Initial Environmental Examination

Project Number: 47017-003
Grant Number: 0417-TAJ

Republic of Tajikistan: Wholesale Metering and Transmission Reinforcement Project


August 2020

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Abbreviations

A = Ampere
ADB = Asian Development Bank
AH = Affected household(s)
AP = Affected person(s)
asl = above sea level
BAT = Best Available Technique
CC = Construction Contractor
CIGRE = International Council on Large Electric Systems DIN
Deutsches Institut für Normung (German Industrial Standard)
EC = European Community
EDM = Energy Demand Management
EMF = Electric and magnetic fields
EMP = Environmental Management Plan
EMMP = Environmental Management and Monitoring Plan EN European Norm
EIA = Environmental Impact Assessment
Ft = feet
G = Giga (10$^9$)
GDP = Gross Domestic Product
GIS = gas insulated
HIV = Human Immunodeficiency Virus
HPP = Hydropower Plant
HSE = Health, Safety and Environmental
HSEMP = Health, Safety and Environmental Management Plan
HSEMS = Health, Safety and Environmental Management System
Hz = Hertz
IBA = Important Bird Area
ICNIRP = International Commission on Non-Ionising Radiation Protection
IEC = International Electrotechnical Commission
IEE = Initial Environmental Examination
IEEE = Institute of Electrical and Electronics Engineers
INRC = International Non-Ionizing Radiation Committee IRPA International Radiation Protection Association IUCN International Union for Conservation of Nature k kilo (10$^3$)
kV = kilovolt
kWh = kilowatt hour
LARP = Land Acquisition and Resettlement Plan
µ = micro (10$^{-6}$)
MDM = Meter Data Management
NIR = non-ionizing radiation
OHTL = Overhead Transmission Line
PCB = Polychlorinated Biphenyls
PCDD = Polychlorinated Dibenzodioxins
PCDF = Polychlorinated Dibenzofurans
PIC = Project Implementation Consultant
PMU = Project Management Unit for Elektro-Energy Sector
RoW = Right of Way
SCADA = Supervision Control and Data Acquisition System SF$_6$ Sulfur Hexafluoride
SS = Substation
STD = Sexually Transmitted Diseases
STI = Sexually Transmitted Infections
T = Tesla
TCDD = Tetrachlorodibenzo-p-dioxin
USD = US Dollar ($)
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0. Executive Summary

0.1 Policy, Legal, and Administrative Framework

Environmental Legislative Framework and national Requirements for Environmental Assessment
The principles performing the IEE process are laid down in the Tajik Law on Ecological Expertise and in the Procedure on Environmental Impact Assessment of 2013.

Following this law, the company which is developing a project has to prepare an Environmental Impact Assessment (EIA) of the project concerned.

Administrative Framework
The Tajik authority who is responsible for issuing environmental permits for infrastructural projects is the Committee of Environment Protection. In order to implement the Project, the Government of the Republic of Tajikistan set up the ‘Project Management Unit for Elektro-Energy Sector’ (PMU). Within this PMU the Social Sector and Environmental Monitoring Department has been established. This department is responsible for the safeguards management of foreign financed projects.

ADB Requirements for Environmental Assessment
This IEE was carried out in accordance with the relevant ADB guidelines, which are the ADB Safeguard Policy Statement (SPS, 2009).

0.2 Description of the Project

This document represents an updated version of the Initial Environmental Examination¹ (IEE) Report on the ADB -TA-8547 TAJ: Wholesale Metering and Transmission Reinforcement Project.

General Description
The project (LOT 1) consists of replacement of approximately 1,117 meters, replacement of several current transformers, replacement of several voltage transformers at 233 substations, introduction of an advanced metering infrastructure, MDM (Meter Data Management), EDM (Energy Demand Management), and introduction of a settlement system. **LOT 1 has been extended to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, Lines, Power Transformers and Busbars in the levels of Voltage 500, 220, 110 and 35 kV. These works will be done at 175 substations.** The new sub-project is called herein PACKAGE 4.

LOT 2 of the project consists of the construction of approximately 90 km of 220 kV OHL between the substation Ayni 220 kV (Ayni region) and the substation Rudaki (Penjakent region) including construction of additional bays and rerouting of existing connections in both substations.

Location

LOT 1
The substations are located in Isfara, Istarafshan, Khujand, Kulyab, Nurek, Panjakent, Rasht, Sugd, Vaksh, Varzob and Yavan areas.

LOT 2
The Project is planned to be realized in West-Tajikistan in the Sughd province. The

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locations belong to Penjaket District and Ayni District (Map 0-1).

**PACKAGE 4**

The 175 substations are located in the following districts around the country:

1. **Sughd region:** Maschoh, Asht, Zafarobod, Spitamen, Jabbor Rasulov, Konibodom, Isfara, Istaravshan, Panjakent and Ayni districts.

2. **Region of the Republic Subordination:** Dushanbe, Tursunzoda, Hisor, Varzob, Vahdat, Rasht, Rudaki, Faizobod, Rogun, Nurobod, Tojikobod and Tavildara districts.

3. **Khatlon region:** Khuroson, Yovon, Nurek, Baku, Khovaling, Dangara, Temurmalik, Bokhtar, Vose, Kulob, Shakhrituz, Farkhor and Panj districts.

**General Situation and Scope of Project**

The Penjaket region in Tajikistan still suffers from the disconnection from the Central Asian Power System in November 2009. Prior to the disconnection, the Penjaket region was supplied from two 220 kV lines from Uzbekistan. From Penjaket (substation Rudaki) electricity was further transmitted to Ayni region. This electricity was transmitted over 102 km through a 110 kV line.

For the moment, the old 110 kV line is used to supply Penjaket region with electricity from the new constructed Ayni-220 kV Substation. As the demand in Penjaket is higher than the capacity of the line, households and industry in the region suffer from load shedding even in summertime, which is energy surplus period in Tajikistan.

The object of the additional subproject (PACKAGE 4) is to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, lines, power transformers and busbars in the levels of Voltage 500, 220, 110 and 35 kV. The objective is to increase redundancy of measurements on the top levels and to gain full control of losses. Besides it can provide relevant information of fluxes of energy between different segments of the grid.

**Category of the Project**

Based on the rapid environmental assessment, Category B was preliminary assigned to project. The LOT 1 and PACKAGE 4 subprojects were assigned Category C after performing the environmental due diligence.

According to ADB Safeguard Policy Statement, June 2009 an Initial Environmental Examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely.

**Project Description**

LOT 1 consists of replacement of approximately 1,117 meters, replacement of several current transformers, replacement of several voltage transformers at 233 substations, introduction of an advanced metering infrastructure, MDM, EDM, and introduction of a settlement system. **Lot 1 has been extended to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, lines, power transformers and busbars in the levels of voltage 500, 220, 110 and 35 kV. These works will be done at 175 substations. The new sub-project is called herein PACKAGE 4.**

The scope of works of PACKAGE 4 is:

1. Replacement or installation of 448 smart meters and 121 metering panels in the 175 substations according to the meter data base,
2. Replacement or installation of 300 current transformers (CTs), 105 voltage transformers (VTs) and 196 arresters,
3. Installation of modems/data concentrators in the substations,
4. Installation of meter cabinets, overvoltage limiters and other minor equipment (as cables, terminal boxes, clamps, etc.)
5. Detailed design for replacement of instrument transformers, smart meters, meter cabinets, cable routing, etc.
6. Communication engineering
7. Software customizing
8. Metering infrastructure installation
9. Communication equipment installation
10. Testing, commissioning and training

LOT 2 covers the new construction of about 100 km 220kV overhead line, the partly rehabilitation of s/s Rudaki and the connection of the 220 kV line with s/s Rudaki and s/s Ayni. At the time of the version 5 update of this IEE, lot 2 has been fully implemented.

The rehabilitation measures will require the exchange of old transformers and circuit breakers. Both contain large amounts of oil that has to be handled. A possible pollution with PCB has been investigated and could be excluded.

Methodology
Project
Between 25 and 28 July 2014 public consultations were held in the course of the social survey. During these meetings the Project was introduced to the population and environmental questions were discussed. In addition, meetings with stakeholders in the region took place.

LOT 2
During the second week of July, 2014 Fichtner’s environmental expert conducted a complete field survey from s/s Rudaki along the proposed line to s/s Ayni. During this visit he consulted the local environmental authorities at Penjakent and at Ayni to clarify the location of protected areas that might be affected by the line routing.

An additional survey and consultations were done by the local environmental expert in the third and fourth week of July 2014.

During 2019 (the third week of May – the first week of June; the third week of November), 2 inspections were carried out on the environmental condition of the project substation, a survey was conducted of residents of the nearby territory, the substation staff, identified shortcomings and developed recommendations for their elimination.

Between 25 and 28 July 2014 public consultations were held in the course of the social survey. During these meetings the Project has been introduced to the population and environmental questions have been discussed. In addition, during meetings with stakeholders in the region took place.

PACKAGE 4
An environmental and social due diligence was performed by the PIC Mercados Aries International in March 2020.

The current document, the updated Initial Environmental Examination for the project in order to cover the subproject PACKAGE 4, was mainly developed desk-based since the impact of the activities is well known after being monitoring LOT 1 environmental and social performance for years. During 2019 (the third week of May and the first week of June; and the third week of November), several inspections were carried out on the
environmental condition of the project substations.

Face to face public consultations could not be performed since in July 2020 there were in place quarantine measures imposed against the spread of COVID-19 coronavirus. The composed information leaflet and an explanatory letter from the PMU were sent to the heads of district environmental protection departments by e-mail through the Environmental Protection Committee under the Government of the Republic of Tajikistan. The chief specialist of the PMU Department for Monitoring of the Environmental Protection, Mr. Kholov Aziz, hold a meeting with Mr. Khalilov Daller, a representative of the Committee for Environmental Protection under the Government of the Republic of Tajikistan in order to arrange the distribution by e-mail of the two mentioned documents.

**Proposed Schedule for Implementation**

**LOT 1 and PACKAGE 4 Metering**

The planned execution period of the demolition, construction and installation works for Metering Project was originally November 2016 - July 2018 (LOT 1). According to revised schedule which takes into account amendment works (PACKAGE 4), the Project will be completed in January 2022.

**LOT 2 Transmission Reinforcement**

Tender Documents concerning ‘LOT 2: Rehabilitation of Substation Rudaki and Extension of Substation Ayni 220 kV and Construction of 220 kV OHL between SS Ayni 220 kV and SS Rudaki’ were completed in June 2015. The Project was put out to tender during the autumn 2015 and contract between the Contractor and Executive Agency signed in December 2015.

The construction of the OHTL started in 2016 and was completed in October 2018. Renovation of SS Rudaki and extension of SS Ayni were completed in March 2020.

**0.3 Description of the Environment**

Chapter 3 includes a general description of the environment concentrating on the area where the works of LOT 2 are executed. This is due to the fact that works of LOT 1 and PACKAGE 4 are executed inside the substations which are already in place and owned by Barqi Tojik and are located geographically around the country at the substations in the Katlon region (24 regions, area 24 600 km$^2$, population 3,275 million), Sughd region (14 regions, area 25 400 km$^2$, population 2,658 million) and the Regions of the Republican Subordination (13 regions, area 28 600 km$^2$, population 1,222 million) areas. Climate, seismic characteristics, and other data are provided below.

**Topography**

The project has an altitudinal range from 950 m asl (Panjakent SS) to 1400 m asl (Ayni SS). The Zerafshan valley (in which the OHTL will mainly take its course) is quite narrow near Ayni but widens up around Dasthikazy. The surrounding mountains do have steep slopes with high rates of erosion and the risk of landslides.

**Geology, Seismology and Soil**

Zerafshan Valley is surrounded by folded Paleozoic rocks; the valley itself is filled with Meso-Cenozoic sediments. The type of soil varies depending on the altitude. In the plains and floodplains, gray soil is predominant. This soil is poor in humus but gives good yields when irrigated and fertilized.
Zerafshan Valley lies in a seismological active region; earthquakes which measure up to 4 on the Richter scale are possible.

Climate
Tajikistan has a continental climate. Heavy rainfalls occur, making the steep slopes on the riverside even more vulnerable to landslides and mudflows.

Water Resources
Zerafshan River has its source at the edge of Pamir. In total, the river length is 781 km, and the total river basin covers 4,000 km$^2$. The groundwater level varies considerably depending on the morphology and season. In floodplains, the water table is close to the surface but where the line corridor is running through mountainous areas the water level is more than some tens of meters below.

Biological Resources
Tajikistan features a great diversity of flora. More than 5,000 species of plants are recorded in the country. Grasses, bushes, and shrubs predominate. Most of the line corridor is crossing semi-arid areas with rocky out crops. The vegetation is heavily degraded, bushes and forests are destroyed almost everywhere.

Protected Areas
There are two Nature Refuges (IUCN Category IV) and one Important Bird Area located in the investigation area. They will not be affected by the project.

Land Use
Agriculture is the most important sector of the economy in the valley. With wheat and oats being the most important crops, there are some additional incomes with the growing of apricots, apples, grapes, mulberry and peach. Pastures are poor for cattle.

Socio-economic Conditions
The Penjakent District has 214,000 inhabitants. Penjakent is the capital with 33,000 inhabitants. Ayni District is bigger but with fewer inhabitants (72,000). Almost all of them live in rural areas, where living conditions do not usually involve technology.

The poverty rate is estimated to be at 39.6 % and unemployment is a problem. Many able-bodied men look for work abroad (mainly in Russia). At present, Tajikistan's potential as a tourist site is rather low.

Cultural/Historical Heritage
The territory of Tajikistan has been continuously inhabited since the early Stone Age. It is located on the important historical trade routes of the Silk Road connecting East and West.

