project design and construction phase. As the elaboration of detailed design features including detailed line routing is now completed, however, this must be implemented in the proposed manner. 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 direction to redesign sections that have been identified within the IEE or are identified during the course of the design process.

9. ADB will be responsible to Review 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 with ADB's safeguard policy principles.

10. It is important to mention that the careful design supervised by PIC and DABS have balanced 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, several wise design decisions have reduced environmental as well as social impacts at the same time. i.e. AP 17 has been reported during survey that it is located inside school building. Therefore, the tower has been relocated with a joint consensus of Consultant, Contractor and Client to another feasible option to left side. The preliminary IEE including EMP and LARP conducted by FITCHNER has been the part of the tender documents, however, this updated IEE including site specific EMP will be shared with construction contractor for implementing all required mitigation measures.

Overall findings for additional financed components

1. In summary, the results of the investigation demonstrate that the additional financed components Project will have mostly low impacts on the environment if the proposed EMP is implemented and all proposed mitigation measures are considered.

2. Careful site selection 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 proposed line bay and reactors will not be in Protected Areas.

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, has been widely avoided in the early planning stages. However, the contractor who conducts the detailed route design follows this approach in the final and approved design that further diminished resettlements and adverse environmental impacts.

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 Arghundy substation.

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

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14. Annexes

14.1. Rapid Environmental Assessment (REA)

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project IEE 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 – additional**

Sector Division: **ENERGY**

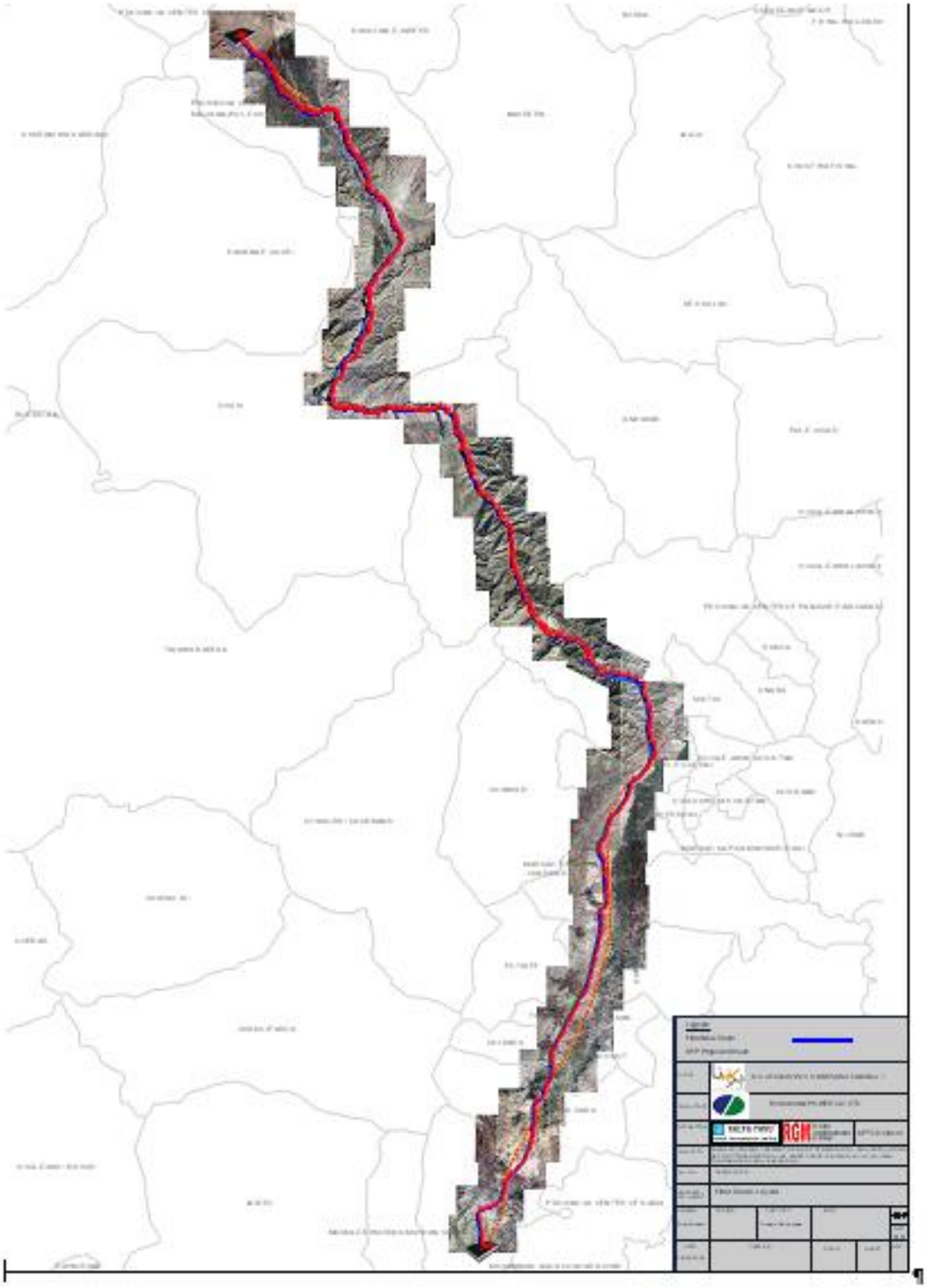
Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site		**No**	
▪ Protected Area		**No**	
▪ Wetland		**No**	
▪ Mangrove		**No**	
▪ Estuarine		**No**	
▪ Buffer zone of protected area		**No**	
▪ Special area for protecting biodiversity		**No**	
B. Potential Environmental Impacts Will the Project cause…			