There are two important archaeological sites situated near Penjakent (Sarazm and Panjakant), none of them is affected by the project.

Infrastructure
Ayni has direct connections not only to the capital Dushanbe (including the main airport of Tajikistan) in the south, but also to the eastern and northern parts of the country. Both Penjakent and Ayni have small airports.

0.4 Anticipated Environmental Impacts and Mitigation Measures

Anticipated impacts of LOT 1 and PACKAGE 4 are quite restricted and mainly realized during the construction phase.
During construction:

- waste generation (steel, ceramics, used oil) due to demolition of equipment like old circuit breakers and replacement of two old transformers; domestic waste generation by the workers;
- wastewater generation by workers
- oil spills
- impacts on health and safety (e.g. through works under high voltage, transportation of the equipment and materials, spread of STD/STI/HIV/AIDS);
- noise and vibration;
- socio-economic impacts.

For LOT 2 anticipated impacts are the following:

During the detailed Design Phase, line routing was done in view of avoiding impacts on settlements, land use, landscape, soil, surface waters and groundwater, flora and fauna, protected areas, cultural and historical sites, and infrastructure (e.g. roads, other OHL) as far as possible. During the construction and operation phases, the Project might mainly cause the following impacts:

During construction:

- land acquisition;
- visual impacts on the landscape;
- soil pollution and erosion;
- pollution of surface water and groundwater;
- damage to vegetation, habitats and protected areas;
- damage to cultural and historical sites;
- waste generation (steel, ceramics, used oil) due to demolition of equipment like old circuit breakers and replacement of two old transformers; domestic waste generation by the workers;
- wastewater generation by workers
- contribution to climate change (SF₆ gas);
- air pollution;
- impacts on health and safety (e.g. through works under high voltage, spread of STD/STI/HIV/AIDS);
- noise emissions and vibration;
- impacts on infrastructure and power supply;
- loss of houses and livelihood, involuntary resettlement;
- socio-economic impacts and influx of workers.

Included in operational costs the following impacts during operation may occur:

- impact on flora during maintenance works;
- electric and magnetic fields;
- contribution to climate change (SF₆ gas);
- socio-economic impacts
- interference with air traffic
- impact of climate change phenomena on the stability of towers
- Impact on birds in vicinity of IBA.

During the design of a proper line corridor, highest priority was laid on the avoidance of settlements and housings. The selected line routing does not require any physical
relocation of houses.

Old oil from s/s Rudaki has been tested for a possible contamination and can be declared free of PCB. Consequently, it can be refined and reused without problems.

Possible effects of climate change phenomena like an increase in frequency and severity of mass movements (e.g. landslides, mudflows) affecting the stability of towers are reflected in the design.

Positive Project impacts are a much more reliable power supply for the region of Penjakent and the employment of unskilled and some skilled local workers during the construction.

In summary, from the results of the investigation it can be seen that the Project will have only low environmental and social impacts if the proposed mitigation measures are implemented.

0.5 Analysis of Alternatives

For LOT 1 and PACKAGE 4 there were initially two alternatives: execution as planned or ‘no go’ option. Tajikistan has great problems regarding the condition of the electric supply system, which is characterized by technically obsolete components, instability of voltage, faults of electric power supply, weak capacity of distribution systems, a low payment level, large losses and high dependency on hydrology. That is why ‘no go’ option was not realistic, and it was decided to continue with the planning of the Project.

Analysis of alternatives was done to LOT 2 (OHTL). The new 220 kV line route was first supposed to be either parallel to or instead of the existing 110 kV. Realization of both was not possible. Without the Project the Penjakent region will stay isolated from the main transmission grid of Tajikistan and the power supply will not be reliable what impedes industrial development.

0.6 Information Disclosure, Consultation and Participation

LOT 1 and LOT 2
Together with the public consultations performed between 25th and 28th of July 2014 in the framework of the preparation of the LARP two public meetings were held in the district of Ayni and four at Panjakent. The participants of the meetings were asked for any complaints concerning environmental issues related to the project. No complaints were raised neither because of needed truck movements, nor because of aesthetic issues or because of electric and magnetic fields.

The problem of clean drinking water was raised and one village complaint about the waste dumping situation. The dirt and smoke from burning waste was described being very annoying some times.

At the end of July 2014 meetings with stakeholders such as the municipal administration and the environmental departments at Panjakent and Ayni were also performed.

PACKAGE 4

Face to face public consultations could not be performed since in July 2020 there were in place quarantine measures imposed against the spread of COVID-19 coronavirus. The composed information leaflet and an explanatory letter from the PMU were sent to the heads of district environmental protection departments by e-mail through the
The chief specialist of the PMU Department for Monitoring of the Environmental Protection, Mr. Kholov Aziz, held a meeting with Mr. Khalilov Daller, a representative of the Committee for Environmental Protection under the Government in order to arrange the distribution by e-mail of the two mentioned documents.

Both documents can be found in Annex 13.

0.7 Grievance Redress Mechanism

Great care is taken to prevent grievances. This has been done so far through careful land acquisition design and implementation, by ensuring full AP participation and consultation, and by establishing extensive communication and coordination between the community, the PMU and the local governments also regarding general environmental issues. This notwithstanding, complaints are sometimes unavoidable and a grievance mechanism has been established for the project to allow the APs the opportunity to appeal against any disagreeable decision, practice or activity arising from compensation/rehabilitation process. Efforts to make APs fully informed of their rights and of the procedures for addressing complaints will continue during civil works.

0.8 Environmental Management Plan

General Environmental Obligations
The following obligations will be applied for all works under the Project (LOT 1, LOT 2, PACKAGE 4).

The Environmental Management Plan (EMP) as stipulated in this IEE Report lists all needed mitigation and monitoring measures necessary to implement the Project in an environment-friendly manner. Monitoring measures and related monitoring parameters, location, measurement, frequency, responsibilities, and costs are given for the construction and operation phases of the Project.

Contractor’s Health and Safety (H&S) Obligations
The following obligations will be applied for all works under the Project (LOT 1, LOT 2, PACKAGE 4).

Considering the defined H&S targets, the H&S objectives for the Project are:

- Above all ‘ZERO ACCIDENT’
- to design an overhead line and substations that are intrinsically safe, a healthy places to work in and have an as low as reasonable practicable impact on the environment;
- to execute the erection, construction and commissioning and to initiate the start-up of the overhead line and substations operation without health or environment related incidents and to form the basis for a safe operation and maintenance;
- to comply with the applicable laws and regulations.

In order to reach these objectives, the Contractor shall develop, implement and operate a Health and Safety Management Plan (HSMS) and shall determine persons being responsible for all H&S issues on the construction site(s). Key tasks to be considered by the contractor are given. The main focus of H&S during construction is the preparation and consideration of a site-specific H&S plan. Minimum requirements with respect to H&S at the construction site are included in the text. The employer shall have the right to
extend these H&S requirements in case of extra required actions to fulfill the H&S targets and objectives.

In order to fulfill the health and safety tasks and the environmental requirements given in this ESMP the contractor has to set up an overall Health, Safety and Environmental Management Plan (HSEMP) and implement a Health, Safety and Environmental Management System (HSEMS). Such a system includes beside health and safety issues also environmental needs.

**Institutional Arrangements and Reporting Needs**

The following arrangement will be applied for all works under the Project (LOT 1, LOT 2, PACKAGE 4).

The construction contractor is obliged to implement the ESMP. Doing so, he shall set up a Health, Safety and Environmental Management Plan (HSEMP) and install a Health, Safety and Environmental Management System (HSEMS) during the entire construction period covering all construction sites and all construction activities (see Section 8.3).

The ‘Social Sector and Environmental Monitoring Department’ within the PMU as a governmental establishment will be responsible for supervising and monitoring the implementation of the EMP by the CC (Construction Contractor). For that, the PMU shall perform field visits about once a month. The PMU is supported by the Project Implementation Consultant (PIC).

The CC will prepare monthly progress reports about the implementation of the ESMP that will be submitted by the day 15 of the following month. Failing to submit these monthly reports will come with a penalty of USD 3,000 each over the next invoice for the CC.

The minimum points to be covered in the CC ESMP implementation reports are:

- Project Activities During Current Reporting Period. Percentage of completion of each main activity.
- Number of workers employed during the reporting period
- Description of Any Changes to Project Design or construction methods
- Performed Environmental Safeguard Activities
- Status of non-conformities identified in previous reporting periods
- Unanticipated Environmental Impacts or Risks
- Material Resources Utilization during the current period and cumulative (petrol in liters, generated waste per type in tons (domestic waste and hazardous waste))
- H&S: Community H&S, accidents; Workers H&S, training, performed actions

Based on the CC ESMP implementation reports and own field visits the PMU shall prepare monthly Safeguard Monitoring Reports showing the progress of the implementation of the Environmental Management Plan (ESSMP). The reports shall contain all discrepancies from the ESMP and list all HSE relevant incidents and accidents that occur during the implementation of the Project.

Based on these reports the Social Sector and Environmental Monitoring Department will prepare semi-annual safeguard performance and monitoring reports and submit them to ADB, to Barqi Tojik and to other relevant national authorities. In doing so, the PMU will be supported by the Project Implementation Consultant (PIC).

**Costs of ESMP**

The costs of implementation of the mitigation and monitoring measures stipulated in the ESMP are included in Project’s overall budget (LOT 1, LOT 2, PACKAGE 4).
Tender Documents
The updated Environmental Management Plan presented in Annex 11 shall be part of the tender documents to be prepared to the Project.

0.9 Conclusion and Recommendations

PACKAGE 4
Additional works under PACKAGE 4 will not have major environmental impacts. Anticipated impacts are mainly Health and Safety related. Waste management and risk of spills are also possible impacts.

To this Project an Environmental Management Plan (ESMP) including mitigation and monitoring measures has been developed for PACKAGE 4 and can be found in Annex 11. This ESMP shall be part of the tender documents and the implementation of the ESMP shall be supervised by the Project Implementation Consultant and the PMU.

The overall costs for implementation of the EMP will be included in Project’s overall budget (LOT 1, LOT 2, PACKAGE 4).

In summary, from the results of the investigation it can be seen that the Project will have only low site-specific environmental and social impacts if the proposed mitigation measures are implemented.

Based on the findings in the original Initial Environmental Examination\(^2\) and revised versions of the IEE, it can be concluded that Project’s 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. Metering Project as such, including additional metering works, can be classified to be a Category C Project. Thus, the classification of the whole Project remains in Category B due to LOT 2. A full Environmental Impact Assessment is not needed.

1. INTRODUCTION

The Republic of Tajikistan has received financing (grant) from the Asian Development Bank (ADB) towards the cost of the Wholesale Metering and Transmission Reinforcement Project. Parts of this financing is being used for payments under the contract for Rehabilitation of Substation Rudaki, Extension of Substation Ayni and Construction of new 220 kV OHL between SS Ayni 220 kV and SS Rudaki (LOT 2); replacement of electricity meters, several current transformers and several voltage transformers, introduction of an advanced metering infrastructure, and introduction of a settlement system (LOT 1). In 2019 BT, ADB and the Project Implementation Consultant have agreed on an additional amount of Wholesale meters (PACKAGE 4) to ensure the coverage of balances in all substations included in this project, as well as the implementation of a wholesale metering settlement system fully adapted to a prospective Tajik Market.

The rationale behind this updated version of Initial Environmental Examination (IEE), originally dated September 2014 (prepared by Fichtner) and updated in December 6th 2016 (version 3.00) by AF Mercados EMI, is the change of the work content of the Wholesale Metering and Transmission Project.

In order to capture unexpected impacts, that may result from changes of design and/or proposed additional activities, that may necessitate modifications to safeguards management arrangements, ADB may require the borrower to revise Initial Environmental Examination Report. The IEE Report will be updated to ensure that safeguard measures are in place and to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts.

Based on the examination of existing IEE (version 3.00)\(^3\) and Procurement Plan concerning additional new metering points 500, 220, 110 and 35 kV (PACKAGE 4), it was concluded that some minor amendments are needed to fulfil the requirements of the ADB’s Social and Environmental Safeguards Policy. This current version 5 is dated July 2020.

\(^3\) [https://www.adb.org/sites/default/files/project-document/218796/47017-003-ieee-02.pdf](https://www.adb.org/sites/default/files/project-document/218796/47017-003-ieee-02.pdf)
2. Policy, Legal, and Administrative Framework


The Republic of Tajikistan is divided into two Provinces (Khatlon and Sughd), one autonomous Province (Gorno-Badakhshan) and the Districts of Republican Subordination. The capital Dushanbe is administered separately.

2.2. Environmental Legislative Framework including national Requirements for Environmental Assessment

The most important laws concerning the Environment and Occupational Health in Tajikistan are:

- Law on Environmental Protection (2011)
- Law on Ecological Expertise (2012)
- Code of Health Care (2017)

These laws will be described in the following paragraphs. For further information about environmental Laws, see Annex 1.

Environmental protection in Tajikistan is embedded in the Law on Environmental Protection of 1993 amended in 1997 and superseded by 2011 (№208) Law on Environmental Protection. It defines the legal framework, protected objects, and the role and responsibilities of the Government, the Committee for Environmental Protection (CEP), local authorities, public organizations and citizens. The Act also provides the guarantee of citizens' rights to a healthy and favorable environment and requires the use of a combined system of environmental impact assessment and evaluation of the environmental impact assessment (EIA), in any decision in respect of activities that may have a negative impact on the environment. Under the law, citizens have the right to live in a healthy environment and the right to protection from negative environmental impacts. Citizens have the right to receive environmental information, as well as participate in the development, adoption and implementation of decisions relating to the environmental impacts.