Screening Questions	Yes	No	Remarks
▪ Encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?		**No**	Line bay and reactors will be installed inside Dasht-e-Alwan sub-station
▪ Encroachment on precious ecosystem (e.g. sensitive or protected areas)?		**No**	
▪ 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?		**No**	
▪ Damage to sensitive coastal/marine habitats by construction of submarine cables?		**No**	Sensitive coastal/marine habitats is not found in the project area
▪ Deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?		**No**	Additional finance component (Line bay and reactors) will be installed inside Dasht-e-Alwan sub-station and will have no or very minimum chance to deterioration of surface water.
▪ Increased local air pollution due to rock crushing, cutting and filling?		**No**	Additional finance component (Line bay and reactors) rock crushing, cutting and filling activities will be not involved.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	**Yes**		There is possibility of risks of electrocution and accidents during construction and operation phases. A Health and Safety (H&S) Plan will be prepared and implemented during various project phases.
▪ Chemical pollution resulting from chemical clearing of vegetation for construction site?		**No**	
▪ Noise and vibration due to blasting and other civil works?	**Yes**		In case of additional finance components (line bay and reactors) blasting will be not involved. However, noise will be generated due to other civil works.
▪ Dislocation or involuntary resettlement of people?		**No**	Line bay and reactors (additional finance components) will be installed inside Dasht-e-Alwan sub-station and dislocation or involuntary resettlement of people is not expected.

Screening Questions	Yes	No	Remarks
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		**No**	These will not occur.
▪ Social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?		**No**	
▪ Hazardous driving conditions where construction interferes with pre-existing roads?		**No**	
▪ Creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?	**Yes**		This may occur in the construction camp area. Implementation of EMP will reduce adversity of such impacts.
▪ Dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?		**No**	
▪ Environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?		**No**	
▪ Facilitation of access to protected areas in case corridors traverse protected areas?		**No**	
▪ Disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		**No**	
▪ Large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?		**No**	Workers will be mostly from local villages. Worker from remote places will be provided with adequate facilities. The ratio of local and outside workers will be balanced in a way so that there is minimum burden on existing social infrastructures and service
▪ Social conflicts if workers from other regions or countries are hired?	**Yes**		Most of the workers will be from local areas and hence such conflict is not anticipated. Moreover, the workers will also be sensitized with local cultural norms.
▪ Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	**Yes**		If site-specific environmental mitigation standards will not be adhered to then there is potential risk. EHS management system including training of workers required.

Screening Questions	Yes	No	Remarks
▪ Risks to community safety associated with maintenance of lines and related facilities?		**No**	
▪ Community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?		**No**	
▪ 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?	**Yes**		There is an increased risk of transport accidents during transportation and storage of construction materials, fuel, and people. .Implementation of the proposed mitigation measures will ensure adversity of these impacts remain negligible.
▪ 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?		**No**	Additional finance components will be located inside the substation. Hence, no such impacts are envisaged.

14.2. Investigation Area Map



14.3. Electric and Magnetic Fields

14.3.1. General Considerations

1. 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

2. Such wavelengths 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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).

8. 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.

9. 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 is closely bypassed and within high voltage substations for workplaces.

10. Internationally used standards/limit values concerning electric and magnetic fields (50 Hz) for the public & 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

Internationally used **r.m.s. = root mean square (value)**

11. **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.

12. **Exposure range 2** includes all areas in which not only short-termexposure 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=Verb and Deutscher Elektrotechnikere.V., Cenelec=European Committee for Electrotechnical Standardisation)

13. 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.

14. 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.

14.3.2. ICNIRP Guidelines and Statements (Excerpt)

Guidelines for Limiting Exposure to Time-varying Electric,

Magnetic, & Electromagnetic Fields

15. 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).

16. 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.

17. 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.

18. 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.

19. The main objective of the guidelines is to establish the limiting of EMF exposure that will provide protection against known adverse health effects.

20. 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.

21. 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.

22. 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.

23. 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.

24. 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

25. 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

26. 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

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

28. 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.

29. 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 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.

30. 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.

31. 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	f100	-	-	-
	100 KHz-10MHz	f100	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	f500	-	-	-
	100 kHz-10MHz	f500	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

32. 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.

33. 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 (I).

34. Quantities that address perception and other indirect effects are contact current (Ic) 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.

35. 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.

36. 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.

37. 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.

38. 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

*Notes:

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.

6. 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.

7. For frequencies exceeding 10 GHz, Seq, E2, H2, and B2are to be averaged over 68/f 1.05–min period (f in GHz).

8. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields.

9. Electric shock from low impedance sources is prevented by established electrical safety procedures for such equipment.

10. 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.

14.3.3 Biological and Health Effects of Electric and Magnetic Fields

39. 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.

40. 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.

41. The line voltage on the conductors generates the electric field. 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 occurs 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.

42. **The current in the conductors generates the magnetic field around a power line**. 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.

43. 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). Walls and roofs do not shield magnetic fields. Around power lines they are often weaker than those one may come into contact within many other contexts in everyday life at work.

44. 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.

45. 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.

46. 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**.**

47. 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.

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

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

50. 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.

51. 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.

52. 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

53. 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".

54. 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"

55. 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.

56. 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.

57. 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

58. 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

59. 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

60. 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.