The principles performing the IEE process are laid down in the Law on Ecological Expertise (2003 amended in 2005, 2007, 2008, 2010, superseded in 2012 by the new Law on Ecological Expertice, State environmental review) and in the Governmental Decree ‘About environmental Impact assessment’ of 2017 (№ 1448). This Resolution approves the list of facilities and activities which require the development of materials necessary for assessment of impact on the environment. National and interstate power lines relate to activities which might have high environmental risk. Since the 220 kV OHL line Ayni-Panjakent relates to national power lines, it is included in this list requiring impact assessment studies.

The Law on Environmental Impact Assessment, new version adopted and signed by the President of the Republic of Tajikistan in 2017 (№ 1448). This Law establishes legal and organizational basis of environmental impact assessment, its interrelation with the state environmental assessment, and also accounting treatment and classifications of objects of environmental impact assessment.

Together with a detailed project description, the EIA study is the basis to go for the
environmental permit and has to be submitted to the Committee. As a rule, the Committee prepares an expertise to the project within one month. In preparation of this expertise, all subdivisions that might be involved in the project do participate. With this expertise, the permission is given, is not given or given with requirements and obligations that have to be followed by the company during construction and/or during operation. If the Committee comes to the conclusion that an environmental permit cannot be given because e.g. limit values are exceeded or other environmental aspects are not sufficiently mitigated, the developer can change its design and submit the impact assessment again.

The Code of Health Care (№ 1413, 2017) governs the public relations in the field of health care and is directed to realization of constitutional rights of citizens and health protection.

More detailed description of some important laws is given in Annex 1.

2.3. Administrative Framework

The Tajik authority who is responsible for issuing environmental permits for infrastructural projects is the Committee of Environment Protection. This committee is directly ranked under the government of the Republic of Tajikistan and has the status of a ministry. The Committee has several subdivisions dealing with nature protection areas, soil, water, hydro- meteorology etc. and has departments in the regions.

In order to implement the Project, the Government of the Republic of Tajikistan set up the ‘Project Management Unit for Elektro-Energy Sector’ (PMU). Within this PMU the Social Sector and Environmental Monitoring Department has been established.

In May 2014, the ‘Social Sector and Environmental Monitoring Department’ within the Project Management Unit (PMU) consisted of 5 persons. This department is responsible for all foreign financed projects except for one World Bank Energy Loss Reduction Project that has created its own PMU. In 2006, the PMU was restructured and is now directly working under the Government of Tajikistan, supervised by the Ministry of Energy. The ‘Social Sector and Environmental Monitoring Department’ is equipped with sufficient computers, printers and needed software. The department has no own cars for transportation, but cars from the PMU are available.

The department is in full operation and will be responsible for conducting and/or supervising all necessary works in the field of implementation of the mitigation measures and monitoring actions including of all needed HSE aspects as outlined in this report to the Project. During implementation of the Project this department is supported by international experienced environmental and social experts who will conduct regular construction site audits in order to supervise the implementation of the foreseen mitigation and monitoring measures.

In Tab. 2-1 below the staff list of the Social Sector and Environmental Monitoring Department within the PMU is given.

Tab. 2-1: Staff of the ‘Social Sector and Environmental Monitoring Department’ (2020)

<table>
<thead>
<tr>
<th>№</th>
<th>Social Sector and Environmental Monitoring Department of PMUES</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Head of Department</td>
<td>Mr. Sirojiddin Karimov</td>
</tr>
<tr>
<td>2</td>
<td>Main specialist on social and environmental issues</td>
<td>Mr. Hisrav Sharipov</td>
</tr>
<tr>
<td>3</td>
<td>Main specialist on social and environmental issues</td>
<td>Mr. Aziz Kholov</td>
</tr>
<tr>
<td>4</td>
<td>Main specialist on social and environmental issues</td>
<td>Ms. Takhmina Aslamova</td>
</tr>
<tr>
<td>5</td>
<td>Leading specialist on environmental issues</td>
<td>Ms. Shahlo Khokiroeva</td>
</tr>
</tbody>
</table>
2.4. International Agreements

Among others, Tajikistan is part of the Convention on Biological Diversity, the Ramsar Convention on ‘Protection of Wetlands’, the Montréal Protocol on Substances that Deplete the Ozone Layer, and the UN Conventions on Climate Change and Desertification.

Electric and Magnetic Field:

- ICNIRP recommended 50/60 Hz the Recommendations of the International Non-Ionizing Radiation Committee (ICNIRP) for 50/60 Hz frequencies;
- European Directive 2004/40/EC
- DIN EN* 60376 ‘Specification of technical grade sulfur hexafluoride (SF₆) for use in electrical equipment’
- DIN EN 60480 ‘Guidelines for the checking and treatment of sulfur hexafluoride (SF₆) taken from electrical equipment and specification for its re-use’
- IEC 62271: High-voltage switchgear and control gear - Part 303: Use and handling of Sulphur hexafluoride (SF₆)

2.5. ADB Requirements for Environmental Assessment

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

ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediation loans, and private sector investment operations.

Environmental assessment is a process rather than a one-time report and includes necessary environmental analyses and environmental management planning that take place throughout the project cycle.

ADB screens all proposed projects to determine their potential environmental and social impacts. Depending on the result of this screening, they are classified in one of the following Safeguard Categories:

**Category A:** A proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

**Category B:** The proposed project’s 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.

**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.

This IEE was carried out in accordance with the relevant ADB guidelines as there are:

- Safeguard Policy Statement, June 2009, effective since January 2010;
- Environmental Considerations in ADB Operations OM Section F1/OP, October 1, 2013.
3. **Description of the Project**

This document represents the updated Initial Environmental Examination (IEE) Report on the **ADB- TA-8547 TAJ: Wholesale Metering and Transmission Reinforcement**. It was carried out in accordance with the relevant ADB guidelines as discussed in Chapter 2.5.

3.1. **General Description**

Tajikistan has great problems regarding the common condition of the electric supply system, which is characterized by technically obsolete components, instability of voltage, faults of electric power supply, weak capacity of distribution systems, a low payment level, large losses and high dependency on hydrology.

The production, transportation and distribution of electricity are under the state-owned joint-stock company Barqi Tojik, which is currently in the process of organizational restructuring to solve these problems in energy supply. The Wholesale Metering and Transmission Reinforcement Project is intended to contribute to a solution.

The project (LOT 1) consists of replacement of approximately 1,117 meters, replacement of several current transformers, replacement of several voltage transformers at 233 substations, introduction of an advanced metering infrastructure, MDM, EDM, and introduction of a settlement system. LOT 1 has been extended to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, lines, power transformers and busbars in the levels of voltage 500, 220, 110 and 35 kV. These works will be done at 175 substations in different districts located in Sughd region, the Region of the Republic Subordination and Khatlon region. The list of substations is presented in Annex 12. **The new sub-project is called herein PACKAGE 4.**

LOT 2 of the project consists the construction of approximately 90 km of 220 kV OHTL between the substation Ayni 220 kV (Ayni region) and the substation Rudaki (Panjakent district) including construction of additional bays and rerouting of existing connections in both substations.

3.2. **Location**

**LOT 1**

The substations are located in Isfara, Istarafshan, Khujand, Kulyab, Nurek, Panjakent, Rasht, Vaksh, Varzob and Yavan districts.

**LOT 2**

The Project is planned to be realized in West-Tajikistan in the Sughd province. The locations belong to Penjakent District and Ayni District (Map 3-1) and Annex 12.

**PACKAGE 4**

PACKAGE 4 activities are executed inside the substations which are already owned by Barqi Tojik.

The 175 substations are located in the following districts around the country:

1. **Sughd region:** Maschoh, Asht, Zafarobod, Spitamen, Jabbor Rasulov, Konibodom, Isfara, Istaravshan, Panjakent and Ayni districts.
2. **Region of the Republic Subordination:** Dushanbe, Tursunzoda, Hisor, Varzob, Vahdat, Rasht, Rudaki, Faizobod, Rogun, Nurobod, Tojkobod and Tavildara districts.
3. **Khatlon region:** Khuroson, Yovon, Nurek, Baljuvon, Khovaling, Dangara, Temurmalik, Bokhter, Vose, Kulob, Shakhrituz, Farkhor and Panj districts.
The list of substations is presented in Annex 12.

Map 3-1: Location (marked with red) of the 220kV OHTL, Rudaki Substation in Panjakent and Ayni Substation.

Map 3-2: Location (marked through arrows) of the SSs in the scope of PACKAGE 4 activities.
3.3. General Situation and Scope of Project

In Tajikistan, 98% of the electricity is produced by hydropower plants (HPPs), which are concentrated on the large rivers. The concentration on hydropower makes the country highly dependent on hydrology and hence natural climatic factors like precipitation and evaporation rates. This is the reason why during wintertime the HPPs do not work at full capacity, generation shortfalls occur and consumers are switched-off from the electric system. At the same time, technical problems and constraints in the transmission grids lead to considerable power losses (currently estimated at around 22%).

Additionally, some regions still suffer from the disconnection from the Central Asian Power System in November 2009. Prior to the disconnection, the Panjakent district of Tajikistan was supplied with electrical power with two 220 kV lines from Uzbekistan. From Panjakent (substation Rudaki) electricity was further transmitted to Ayni region. This electricity was transmitted over 102 km through a 110 kV line. For the moment, the old 110 kV line is used to supply the Panjakent district with electricity from the newly constructed substation Ayni 220 kV. As the demand in Panjakent is higher than the capacity of the line, households and industry in the region suffer from load shedding even in summertime, which is energy surplus period in Tajikistan. The implementation of LOT 2 troubleshot that situation.

The object of the additional subproject (PACKAGE 4) is to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, lines, power transformers and busbars in the levels of voltage 500, 220, 110 and 35 kV. The objective is increasing redundancy of measurements on the top levels and full control of losses. Besides, it can provide relevant information of fluxes of energy between different segments of the grid.

3.4. Category of the Project

Based on the rapid environmental assessment, Category B was preliminary assigned to the project (ADB Project Data Sheet last update April 2014).

In the ADB ‘Safeguard Policy Statement’ of June 2009, definitions for the different types of projects are given (see Section 1.5). According to these considerations, projects of Category B are characterized as Projects which “could have some adverse environmental impacts, but of lesser degree or significance than those in Category A”.

According to ADB Safeguard Policy Statement, June 2009 an Initial Environmental Examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely.

Based on the findings in the original Initial Environmental Examination and revised versions of the IEE, it can be concluded that Project’s 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. Metering Project as such (LOT 1), including additional metering works (PACKAGE 4), can be classified to be a Category C Project. Thus, the classification of the whole Project remains in Category B. A full Environmental Impact Assessment is not needed.

3.5. Project Description

LOT 1 Metering Project

All works on LOT 1 belong to the original scope of the Project.
**Scope and content**

Replacement of approximately 1,117 meters at 277 substations in 11 districts of the country, replacement of several current transformers, replacement of several voltage transformers, introduction of an advanced metering infrastructure, MDM, EDM, and introduction of a settlement system.

The main components of the project are presented in detail in the former IEE dated 6th December, 2016.

**LOT 2 Transmission Reinforcement Project**

All works on LOT 2 belong to original scope of the Project.

The Project consists of three sub-projects:

1) Rehabilitation of 220/110/10 kV Rudaki Substation
2) Extension of 220/110/10 kV Ayni Substation
3) Construction of 220 kV, single circuit, overhead transmission line from Ayni Substation to Rudaki Substation

The main components of the project are presented in detail in former IEE dated 6th December, 2016.

**PACKAGE 4 New metering points 500, 220, 110 and 35 kV**

**Purpose**

The purpose of this additional subproject is to enhance the system enabling it to control the fluxes of energy in the Transmission Grid item by item from higher to lower levels, meaning all the items, lines, power transformers and busbars in the levels of voltage 500, 220, 110 and 35 kV. These works will be done at 175 substations. The list of subject substations is presented in Annex 14. The objective is increasing redundancy of measurements on the top levels and full control of losses. Besides, it can provide relevant information of fluxes of energy between different segments of the grid.

**Main Content**

- Replacement or installation of 480 smart meters in the 175 substations according to the meter data base. Replacement or installation of 300 current transformers (CTs), 105 voltage transformers (VTs) and 196 arrester,
- Installation of modems/data concentrators in the substations,
- Installation of meter cabinets, overvoltage limiters and other minor equipment (as cables, terminal boxes, clamps, etc.)
- Detailed design for replacement of instrument transformers, smart meters, meter cabinets, cable routing, etc.
- Communication engineering
- Software customizing
- Metering infrastructure installation
- Communication equipment installation
- Testing, commissioning and training

**Project works description**

The replacement or installation of new meters and transformers will take place in substations, only. For new current and voltage transformers foundations have to be constructed and the transformers will be erected on the foundations. The new meters replace old meters or will be installed inside of the substations where no
meters were installed until now. The enlargement of the number of meters installed in the substations will not require different type of works as they were planned for LOT 1. Just the number of transformers and meters will increase. The measurement transformers and meters will be installed in bays belonging to the levels of voltage 500, 220, 110 and 35 kV.

The construction of foundations, erections of transformers and replacement or installation of meters will be carried out inside the substations, so no disturbance for residents is expected. The construction of the foundations can be done without disconnecting the substation from the grid. The connection of the transformers to the grid will require a disconnection of the substation from the grid for a duration up to one day per substation. The replacement or installation of meters can be done in a short time. Depending on the net topology the disconnection of very few substations will affect the population; the majority of the substation disconnection will not lead to a lack of energy supply for the population.

Around 50% of the substation disconnections will not lead to a lack of energy supply for the population since they will be supplied from other substations. The other 50% of the substation disconnections that will lead to blackouts are envisaged to happen in Chanubi Electricity Network (Lomonosova Substation), Isfara Electricity Network (Isfara Substation), Istaravshan Electricity Network (Uzlavaya Substation) and Kulyab city (Ismoilova Substation) among others.

Equipment to be installed in frame of this LOT will be same as in LOT 1 whose photos are attached in annexes no 14.

3.6. Workforce

The Contractor’s work plans are not yet available and thus it is not possible to give any numbers concerning the size of the workforce. The Contractor must provide at least six highly qualified specialists for the main positions in accordance with the Bank’s requirements.

It is evident that the installations can be done only by specialized and trained workers. The availability of such experts locally is very much limited. Part of the workers may come from other parts of Tajikistan but for the most part these workers will be foreigners.

To carry out the work at substations under PACKAGE 4 it is planned to use 3 to 4 brigades of 6 people each for the installation and connection of equipment, and 3 brigades of 5 people each for earthwork and other auxiliary works. Organization and control of work - 5 people required. Total number of workers will be around 45 - 50 people.

Opportunities for local workers, even unskilled, may arise especially in the field of civil construction. Other fields of potential opportunities are e.g. transportation, accommodation and other related services.

3.7. Methodology

LOT 1 and LOT 2

During the second week of July, 2014, an environmental expert conducted a complete field survey from s/s Rudaki along the proposed line to s/s Ayni. During this visit he consulted the local environmental authorities at Panjakent and at Ayni to clarify the location of protected areas that might be affected by the line routing.

An additional survey and consultations were done by the local environmental expert in the third and fourth week of July 2014.
Between 22 and 28 August, 2014 public consultations were held in the course of the social survey. During these meetings the Project was introduced to the population and environmental questions were discussed. In addition, meetings with stakeholders in the region took place.

A list of field surveys, meetings and participants are given in Annex 3 and 4.

**PACKAGE 4**

During 2019 (the third week of May and the first week of June; and the third week of November), several inspections were carried out on the environmental condition of the project substations.

Consultations with the environmental authorities of the territories adjacent to the substations were done using information leaflets sent via e-mail in July 2020 since the COVID-19 pandemic made not possible the face to face meetings (see detailed information in Chapter 7).

### 3.8. Proposed Schedule for Implementation

**LOT 1 and PACKAGE 4 Metering Project**

The planned execution period of the demolition, construction and installation works for Metering Project was originally November 2016 - July 2018 (LOT 1). According to revised schedule which takes into account the amendment on the works (PACKAGE 4), the Project will be completed in January 2022.

**LOT 2 Transmission Reinforcement Project**

Tender Documents concerning ‘LOT 2: Rehabilitation of Substation Rudaki and Extension of Substation Ayni 220 kV and Construction of 220 kV OHL between SS Ayni 220 kV and SS Rudaki’ were completed in June 2015 after performing the feasibility study in 2014. The Project was put out to tender during the autumn 2015 and contract between the Contractor and Executive Agency signed in December 2015.

The construction of the OHTL started in 2016 and was finished in October 2018. Renovation of SS Rudaki and extension of SS Ayni were completed in March 2020. Substations had several amendments for the work content.
4. Description of the Environment

4.1. Topography

Tajikistan is a landlocked country with an area of about 140,000 km². It is covered by mountains of the Pamir range, and more than 50 % of the country is located above 3,000 m asl (approx. 10,000 ft) (Map 4-1).

Map 4-1: Topography of Tajikistan (The Third National Communication of the Republic of Tajikistan under the United Nations Framework Convention on Climate Change, 2014).

The substations of the LOT 1 of the Project are located in three regions of the country: Sughd region, Khatlon region and DRS. Following districts are covered by Lot 1: Isfara, Istarafshan, Khujand, Kulyab, Nurek, Penjakent, Rasht, Sughd, Vaksh, Varzob and Yavan areas.

OHTL and substations of Ayni and Rudaki (LOT 2) are located close to the river Zerafshan. Its altitudinal range is from 950 m asl (Panjakent) to 1,400 m asl (Ayni).

The Zerafshan valley (in which the OHTL will mainly take its course) is quite narrow near Ayni but widens up around Dashtikazy. The surrounding mountains do have steep slopes with high rates of erosion and risk of landslides.
PACKAGE 4 activities are executed inside the substations which are already owned by Barqi Tojik and are located geographically around the country at the substations in the Khatlon region Khuroson, Yovon, Nurek, Baljuvon, Khovaling, Dangara, Temurmalik, Bokhtar, Vose, Kulob, Shakhrituz, Farkhor and Panj districts), Sughd region (Maschoh, Asht, Zafarobod, Spitamen, Jabbor Rasulov, Konibodom, Isfara, Istaravshan, Panjakent and Ayni districts) and the Regions of the Republican Subordination: Dushanbe, Tursunzoda, Hisor, Varzob, Vahdat, Rasht, Rudaki, Faizobod, Rogun, Nurobod, Tojikobod and Tavildara districts.

4.2. Seismicity and Soils profile

4.2.1. Seismicity

The connection of earthquakes in Tajikistan with major faults is proved.

![Map 4-2: Seismological zones in Tajikistan (Source: Agency of Hydrometeorology of RT, Atlas of the RT).](image)

Tajikistan is located in an active area of seismic events. During the 1900s there have been 3 earthquakes with magnitude >7 and 500 earthquakes with magnitude >5. During 1997-2007 a total of 229 seismic events has occurred in Tajikistan (Central Asia and Caucasus Disaster Risk Management Initiative: Risk Assessment for Central Asia and the Caucasus, UN ISDR, 2009).

At the Zerafshan Valley earthquakes up to magnitude 4 are possible.

Almost all the regions where the substations included in PACKAGE 4 are located belong to one of the most highly seismic regions of our planet. These territories are home to the so-called Alpine-Himalayan seismic belt, within which earthquake centers of maximum amplitude can appear.

Thus, in the Eastern part of the Khatlon region, there may be manifestations of earthquake foci with a maximum magnitude of M = 7.0 – 7.5, and in the Western part - manifestations of earthquake foci with a maximum magnitude of M = 6.5.

The territory of the RRS is the most active in the manifestation of crustal earthquakes.
The maximum magnitude of possible earthquake foci is M=7.5 for the Western part, and M=8.0 for the Eastern part.

In the Northern part of Tajikistan, where the Sughd region is located, the North Ferghana fault passes with a high degree of activity. Therefore, in this zone, there are possible manifestations of earthquake foci with a maximum magnitude of M = 7.8 and 9-point earthquakes are also possible.

Almost all the regions where the substations included in PACKAGE 4 are located belong to one of the most highly seismic regions of our planet. These territories are home to the so-called Alpine-Himalayan seismic belt, within which earthquake centers of maximum amplitude can appear.

Thus, in the Eastern part of the Khatlon region, there may be manifestations of earthquake foci with a maximum magnitude of M = 7.0 – 7.5, and in the Western part - manifestations of earthquake foci with a maximum magnitude of M = 6.5.

The territory of the DRS is the most active in the manifestation of crustal earthquakes. The maximum magnitude of possible earthquake foci is M=7.5 for the Western part, and M=8.0 for the Eastern part.

In the Northern part of Tajikistan, where the Sughd region is located, the North Ferghana fault passes with a high degree of activity. Therefore, in this zone, there are possible manifestations of earthquake foci with a maximum magnitude of M = 7.8 and 9-point earthquakes are also possible.

4.2.2. Soils

Soil types characteristic for the Project area are typically sierozem (grey desert soil) and light sierozem, loamy sands, conglomerates and loess with gypsum inclusions and gravels (Map 4-3). The humus layer is insignificant and is not present below the root system. The soil quality is low in organic matter.

The Right of Way for the transmission line in Panjakent and Ayni districts is mainly represented by sandstone, conglomerates, gypsum and clay rocks.
The most common types of piedmont plains soils, which include Panjakent District, are gray soils (rainfed and irrigated), which are divided into three types: light, common and dark. The soils of the central and southern region of Panjakent there are dark gray soils, occupying a higher part of the foothills and slopes of low ridges between 900 and 1,500-1,900 m. They separate a carbonate horizon at a depth of 40-60 cm. Humus in the upper layer of soil noted 2.5-4 %.

The area with the gray soils is used for rainfed grain crops. On irrigated gray soils mainly industrial crops are cultivated.

Soil types at northern Panjakent should be attributed to the mountain light brown soils of the mountain juniper forests, alpine steppe.

In the Khatlon region, in the lower reaches of the Panj and Vakhsh rivers, light gray soils are common, formed in a dry, hot climate under sparse vegetation, contain little humus, are rich in lime, and often contain easily soluble salts. Under certain conditions, they are subject to secondary salinization. On the Dangara plateau at an altitude of 600 to 900-1,000 m, the soil type is spread out ordinary serozems contain a little more humus and are also rich in lime.

The soils of the highlands are most prevalent in the districts of Republican subordination. They are formed at an altitude of 2,800 m-3,300 m. They have a brown and chestnut-brown color, low-power and woody-crushed stone, leached from calcium carbonates. On the leveled relief elements, high-altitude meadow-steppe dark-colored soils with a loose humus horizon are distinguished among these soils.

Sughd region is characterized by a large development of the Alpine complex formed by cretaceous, paleogene and neogene deposits. In the Syr-Darya valleys, light gray soils are common, formed in a dry, hot climate under sparse vegetation, containing little humus, rich in lime, and often contain easily soluble salts.
4.3. Climate

The climate of Tajikistan is sharply continental. On the edge of the subtropical and temperate zones, due to its geographical position within the Eurasian continent. In general, it is subtropical with significant daily and seasonal fluctuations in air temperature, low precipitation, dry air and low cloud cover.

**Map 4-4:** Climate of Tajikistan (Source: Agency of Hydrometeorology of RT, Atlas of the RT).

Khatlon region

The southern regions are characterized by a climate with very hot summers and mild winters, which dominates the plains located at altitudes of 350-500 m. It is characterized by a long (more than 200 days) summer and a small amount of precipitation 150-200 mm.

Sughd region

The formation of the climate of Northern Tajikistan is greatly influenced by the same air masses that invade the territory of Central Asia and determine the nature and change of weather. Precipitation is mainly due to cyclonic activity and the nature of the underlying surface. The annual precipitation is 87 mm during the cold season, and the highest amount is in March and April (25-27 mm); the lowest is in the summer months (9-11 mm, Aug.). The average temperature in winter is 0 degrees, in summer 30 degrees.

Panjakent and Ayni districts of Tajikistan belong to the belt of humid climate with warm summers and moderately mild winters

Climatic conditions in this zone are more severe compared with the underlying belts. The average annual air temperature does not exceed 11 °C, below zero temperatures are observed within 2-3 months - from late November to early March. The average monthly temperature in January is from - 4 to – 7 °C. The absolute minimum is – 34 °C. The
average air temperature in July is 22-24 °C, the absolute maximum reaches 40 °C.

Precipitation is higher even than in the lower zones. In winter, it forms a stable snowpack. The average number of days with snow cover is about 100.

**Districts of Republican Subordination, DRS**

Precipitation in plain areas of the country is approximately 100-200 mm from November to March and up to 800 mm and more in mountain areas. Average yearly precipitation is 624 mm in Dushanbe. The period from June to October is the driest season of the year. The precipitation consists mainly of rain and wet snow. Due to mild winter climate in the plains, solid snow cover rarely builds up. The average thickness of snow cover is less than 10 cm and it melts quickly. Snowfall occurs mostly between mid-December to mid-February. Rainfall is most common from March to mid-May. Main climatic and meteorological data is presented in Table 4-1 and Map 4-4.

Dushanbe features a Mediterranean climate with some continental climate influences. The summers are hot and dry and the winters are chilly, but not very cold. The climate is damper than other Central Asian capitals, with an average annual rainfall over 500 millimeters as moist air is funneled by the surrounding valley during the winter and spring. Winters are not as cold as further north owing to the shielding of the city by mountains from extremely cold air from Siberia.

The climate in the central and south-west regions of Tajikistan is characterized by rather hot summers and mild winters. The cold period lasts 90-120 days, the warm period – 275- 235 days. 75-85% of annual precipitations happens from December to May.

**Table 4-1: Temperature and Precipitation by District. Source: Tajikistan National Agency for Hydrometeorology**

<table>
<thead>
<tr>
<th></th>
<th>Month</th>
<th>Max. High Temperature</th>
<th>Min. Low Temperature</th>
<th>Avg. Annual Temperature</th>
<th>Annual Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayni</td>
<td>January</td>
<td>2.4 °C</td>
<td>-6.4 °C</td>
<td>10.5 °C</td>
<td>617 mm</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>30.6 °C</td>
<td>15 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rasht</td>
<td>January</td>
<td>1.2 °C</td>
<td>-7.6 °C</td>
<td>10.7 °C</td>
<td>679 mm</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>31.5 °C</td>
<td>15.6 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varzob</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panjakent</td>
<td>Annually</td>
<td>40 °C</td>
<td>-16 °C</td>
<td>12.4 °C</td>
<td>486.5 mm</td>
</tr>
<tr>
<td>Sughd</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isfara</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Istarafshan</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khujand</td>
<td>Annually</td>
<td>36.2 °C</td>
<td>-3.1 °C</td>
<td>15 °C</td>
<td>167.1 mm</td>
</tr>
<tr>
<td>Vakhsh</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yavan</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kulyab</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurek</td>
<td>Annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.4. **Water Resources**

4.4.1. **Hydrology**

The Republic's territory is divided into two sharply opposing hydrological areas:
formation and dispersion flow. There are altogether 6 runoff formation areas.

Powerful mountain systems of Tajikistan and their branches divide the territory of the Republic into several hydrographic regions, forming two main river systems—the Syr Darya and Amu Darya rivers. The Northern regions of Tajikistan occupy part of the Syr Darya river basin in its middle course, with an area of 13.4 thousand km$^2$. This is a tenth of the area of the Republic. Almost all the rest of the country is located in the basin of the river. The Amu Darya River is divided by mountain ranges into large river basins, which differ in the height of catchments, the degree of glaciation, different development of the river network, conditions for feeding rivers and the formation of runoff. The hydrographic network of Tajikistan consists of more than 25 thousand rivers with a total length of 69.2 thousand km.

Sughd region

As a part of the allocated area, two sub-districts exist: Pasrud-Kshtut-Magiandarin (Southwest region) and Zeravshan-Fandarin-Iskanderdarin.

Water in Zarafshan rivers belong to hydrocarbonate class, calcium with mineralization medium level (200-500 mg per liter).

The length of the Zarafshan River in Tajikistan – 877 km, the basin area – 12,300 km$^2$. Type of floods in Zarafshan River and its tributaries is glacial snow.

Ground water levels in the LOT 2 area are typically at depths ranging from 5-100 m. As the transmission line is located in most parts on elevated ground compared to Kayrakkum Reservoir (about 100-200 m or even higher) and due to layers of very permeable soils, ground water level is assumed to be deeper than 10 m.

The northwest of the country forms part of the Syr Darya basin. Only 1 percent of the total flow of the Syr Darya river is generated within Tajikistan by the shallow rivers Khodzhakirgan, Isfara and Isfana, with a total flow of 1.01 km$^3$/year.

In the extreme northeast of the country a small river, the Marcansy, drains towards China.

There are a few small closed basins, such as those formed by the small Kattasoy and Basmandasoy rivers, but the annual flow is negligible compared to the total renewable flow generated in Tajikistan.

DRS region

Kofarnihon river flows across Dushanbe.

Khatlon region

About 76 percent of the flow of the Amu Darya river is generated in Tajikistan. The Panj river, the largest tributary of the Amu Darya river originates in the Pamir mountainous ranges and forms the border between Tajikistan and Afghanistan for almost its entire length flowing from east to west. The Bartang river is the first large tributary of the Panj river. Before the confluence with the Vakhsh river, the annual average flow of the Panj river is 33.4 km$^3$/year. During the Soviet era, based on an agreement in 1946, entitled Afghanistan use of up to 9 km$^3$/year of water from the Panj river. The Vakhsh river is the largest river in Tajikistan, crossing the country from the northeast to the southwest. Originating in Kyrgyzstan, where it is called the Kyzyl Suu river, it enters Tajikistan, where it is called the Surkhob river. After the confluence of the Surkhob and Obikhingob rivers, it becomes the Vakhsh river. Its catchment area lies in the highest part of Tajikistan, at over 3 500 m. After the confluence of the Vakhsh and Panj rivers, at the border with Afghanistan, it becomes the Amu Darya river. The Kofarnihon river is...
another large tributary of the Amu Darya river. Originating in Tajikistan, it becomes the border between Tajikistan and Uzbekistan for several tens of kilometres, then it re-enters Tajikistan, after which it flows into the Amu Darya river, which is about 36 km downstream of the confluence of the Panj and Vakhsh rivers, at the border between Tajikistan and Afghanistan. About 65 km further downstream, the Amu Darya leaves the Tajikistan border to become the border between Afghanistan and Uzbekistan. The Surkhandarya river also originates in Tajikistan, then enters Uzbekistan and joins the Amu Darya river at the border between Uzbekistan and Afghanistan. The Zeravshan river originates between the mountain ranges of Zeravshan and Gissar in Tajikistan, and the total flow generated within Tajikistan is an estimated 3.09 km³/year. The river then enters Uzbekistan and joins the Amu Darya river at the border between Uzbekistan and Turkmenistan. Total water generated within Tajikistan in the Amu Darya river basin is an estimated 59.45 km³/year.

Substations under PACKAGE 4 are not located close to water bodies.

4.4.2. Surface Water

Tajikistan is rich in water resources and has a dense river network (Map 4-5).

![Map 4-5: Main rivers in Tajikistan (Source:geofactoftheday.blogspot.com).](image)

Most of Tajikistan’s rivers flow from east to west and lead to the Aral Sea. Their maximum spring and summer flow is important for irrigation of agricultural fields on semi-desert areas and for energy production. Problems occur from severe over-utilization of water for irrigation purposes. Flooding sometimes occurs during spring.

Tajikistan possesses about 1,300 lakes, which can be found mainly in the Pamir region. Other standing water bodies are water reservoirs, which are mainly used for irrigation, electricity generation and fisheries.
4.4.3. Groundwater

Important groundwater reserves of Tajikistan are mainly located in the quaternary alluvium of the large river valleys (e.g. Syr-Darya, Vakhsh) and intermountain depressions. There is a wide range of springs in the country, especially in the Pamir Mountains. Groundwater is used for drinking water supply, industrial processes, and irrigation of lands. The main water consumer is agriculture consuming up to 93 % of the total freshwater intake. Intensive groundwater pollution in Tajikistan is due to infiltration of irrigational wastewater, e.g. along the left bank of Syr Darya River.

The groundwater level varies considerably depending on the morphology and season. In floodplains, the water table is close to the surface but where the line corridor is running through mountainous areas the water level is more than some tens of meters below.

Underground water in the southern part of the Republic is characterized by a variety of chemical composition and mineralization. Fresh water of good quality is developed in the area of the River Vakhsh outflow cone. To the South, fresh water is gradually replaced by brackish and salty with a mineralization of 5-10 to 50 g/dm$^3$. Fresh water is found in narrow strips along the channels of the irrigation network. The level of underground water occurrence varies from fractions to several tens of meters.

In the Hissar valley (DRS), fresh underground water with a mineralization of up to 1 g/dm$^3$ is predominant. the Water lies at depths of 5-40 m. In the southern part of the valley, where the ground water level is close to the surface, a narrow strip of brackish sulphate water with a mineralization of 1-6 g/dm$^3$ is developed.

In the Syr Darya river valley (Sughd region), mainly fresh water is developed, among which there are small areas of brackish water with a mineralization of up to 5-6 g/dm3. Fresh water is usually circulated along the beds of rivers, irrigation channels and reservoirs. The depth of underground water is 1-10 m. In some areas, there are pressure waters of good quality.

4.5. Climate Change

Climate change has already had concrete consequences in Tajikistan and neighboring areas. The region’s climate has become noticeably warmer. Average annual temperature has risen by 0.10 to 0.31 °C every ten years from 1940 (higher than global trend 0.06 °C). In Tajikistan the greatest increase has been for the winter period (based on analyzed data from the period 1940-2005) (State Agency for Hydrometeorology of Tajikistan, 2009).

The variability of precipitation, both among years and seasons, has increased. Intense rainfall events (15-20 mm or more per 24 hours) have become more frequent and irregular. This is particularly true at mountain areas.

Correlation between rising temperature and heightened average annual precipitation is presented in the following Table 4-2 and Map 4-6. A decline in precipitation is expected during the summer season. Individual precipitation events are projected to become more intense. Frequent floods in Zerafshan River Basin are anticipated. Currently there are around 70 flash floods and mudslides per year in Zerafshan Valley area (Committee on Emergency Situations and Civil Defense under the Government of the Republic of Tajikistan, 2007).
Tajikistan ranks first among the countries of Europe and Central Asia on the index of vulnerability to climate change (25 - Tajikistan, compared to 22 - Kyrgyzstan, 21 - Armenia, 19 - Uzbekistan). This figure is exacerbated by the low capacity of Tajikistan to climate adaptation. Climate warming and the increase in mean annual air temperature in the PT begins with the 80s of the last century. Since the 80s of the magnitude of global warming is 1.2 °C, recent warming is due to anthropogenic impacts. Since the late 70s vast cut down of the forest has created favorable conditions for the development of semi-arid areas.

Analysis of the situation in recent years has shown that in the north, on the western Pamir, there is a joint action of all the factors of desertification. There is a combination of lack of rainfall, wind erosion, salinization and soil dehumidification. In the central part of the country and at the Western Pamir there are ongoing processes of physical weathering, water erosion, uncontrolled deforestation and degradation of trees and shrubs.

By the year 2030 in most areas of Tajikistan it is expected that the increase of the average temperature will be 0.2 – 0.4 °C (compared with the period 1961-1990) (Map 4-
7). This trend coincides with the trends prevailing in the country during the last 15-20 years. The predicted future rainfall will show large shifts in the terms of their change, intensity and geographical distribution. Winter seasons are expected to be wetter and drier which can lead to flooding and more prolonged droughts.

Map 4-7: Annual air temperature anomalies in Tajikistan (Source: Second National Communication to the UNFCCC in Tajikistan, 2008).

CO₂ emissions in Tajikistan in 2010 amounted to 0.4 thousand tons per capita, accounting for 0.03 % of global CO₂ emissions.

The increasing temperature generally leads to an increased evaporation, and to a change of water runoff accentuating water stress and droughts. Additionally, the melting of glaciers becomes a problem: the glaciers in Central Asia have melted faster in recent years than ever reported before. Similar to many other rivers in Central Asia, Zerafshan originates from a glacier and is therefore highly dependent on its water balance. The melting of this glacier changes the runoff in the catchment area of Zerafshan drastically. In a short time scale, the melting results in an increased runoff, combined with mudflows, landslides, and land degradation. Once, when the glacier disappeared, an increasing shortage of water will follow.

Related to our project, the probable events described above may lead to an increased frequency and severity of disasters like landslides, and mudflows affecting the stability of towers.

4.6. Biological Resources

Flora
Tajikistan belongs to two major vegetation zones and has a variety of habitats and ecosystems. Large differences in altitude, topography, climate and soil give rise to different natural environments ranging from deserts in Southern Tajikistan to alpine environments in Pamir.

Tajikistan features a great diversity of flora. More than 5,000 species of plants are recorded in the country, with two threatened plant species among them. Grasses, bushes, and shrubs predominate.
Works under PACKAGE 4 are implemented within the area of existing Substations located in urban areas of the cities or district centers. No rare or endangered or Red Book species are found in these areas.

**Fauna**
The country’s animal life is abundant and diverse. Generally, there are about 80 species of mammals, 360 species of settled and migrating birds, 44 species of reptilians and 49 species of fishes in Tajikistan. According to IUCN (International Union for Conservation of Nature, 2006), threatened species include seven mammal species, nine bird species, one reptile species, three fish species and two invertebrate species.

Works under PACKAGE 4 are implemented within the area of existing Substations located in urban areas of the cities or district centers. No rare or endangered or Red Book species are found in these areas.

### 4.7. Protected Areas

According to the World Commission on Protected Areas (WCPA), five State Nature Reserves (IUCN Category I), three National Parks (IUCN Category II), a variety of small Nature Monuments (IUCN Category III) and 23 Nature Refuges (Zakazniks, IUCN Category IV) can be found in Tajikistan. In addition, areas under international agreements and programs (e.g. Ramsar Sites according to the Ramsar Convention and Important Bird Areas – IBA- according to BirdLife International) are present in the country (Figure 4-1). Tajikistan has designed five wetland sites (Ramsar sites) under the Ramsar Convention.

There are two Nature Refuges (IUCN Category IV) and one IBA in the Zerafshan Valley:

  Objective: Protect the only flood-plain forests in Northern Tajikistan and the habitat of Phasianus colchicus zerafshanicus

- **Soy Vota (Saivatinsky, Sayvatin, Say Bota) Nature Reserve**, 4,300 ha, founded in 1970 
  Objective: botanical reserve to conserve juniper

- **IBA Sarazm**, 4,280 ha, assessed in 2007, Contained in Zerafshansky Nature Reserve 
  Objective: Protect the habitat of Saker Falcon (*Falco cherrug*), Yellow-eyed pigeon (*Columba eversmanni*), European Roller (*Coracias garrulus*) and others.

According to information of the director of the Forest Department of Ayni (H. Koriev, see Annex 2), the Reserve will not be affected by the transmission line. A map of the Soy Vota Nature Reserve has been received and its borders were respected in the routing (see Figures 4-1 and 4-2).

The maps are originated in the mid 60ies of the last century without any update and the exact borders of the area (coordinates) are unknown. To be sure to be outside of the reserve, two towers (60 and 55) were moved to the north, thus the OHL is really outside the protected area.

The same situation applies for the location of Zerafshansky Nature Reserve for which no exact georeferenced maps are available. Following google maps this Reserve is located on the right river bank far away from Rudaki Substation, following birdlife.org it covers the river area also on the left bank, including IBA Sarazm. In any case, this reserve protects an area of Zerafshan River located at the fluvial terrace but substation Rudaki is
situated on the upper part of the valley (see Map 4-8). Consequently, it can reasonably be assumed that Rudaki substation is outside Zerafshansky Nature Reserve and IBA Sarazm.

Map 4-8: Nature protection areas in Tajikistan (Source: Agency of Hydrometeorology of RT, Atlas of the RT).
There are two state nature reserves located on the territory of Penjakent: Zeravshan and Say-Votinsky.

Zeravshan Reserve was founded in 1976 to preserve the remnants of the natural population of unique subspecies of Zeravshan Pheasant and Bukhara deer. The reserve is located in the northwestern part of the area in the lower reaches of the river Zeravshan on the border with Uzbekistan. The territory includes a relatively small section of the floodplain of the river Zarafshan Sugino from the village to the village Maykata. upstream of the river. Area of the reserve is 2,300 hectares. Distance from Panjakent until Zeravshan reserve is 8.4 km, travel with a motor vehicle to Havzak village (early reserve) takes 12 minutes.

The vegetation in the reserve is represented by sea buckthorn, willow, tamarisk and sea buckthorn - not only a forage plant, but the plant provides shelter for pheasants.

The fauna of the reserve is presented by hare, otter, badger, jackal, fox, porcupine and acclimatized species - musk-rat and the Bukhara deer.

In recent decades, at the NAA territory of the reserve economic activities have been carried out; laid orchards, crops grown in places. Systematic uncontrolled grazing and illegal cutting of forests have reduced the ecological value of the reserve, which needs to restore its natural ecosystems.

On the territory of Khatlon region there are two State nature reserves "Tigrovaya Balka" and "Dashti Jum" and 3 nature reserves, in Sughd region - 4 reserves, in DRS – 2 reserves. There are no substation facilities on the territories of nature reserves or nearby territories.

Additional works under PACKAGE 4 are implemented within the area of existing Substations located in urban area of the cities or district centers and far away from protected areas.

4.8. Land Use

Approximately 1/4 of Tajikistan’s land area is under agricultural use with production of cotton, grain, vegetables, potatoes, fruits and wine and rearing of sheep, goats, cattle and yaks. Pastures are the most common agricultural use (21 %). Desert and semi-desert lands are irrigated and show cotton plantations, gardens, and vineyards. In narrow valleys (especially in the north) orchards, fruit trees, mulberry groves, and small cultivated fields can be found. In general, the agricultural land use in Tajikistan is strongly dependent on irrigation and fertilization. Particularly cotton requires intense irrigation.

Another important land use is mining. Some fishing is done in the upper Amu Darya River, the Kayrakum Reservoir (fish farming), and the Syr Darya River.

In Soviet times, tobacco has been the most important crop. Since then, the cultivation of tobacco has decreased significantly and the production of cereals, vegetables and potatoes has been growing. With wheat and oats being the most important crops, there are some additional incomes with the growing of apricots, apples, grapes, mulberry and peach. Nevertheless, revenues are quite low due to bad infrastructure and losses of the fresh products on the transport. Pastures are poor for cattle.

Works under PACKAGE 4 are implemented within the area of existing Substations, so no land will be acquired under PACKAGE 4 of the Project and no land use change will happen due to PACKAGE 4 implementation.
4.9. Socio-economic Conditions

4.9.1. Population and Communities

The population of Tajikistan is estimated at almost 8 million. Less than 1/3 live in urban areas due to a general trend toward ruralization. Most people live in small villages (*dehots*).

Living conditions in most rural areas are primitive. Paved roads, modern communications, potable running water, indoor toilets, and modern indoor heating and electrification are still only available in urban areas.

Tajikistan’s population is composed of over eighty different ethnic groups but there are no indigenous peoples in the country. 80 % of the population belongs to the Tajiks, being direct descendants of the Iranian peoples and the largest indigenous group in the country. Other ethnic groups living in the country are Uzbeks (about 15 %), a declining Russian population (1.1 %) and several other such as Kyrgyz, Tatars, Ukrainians, Germans, Jews and Armenians. 95 % of the people are Muslim (90 % of Sunni Muslims and 7 % Shi’a Muslims); 5 % belong to other religions.

The Panjakent District (3,671 km²) has 214,000 inhabitants. Panjakent is the capital and also the biggest city with 33,000 inhabitants. The rest of the population lives in 14 rural Jaomats. The vast majority of the population is Tajik (70 %) and about 30 % is Uzbek.

Ayni District is bigger (5,159 km²), but with less people living there (72,000 inhabitants). Almost all of them live in rural areas (8 Jamoats). More than 98 % are Tajik.

Khatlon region was established in 1992. It’s territory 24.6 thousand square km. The population is 3.275 000 people. The center of the region is Bokhtar. The average population density in the region (per 1 sq.km of territory) is 133.13 people. There are 24 rural districts and 4 cities, 133 rural jamoats in the region. The share of Tajiks is almost 80% of the population of this region, a significant share of the population is made up of Uzbeks who live mainly in the Western part of the region. The urban population is 563.3 thousand people (17.2% of the total population of the region), the rural population is 2711.7 thousand people (82.8%).

Sughd region covers an area of 25.2 thousand square km. The population is 2.7 million people. The average population density in the region (per 1 sq.km. of territory) is 89.3 people. The center of the region is Khujand. There are 14 rural districts and 8 cities, 93 rural jamoats in the region. The urban population is 664.5 thousand people. (25.0% of the total population of the region), the rural population of 1993.5 thousand people (75.0%).

4.9.2. Economy

Regarding Central Asia and the former Soviet states, Tajikistan is the poorest country. The official estimation for the poverty rate (2013) is at 39.6 %. Nevertheless, some Tajik

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4 http://www.encyclopedia.com

and international NGOs indicate that the real poverty rate is much higher (more than 70 % in 2010). Most probably, the real number is somewhere in between\textsuperscript{3}.

After the civil war (1992-1999) the political stability led to a growth of the Gross Domestic Product (GDP). In 2019 the GDP was about USD 8.1 billion and the GDP per capita was about USD 827. In 2018 2.4 million were employed in Tajikistan.

Tajikistan’s economy traditionally depends on agriculture. 2/3 of the labour force is occupied in this field, which accounts for almost 24 % of the GDP. The main crop produced for export is cotton.

In contrast, the industrial sector is poorly developed, providing 14.4 % of the GDP and only around 4 % of total employment. A small number of state-owned enterprises dominate this sector. Industries include mining, chemicals, fertilizers, cement, machine tools, refrigerators, textiles and food processing. Hydropower and aluminum are significant resources with aluminum being the country’s most important mineral-based product\textsuperscript{6}.

At present, Tajikistan’s potential as a tourist site is rather low. This fact is for example due to the destruction of most ancient monuments and buildings by numerous earthquakes and the civil war.

The economy in Zerafshan valley depends primarily on cropping, tobacco, small scale gold mining and trade. Especially in Ayni district, agriculture in insufficient to engage all the population and the industry can only provide 2,000 workplaces. Therefore, unemployment is a problem and a high percentage of able-bodied men search (seasonal) work abroad, mainly in Russia and other former Soviet countries. Thus, migrant remittances are another important source of income for the population in the valley.

Panjaket district has a high level of development of agricultural production. The area under cultivation in all categories of farms at the beginning of 2014 Panjaket made in the area of 25,776 hectares, or 9.5 % of the total acreage of Sughd region (Table 4-2). As can be seen from the table below, the largest land area (60 %) is occupied by crops. The yield of grain crops in Panjaket area amounted to 27.5 t/ha, which is higher than the national average (26 kg/ha).

Especially should highlight the importance of the area for the production of high-quality potatoes winter varieties. Under potatoes occupied 3,583 hectares of land (23 % of the land in Sughd), the yield of this type of crops amounted to 275.7 kg/ha, which is higher than the average for the country (234.7 kg/ha). It should also be noted the high, compared with other areas, vineyards yield - 61.6 t / ha (42.7 t/ha on average in the country and 51.2 t/ha on average in Sughd).

\textbf{Table 4-2: Field areas, production of crops and yields in Panjaket District}

<table>
<thead>
<tr>
<th>Name of crops</th>
<th>Sown area of agricultural crops (ha)</th>
<th>Production of agricultural products (tons)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>25,776</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corns</td>
<td>15,163</td>
<td>42,185</td>
<td>27.5</td>
</tr>
<tr>
<td>Potato</td>
<td>3,583</td>
<td>100,009</td>
<td>275.7</td>
</tr>
</tbody>
</table>

\textsuperscript{6} LARP, Draft version August 2014
<table>
<thead>
<tr>
<th>Vegetables</th>
<th>1,921</th>
<th>59,619</th>
<th>269.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melons</td>
<td>60</td>
<td>1,477</td>
<td>245.0</td>
</tr>
<tr>
<td>Forage crops</td>
<td>3,148</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td>4,691</td>
<td></td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td>9,886</td>
<td>61.6</td>
</tr>
</tbody>
</table>

Penjakent district is widely known as the mining sector of the country. The largest enterprise in the country is located in the area - Joint Venture “Zeravshon”, which produces 60% of all the gold in Tajikistan. The factory has a complete production cycle: mining, processing, metallurgy. There are also other mining companies acting at the area. They have received licenses to mine several types of minerals, e.g. marble, tin, phosphates, facing stone, limestone and coal.

Khatlon region. The Vakhsh cascade, the largest complex of hydroelectric power stations in the Republic of Tajikistan, is located on the territory of Khatlon region. The cascade consists of seven active stations. Power stations of the cascade is 4 775 MW power generation capacity is about 20 billion kWh per year (when fully implemented cascade capacity will be 9 262.5 MW power generation capacity — about 37 billion kWh per year). Developed light (cotton, leather and footwear), food (butter, meat, flour, fruit canning), chemical (Vakhsh nitrogen-tuk plant), electrical and Metalworking industries. Oil, gas, and rock salt are extracted. Developed irrigated agriculture (Vakhsh canal and others). They cultivate fine-fiber cotton, cereals (wheat, barley, corn, rice), potatoes, vegetables, and feed. Fruit farming (including citrus farming). Viticulture. Plantation of geranium.

Sughd region. It is one of the most industrially developed regions of the Republic of Tajikistan, accounting for 17.2% of the country's industrial production. In the structure of the industrial sector of Sughd region, the predominant volume, more than 67% of production is in the manufacturing industry: mining and processing of precious, non-ferrous and rare metals.

Irrigation plays an important role in agriculture. The main agricultural crop is cotton, as well as fruit growing and viticulture. Sericulture is developed. Cattle are raised on the plains, and sheep are raised in the mountains. The region ranks first in Tajikistan in terms of potato production.

DRS. The main production unit of the DRS is the Tajik aluminum company (TALCO). The main product is primary aluminum. The company provides up to 75% of all foreign currency receipts to the budget of Tajikistan and about a third of the country's exports. The region has developed agricultural production: production of cereals, potatoes, vegetables, melons. Livestock breeding of sheep and goats and cattle is developed.

4.10. Cultural/Historical Heritage

The territory of Tajikistan has been continuously inhabited since the early Stone Age. It is located on the important historical trade routes of the Silk Road connecting East and West.

There are two important archaeological sites situated near Panjakent:
- Sarazm is one of the oldest settlements in Central Asia and over 5,500 years old. It is considered to be the birthplace of civilization of the Tajik nation and is protected by
UNESCO as a World Cultural Heritage. As it lies more than 10 km west of Panjakent, it is not affected by the project.

- Panjakant is a former Sogdian city whose ruins are located in the south of the present-day Penjakent. It has a distance of about 2.8 km through hilly ground from the project site, for which reason it is well protected from construction works.

Cultural and historical attractions of Tajikistan are concentrated in the West of the country—monuments of Khujand, Istaravshan, Panjakent and Dushanbe. Many of them are connected with important trade routes that ran along the main rivers of Central Asia—the Syr Darya and Amu Darya, and of course, the Great Silk Road played an important role here.

In Khujand there is an ancient Khujand fortress, which today has turned into a historical Museum, the Mausoleum of Sheikh Muslihiddin. In Istaravshan there is one of the oldest attractions of Tajikistan—the mausoleum of Hazrati Shoh.

In the Central part of Tajikistan, the Hissar historical and cultural complex, which is located 20 km from Dushanbe, is of historical and cultural value. There you can find the popular Hissar fortress, Kuhna madrasah, and other monuments of the Middle Ages.

Works under PACKAGE 4 are implemented within the area of existing substations. None of the subject substations is located in close proximity to a cultural site. Therefore, the implementation of PACKAGE 4 works will not have a negative impact on the cultural and historical heritage of Tajikistan.

4.11. Infrastructure

Tajikistan has an estimated 30,000 km of roads, nearly all of which were built before 1991. One main north-south artery runs across the mountains between the north-western city of Khujand and Dushanbe in the central part of the country. A second main artery runs east from Dushanbe to Khorog in Gorno-Badakhshan Autonomous Province (GBAO), then northeast across the mountains to Murghab and on either to the Kyrgyz city of Osh or to Kashgar, China via the Kulma border crossing.

The main airport of the country is Dushanbe International Airport.

It is expected that most of PACKAGE 4 equipment (121 metering panels, 448 meters, 300 current transformers, 105 voltage transformers and 196 arresters) will be arriving by road into the country and distributed also by road into the subject substations.
5. Anticipated Environmental Impacts and Mitigation Measures

5.1. General

LOT 1 and PACKAGE 4

Anticipated impacts of LOT 1 and PACKAGE 4 are quite restricted and mainly expected during the construction phase.

During construction:
- waste generation (steel, ceramics, used oil\(^5\)) due to demolition of equipment like old circuit breakers and replacement of two old transformers; domestic waste generation by the workers;
- Oil spills;
- Increased traffic and dust due to the transport of the equipment;
- Potential impacts on health and safety (e.g. works under high voltage, spread of COVID-19 or AIDS);
- Noise emissions and vibration due to the construction of the foundations;
- Limited work opportunities.

LOT 2

During the detailed Design Phase, line routing was done in view of avoiding impacts on settlements, land use, landscape, soil, surface waters and groundwater, flora and fauna, protected areas, cultural and historical sites, and infrastructure (e.g. roads, other OHL) as far as possible. During the construction and operation phases, the Project might mainly cause the following impacts:

During construction:
- land acquisition;
- visual impacts on the landscape;
- soil pollution and erosion;
- pollution of surface water and groundwater;
- damage to vegetation, habitats and protected areas;
- damage to cultural and historical sites;
- waste generation (steel, ceramics, used oil\(^5\)) due to demolition of equipment like old circuit breakers and replacement of two old transformers; domestic waste generation by the workers;
- waste water generation by workers
- contribution to climate change (SF\(_6\) gas);
- air pollution;
- impacts on health and safety (e.g. through works under high voltage, spread of STD/STI/HIV/AIDS);
- noise emissions and vibration;
- impacts on infrastructure and power supply;
- loss of houses and livelihood, involuntary resettlement;
- socio-economic impacts and influx of workers.

Included in operational costs the following impacts during operation may occur:
• change of land use;
• visual impacts on the landscape;
• pollution of soil, surface water and groundwater;
• obstacle for birds;
• impact on flora during maintenance works;
• electric and magnetic fields;
• contribution to climate change (SF₆ gas);
• noise emissions;
• fire;
• socio-economic impacts;
• interference with air traffic.
• Impact on birds in vicinity of IBA.

Below, in Chapters 5.2-5.3, the potential environmental impacts during the different phases of the Project are described in tabular form (Table 5-1, Table 5-2). These tables include the proposed mitigation actions to each impact, if necessary.
### 5.2. Construction Phase

**Table 5-1: Anticipated Environmental Impacts and Mitigation Measures during construction phase of PACKAGE 4.**

<table>
<thead>
<tr>
<th>Impact on/of</th>
<th>Extent of Impact</th>
<th>Comments</th>
<th>Mitigation Measures to be included in the HSE Management Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste</td>
<td></td>
<td></td>
<td>A Waste Management Plan shall be elaborated by the construction contractor as part of the HSE Management plan. Old equipment: reuse of parts where possible, however, reuse is restricted due to outdated technique. At the moment, scrap metal processing enterprises can only be found in Dushanbe and Khujand. It is proposed to transport the scrap metal to Dushanbe or Khujand. Normally, the scrap metals will be stocked there and sold by auction. Ceramic wastes are inert and can be used as landfilling material, e.g. for road construction. Hazardous waste consists of oily rags, electronic waste, batteries etc. It should be delivered to an appropriate licensed waste management facility. Non-hazardous waste shall be disposed with domestic waste if cannot be recycled. Domestic waste generated by workers during construction shall be collected and disposed at the proper waste landfill site. A possible disposal has to be agreed with the relevant city. In general, principles of waste minimization shall be followed: (1) reduction of waste quantity, (2) recycling as much as possible, (3) proper dumping of remaining waste. Workers shall be trained regarding proper waste handling according to environmental management requirements.</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td></td>
<td></td>
<td>The Project increases the risk of work accidents (e.g. due to works under high voltage, working at height, welding works, earth works, concrete works). There is also a potential impact on health and safety of workers due to inadequate sanitary conditions during the accommodation and construction work. The construction contractor shall develop an appropriate HSEMP and implement an HSEMS during the construction phase (see Section 9.3). Information campaigns for health and safety of workers will reduce the health risks.</td>
</tr>
<tr>
<td>Impact on/of</td>
<td>Extent of impact</td>
<td>Comments</td>
<td>Mitigation Measures to be included in the HSE Management Plan</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Community health and safety</td>
<td></td>
<td>Spreading of COVID-19 (Coronavirus). HIV exposure of local women.</td>
<td>Information campaigns for health and safety of workers will reduce the health risks. Corona virus: use of face masks, social distancing of 2 m always when possible, avoidance of face to face meetings, hand washing regularly, showers when getting to the accommodation in the evenings. A potential negative impact of spreading STD’s/ HIV by workers can be mitigated through asking them to use condoms.</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td></td>
<td>Noise and vibration is limited to the duration of the construction activities and will be generated mostly by construction machines during excavation and foundation works. Several machines can lead to cumulative effects.</td>
<td>Construction works should be avoided at sensitive times (e.g. nighttime, school hours). Construction machines shall be fitted with silencers or mufflers and, whenever possible, only machines with low sound power shall be used. Workers are obliged to wear ear protectors where 85 db(A) are exceeded (see World Bank/ IFC General EHS Guideline, 2007). Ear protection devices shall be handed out to workers expose to noise levels beyond that threshold.</td>
</tr>
<tr>
<td>Road safety</td>
<td></td>
<td>Increased traffic and heavy trucks may cause safety problems to pedestrians and other traffic.</td>
<td>A Traffic Management Plan will be developed. It will identify the best routes to follow for avoiding sensitive spots for noise such as schools and hospitals, suitable reduced driving speeds and other measures.</td>
</tr>
<tr>
<td>Soil pollution</td>
<td></td>
<td>Oil leaks.</td>
<td>Proper waste management and handling of electrical equipment refrigeration oil. Proper training and implementation shall be performed regarding re-fueling and vehicle oil changes.</td>
</tr>
<tr>
<td>Power supply</td>
<td></td>
<td>Short interruptions (&lt; 1 days) for connection activities may happen.</td>
<td>These short power supply interruptions shall be done during times of low power demand and compulsory announced some days in advance by the Contractor with the support of Barqi Tojik.</td>
</tr>
<tr>
<td>Climate change (SF₆)</td>
<td></td>
<td>SF₆, which is used in transformers, is a very highly effective and</td>
<td>Following the technical guidelines for careful handling of SF₆ gas during the construction phase is absolutely necessary in order to avoid SF₆ releases and contributing to climate change.</td>
</tr>
</tbody>
</table>
### Extent of impact:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-3</td>
<td>High negative</td>
</tr>
<tr>
<td>2-2</td>
<td>Medium</td>
</tr>
<tr>
<td>1-1</td>
<td>Negative</td>
</tr>
<tr>
<td>0-0</td>
<td>Low negative</td>
</tr>
<tr>
<td>0</td>
<td>Nil</td>
</tr>
<tr>
<td>+</td>
<td>Locally positive</td>
</tr>
<tr>
<td>++</td>
<td>Regionally positive</td>
</tr>
</tbody>
</table>

**persistent greenhouse gas.**
5.3. Operation Phase (reflected in the design)

Table 5-2: Anticipated Environmental Impacts and Mitigation Measures during Operation Phase of PACKAGE 4.

<table>
<thead>
<tr>
<th>Impact on/of</th>
<th>Extent of impact</th>
<th>Comments</th>
<th>Mitigation Measures to be included in the HSE Management Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil, surface water and groundwater</td>
<td>□</td>
<td>Potential pollution of soil and water due to oil leakage</td>
<td>Proper waste management and handling of electrical equipment refrigeration oil. Proper training and implementation shall be performed regarding re-fueling and vehicle oil changes.</td>
</tr>
<tr>
<td>Electric and magnetic fields</td>
<td>□ for the public □ at the workplace</td>
<td>From experience of similar projects, it can be reasonably assumed that the strength of electric and magnetic fields at the substations will be below the permissible limits at workplaces of 10 kV/m and 500 µT. For relevant standards see Annex 7 and 8</td>
<td>Because state-of-the-art technology is used, specific mitigation actions are not needed (see monitoring measures).</td>
</tr>
<tr>
<td>Climate change (SF₆ gas)</td>
<td>□</td>
<td>SF₆, which is used in transformers, is a very highly effective and persistent greenhouse gas. SF₆ will be used only in small amounts.</td>
<td>In order to minimize SF₆ emissions, the recommendations as given in Annex 13 shall be followed. The installations will be fitted with gas detectors that indicate immediately any leak and the equipment from which SF₆ is emitted. On top of it, the pressure gauge will be check daily in order to detect any gas release.</td>
</tr>
<tr>
<td>Noise</td>
<td>□</td>
<td>Additional noise at substation sites is practically negligible.</td>
<td>N/A</td>
</tr>
<tr>
<td>Fire</td>
<td>□</td>
<td>Oil in the electrical equipment is flammable.</td>
<td>Mobile fire extinguishers should be made available at regular distances.</td>
</tr>
<tr>
<td>Socio-economic aspects</td>
<td>+ + + + + + +</td>
<td>The Project will result in a more reliable power supply in Tajikistan.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
6. Analysis of Alternatives

LOT 1 and PACKAGE 4

For LOT 1 and PACKAGE 4 there were initially two alternatives: execution as planned or ‘no go’ –option. Tajikistan has big problems regarding the common condition of the electric supply system, which is characterized by technically obsolete components, instabiliy of voltage, faults of electric power supply, weak capacity of distribution systems, a low payment level, large losses and high dependency on hydropower which it is at risk due to climate change. That is why ‘no go’ option was not realistic, and it was decided to continue the planning of the Project.

LOT 2

Analysis of alternatives was done for LOT 2.

Main principles applied for the line route:

1) Choosing the line route with environmental protection in mind, avoiding affecting local housing project and plantations.
2) Balancing the new transmission line with constructing, existing or planned transmission lines, roads and other construction project.
3) Sufficiently considering geographical, hydrological and topographical conditions to compose the most sufficient and economical line route.
4) Line route selection avoids natural conservation area, forest, fruit ranch, commercial farm and plantations as much as possible.

At first phase of the Project planning the new OHTL route was supposed to be either parallel to the existing 110 kV line (V-1) or at the same Right of Way replacing the old line (V-2). The second mentioned option was considered not to be viable mainly because current 110 kV line is the only line supplying energy to Penjakent Region and it is not possible to cut off the whole energy supply for a long period.

The first option was also rejected also because the existing line is located for the most parts inside the narrow valley of Zerafshan River in the middle of or very close to houses. Consequently, there is not enough space for a new line to be constructed according to existing standards. Moreover, some areas in the valley are extremely prone to landslides.

The line routing that was used for the Tendering process (V-3) was chosen to be the most suitable from the environmental and social point of view. For example, demolition of houses was avoided completely as well as any resettlement issues.

The Contractor that was chosen for the implementation of the Project, proposed a new route for the OHTL (V-4). For the most part it followed the original line routing (V-3) but in several areas it straightened the route which means in practice smaller amount of angles and, accordingly, less towers. The Project Implementation Consultant proposed some changes on the line route to be considered by the Contractor to avoid as much environmental and social impacts as possible (Alternative V-4+). The Final proposal for route location is only slightly different than option V-4.
In case the LOT 2 is not realized, the main consequences will follow:

- Penjakent and surrounding areas shall be supplied also in the future from the substation Ayni 220 kV with existing 110 kV line constructed in the 1960s without redundancy
- The peak power demand in Penjakent is currently 75 MW surpassing the maximum capacity of the old line (67 MW) causing frequent fluctuating
- The power demand is predicted to increase to 100 MW in the next 3-5 years due to industrial development; this demand cannot be complied with the old line. Therefore, industrial development will be impeded
- Electricity supply in Penjakent will not be as reliable as with the Project; frequent breakdowns of the electrical system will further exist.
7. Information Disclosure, Consultation and Participation

LOT 1 and LOT 2

Together with the public consultations performed between 25th and 28th of July 2014 in the framework of the preparation of the LARP, public meetings were held in the district of Ayni and in Penjakent (list of participants see Table 7-1 and Annex 4). Record of the meetings and site visits is presented in Annex 3.

Table 7-1: Participants of the public consultations in Ayni and Penjakent region in July 2014

<table>
<thead>
<tr>
<th>Location</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zerabad (Dar-Dar, Ayni)</td>
<td>About 20 men in village public meeting place with representative of Jamoat</td>
</tr>
<tr>
<td>Urmetan (Ayni)</td>
<td>Four men (land owners) and representative of Jamoat</td>
</tr>
<tr>
<td>Serazm (Panjakent)</td>
<td>Five men and nine women with representative of Jamoat</td>
</tr>
<tr>
<td>Kushteppa (Kahilfa Hasan,</td>
<td>Six men and 15 women with representative of Jamoat and private</td>
</tr>
<tr>
<td>Panjakent)</td>
<td>farmer’s chairperson</td>
</tr>
<tr>
<td>Zudhzina (Panjakent)</td>
<td>Seven men and one women plus Jamoat leader and farmer’s representative</td>
</tr>
<tr>
<td>Gusar (Loikh Sherali, Panjakent)</td>
<td>Five family farm representatives of probably affected area and Jamoat</td>
</tr>
<tr>
<td>Margedar (Rudaki)</td>
<td>Jamoat leader and representative of farmers</td>
</tr>
</tbody>
</table>

The project was communicated to the people potentially affected. The participants of the meetings were asked for any complaints concerning environmental issues related to the project. No complaints were raised neither because of needed truck movements, nor because of aesthetic issues or because of electric and magnetic fields.

In general, the problem of clean drinking water was raised and one village complaint about the waste dumping situation. The dirt and smoke from burning waste was described being very annoying some time.

End of July also meetings with stakeholders have been performed. The Head of Public Utilities and First Deputy Chairman of the City of Penjakent lined out that a waste landfill site (with 22 ha square) is suitable for the disposal of the solid waste generated by the workers and resulting from construction debris (bags, wood debris, and etc.). During the meeting it was agreed that a relevant agreement should be made before start of the construction.

At the present time (2014), according to the Director’s Order No. 185/5 as of 5 March 2014 of the ‘Hojajii Manziliyu Kommunali’ (Public Utilities Service) under the Government of the Republic of Tajikistan, the cost of 1 m³ transportation and placing at the landfill sums up between 56 and 66 TJS.

At the moment (2014), there are no available metal waste processing enterprises in Panjakent and Ayni. It is proposed to transport the metal scrap to Dushanbe or Khujand. As
scrap stocked, the bidding can be announced and if there is sufficient quantity the metal scrap can be purchased from the site.

Usually old oil will be refined by Barqi Tojik and reused elsewhere.

Concerning the location of the Zerafshan Conservation Area nearby Penjakent a meeting with the Director of Forestry and with Mr. Inoyatov U.M., Head of Penjakent Rayon Environment Protection Department was held. Following his information, the power transmission line will not touch any part of Zerafshan Nature Reserve.

The accurate location of the Soy Vota conservation area close to Urmetan could not be determined. A meeting was held with the Head of Ayni Rayon Environment Protection Department and Forestry Department concerning this issue. Afterwards, an official letter of the Director of the Forest Department Ayni was issued, stating that the Reserve will not be affected by the transmission line corridor (see Annex 2). This was discussed and confirmed at a field visit on 1.9.2014 with representatives of ADB (Nurlan Djenchuraev and Vergel M.Medina) and the director of the Forest Department (M. Koriev, together with Hikmat Dzhunaydovich and Turokulov Nazar).

Photo 7-1: Meeting with First Deputy Chairman of the City of Penjakent

Photo 7-2: Meeting with the Head of Environment Protection Department at Penjakent

Photo 7-3: Meeting with representatives of the population in a Jamoat of Panjakent Rayon

Photo 7-4: Interview of concerned farmers in Zerafshan
Face to face public consultations could not be performed since in July 2020 there were in place quarantine measures imposed against the spread of COVID-19 coronavirus. The composed information leaflet and an explanatory letter from the PMU were sent to the heads of district environmental protection departments by e-mail through the Environmental Protection Committee under the Government of the Republic of Tajikistan.

The chief specialist of the PMU Department for Monitoring of the Environmental Protection, Mr. Kholov Aziz, hold a meeting with Mr. Khalilov Daller, a representative of the Committee for Environmental Protection under the Government of the Republic of Tajikistan in order to share the information regarding the project and its environmental aspects and arrange the distribution by e-mail of the two mentioned documents. See picture below. The two documents can be found in Annex 13.

Photo 7-5: Chief specialist of the Department for Monitoring of the Environmental Protection of the PMU Mr. Kholov Aziz during the dispatch of information leaflet with a representative of the Committee for Environmental Protection under the Government of the Republic of Tajikistan Mr. Khalilov Daller.
8. Grievance Redress Mechanism

LOT 2

Great care is taken to prevent grievances. This has been done so far through careful land acquisition (LOT 2) design and implementation, by ensuring full APs participation and consultation, and by establishing extensive communication and coordination between the community, the PMU and the local governments also regarding general environmental issues. This notwithstanding, complaints are sometimes unavoidable and a grievance mechanism has been established for the project to allow the APs the opportunity to appeal against any disagreeable decision, practice or activity arising from compensation/rehabilitation process. Efforts to make APs fully informed of their rights and of the procedures for addressing complaints will continue during civil works.

Complaints and grievances can be addressed through the following steps and actions:

First Step:
One joint Project Grievance Redress Committee for both concerned Hukumats has been established. It includes two members of the affected community (including AP’s and non-APs), one representative of each concerned Jamoat and one representative of each of the two Hukumat Land Councils, to be chaired by one of the two Hukumat representatives (to be agreed upon internally by the two Hukumats). Grievances must be heard and resolved within 14 days of submission of the complaint.

Second Step:
If the Project Level Grievance Redress Committee is not able to resolve the grievance within a 14-day period, the complaints should be presented via the BT Rayon representative to BT PMU at a central level. The elected representatives of the AF will have the opportunity to mediate by providing their written comments and proposals to the PMU. A final decision will be made by the Director of the PMU after the assessment of the case and a careful preparation of the decision by the PMU resettlement representative. Grievances must be heard and resolved within 7 days of submission of the complaint.

Third Step:
If no solution is reached within 14 days at BT PMU level, the APs can further submit their case to the appropriate court of law.

According to Tajik law, taking the case to court can be related only to the valuation of the losses and the determination of the level of compensation (payment). The question of the expropriation for the construction of a OHTL itself is not negotiable and a case in court cannot delay construction work.

While applying the Grievance Redress Mechanism, APs can seek support from the BT PMU resettlement representative who on his part might be assisted by the national and international consultants. The contact addresses/phone numbers will be available at the level of each concerned Jamoat.

LOT 1

First Step:
The complaints should be presented via the BT Rayon representative to BT PMU at a central level. The elected representatives of the APs will have the opportunity to mediate by providing their written comments and proposals to the PMU. A final decision will be made by the Director of the PMU after the assessment of the case and a careful preparation of the decision by the PMU resettlement representative. Grievances must be heard and resolved within 7 days of submission of the complaint.

Second Step:
If no solution is reached within 14 days at BT PMU level, the APs can further submit their case to the appropriate court of law.

PACKAGE 4
The involved steps and time periods are as follows:
9. Environmental Management

9.1. Mitigation Measures

Mitigation measures for potential environmental impacts are presented in the Environmental Management Plan (Annex 11). Waste electrical equipment will include: electrical equipment (transformers, switches, circuit breakers).

Electrical equipment containing oil: waste oils will be analyzed for hazardous characteristics as PCB/POPs.

Device for analyzing hazardous waste will be procured and supplied by the Contractor and will be handed over to the Employer after the completion of turnkey contract. Since the contractor bears responsibility for waste analysis, the procurement and supply of device for analysis shall be done by the Contractor.

Electrical equipment not containing oil will:
(i) Be dismantled for spare parts for future use;
(ii) If not usable, spare parts will be handed over for processing as scrap metal


9.2. Monitoring Plan

Monitoring measures during the Project execution are presented in Monitoring Plan (Annex 11).

9.3. Contractor’s Health and Safety (H&S) Obligations

9.3.1. General H&S Targets and Objectives

The Health and Safety (H&S) targets for the Project (LOT 1, LOT 2, PACKAGE 4) are:

- zero accidents,
- no hazardous situations to the environment and public;
- no harmful spills to the environment,
- the promotion of welfare and health issues,
- the development of a sound working environment; and
- the integration of the local community.

Considering the defined H&S targets, the H&S objectives for the Project (LOT 1, LOT 2, PACKAGE 4) are:

- to design overhead lines and substations that are intrinsically safe,
- a healthy place to work in and have an as low as reasonable practicable impact on the environment;
- to execute the erection, construction and commissioning and to initiate the start-up of the overhead lines and substation operation without health or environment related incidents and to form the
basis for a safe operation and maintenance;
- to execute works (LOT 1) without health or environment related incidents and to form the basis for a safe operation and maintenance;
- to comply with the applicable laws and regulations.

9.3.2. Comparison of International Best Practices vs. National Regulations

ADB Safeguard Policy Statement requires application of pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards. The SPS states that when the host country regulations differ from these standards, the more stringent ones are followed.

Tajikistan has not clearly developed and officially approved national standards, and therefore, the environmental authorities use the standards, developed in the Soviet period, or by the documents accessed by the energy department of the CIS countries' Secretariat. For example, according to SanPiN 2971-84: "Sanitary norms and rules of population protection from the effects of the electric field generated by OHL, alternating current of industrial frequency", developed by the Ministry of Health of the USSR, and approved by the Chief State Sanitary Doctor of the USSR in 23.02.1984 and added to the database in 01.09.2013 it states, that "The protection of the population from the effects of electric fields of overhead power lines of 220 kV and less, which meets the requirements of the Regulations and Rules for Electrical protection of high-voltage electricity networks, it is not required."

In accordance with these documents, the permissible noise level on the territory, close to residential buildings should not exceed 45 dBA at night and 55 dBA during the day. Allowable Voltage of electrical field, generated by transmission lines (220 kV) is, should be generally not more than 5 kV/m, for a dwelling house - 1.5 kV/m.

International Commission on Non-Ionising Radiation Protection has given Reference levels for occupational exposure (10 kV/m) and general public exposure (5 kV/m). European Union has given the same value (10 kV/m) for occupational exposure and German State Order Bundesimmissionsschutzverordnung) the same value (5 kV/m) for general public exposure for 24 hours/day.

IFC Guidelines for noise levels for Residential, Institutional and Educational receptors are 55 dBA (07-22.00) and 45 dBA (22.00-07.00) (one hour LAeq dBA). For Industrial and Commercial receptors, the limit is 70 dBA (00.00-24.00). Both IFC and national standards are comparable: 45 dBA and 55 dBA for night time and day time respectively, and any of those can be used in the project.

9.3.3. H&S Organization

In order to reach the general objectives given below, the Contractor shall develop, implement and operate a Health and Safety Management System (HSEMS). This HSEMS is based on the generally existing H&S policy and goals of the Contractor and on an H&S Management Plan that has to be specifically developed to this Project by the Contractor. This plan shall give all measures how to meet the outlined H&S targets and goals.

The Contractor shall determine persons being responsible for all H&S issues on all construction site(s). These H&S officers in charge shall prepare monthly records of all H&S relevant incidences (e.g. worker's fatal and non-fatal accidents), and keep an employment record giving name, age etc. of employed workers. The H&S officers will be responsible for keeping a high health and safety standard at the construction sites as wearing helmets, providing workers with ear protection devices, ensure that workers
are belted while working at height etc. They will also be responsible for regularly teaching of workers in first aid, how to work under high voltage etc. These H&S officers will also take care that all sub-contractors follow this good H&S practice at the construction site(s). A monthly report shall be prepared and submitted to the PMU.

Following key tasks shall be considered by the contractor in order to meet the targets and objectives as defined above:

- build up an H&S team with all project team members as part of coordination meeting(s);
- perform H&S training presenting all relevant governing documents and applicable legislative requirements related to H&S;
- implement measures to meet all risk acceptance criteria and H&S objectives defined for the OHTL and Substation project;
- implement H&S requirements in all requisitions/subcontractors,
- implement H&S requirements in all supply contracts,
- set-up and maintain H&S evaluation and decision making system;
- define and implement all H&S permit requirements;
- implement an office safety and clean desk policy;
- prepare an emergency preparedness and response plan.

The main focus of H&S during construction is the preparation and consideration of a site-specific H&S plan to be prepared by the Contractor and to be submitted to the Employer for approval prior to mobilization. This H&S plan shall:

- consider the H&S targets and objectives defined above;
- cater for the full scope of Contractor’s work, including what is done by his subcontractor;
- provide all procedures required for performing H&S tasks that are inherently harmful and/or hazardous, e.g. performing excavations and trenching, confined space entry, work at heights, lifting/hoisting operations, working with hazardous, dangerous or flammable material or goods, working under high voltage etc.

Any deviation to the H&S requirements must be reported in writing to the Employer for approval. The Contractor shall be responsible for promoting H&S awareness among his employees as well as those of his subcontractors, suppliers, visitors, and persons delivering materials and equipment.

9.3.4. Specific H&S Requirements during Construction (Work and Public Safety)

The following requirements are the minimum requirements for LOT 1, LOT 2 and PACKAGE 4 with respect to H&S at the construction site. The employer shall have the right to extend these H&S requirements in case of the needed actions to fulfill the H&S targets and objectives:
Regarding the influx of construction workers, specific attention shall be paid to COVID-19 virus and Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular. A COVID-19 management plan shall be developed including measures such as being compulsory for all the workers to wear face masks while working in the substations and travelling to them, doing their best to practice a social distancing of 2 meters and frequent hand washing or use of hand sanitizers. The face masks and hand sanitizer will have to be provided to the workers by the Contractor. An awareness program shall be developed and communicated to all workers. This program might also include the provision of condoms for all site staff and labor as appropriate and provide an STI and HIV/AIDS screening, diagnosis and counseling.

The Contractor’s approved H&S plan will be the only applicable and valid H&S plan at site outlining and specifying details regarding H&S. Separate subcontractor or supplier’s H&S company policies, H&S management systems or H&S plans are not acceptable at site.

No personnel or employees are allowed to perform works, tasks or operations which they are not specifically trained and certified to perform. All works will be subject to work permits. No works are allowed to perform without an applicable and valid permit to work.

At arrival of any personnel on site the Contractor shall secure that they have or will get the required training / certification before any works, tasks or operations are assigned.

The Contractor shall ensure that his own, his subcontractors’ and suppliers’ personnel at all times follow all site specific H&S rules and requirements whenever they are present on site.

The Contractor shall ensure that first aid kits including "eye washers" are available at all work locations and that first aid kits are complete at all times. The Contractor shall ensure that at least one defibrillator will be available on each construction site.

If applicable, the Contractor shall inform himself about the potential presence of poisonous animals and take all required precautions to avoid accidents.

The Contractor shall ensure that his personnel have passed an elementary first aid training including cardiac arrest treatment.

The Contractor shall ensure that safety goggles are handed out and worn by all employees or personnel at all times at working places. Hard hat, safety footwear, working gloves and protective outer clothing suitable for the local climate conditions shall be worn at all working locations. Hearing protection shall be worn in all areas with noise levels at or above 80 dB(A).

All electrical hand tools, extension cables, transportable generators, other non-permanent electrical equipment etc. shall undergo short circuit checks by a certified and registered electrician minimum per every three (3) months, prevailing national or international rules.

Use of drugs and alcohol are strictly prohibited when working or being present on site. Personnel reporting for work that are under the influence of alcohol and/or drugs shall be denied access to site. In such cases, the Employer expects the Contractor to intervene with appropriate measures according to Contractors’ terms of employment in order to prevent recurrence. However, the Employer reserves the right to deny continued access to site to such person(s)
without further notice if the site safety and security in any way otherwise is felt threatened.

In order to fulfil the health and safety tasks and the environmental requirements given in this EMP the contractor has to set up an overall Health, Safety and Environment Management Plan (HSEMP) and implement a Health, Safety and Environment Management System (HSEMS) consisting of the relevant Policy and Team. Such a system includes beside health and safety issues also environmental needs.

More information of specific health hazards are given in Annex 5 (Sulfur Hexafluoride), Annex 6 (Electric and Magnetic fields), Annex 7 (Standards for Electric and Magnetic fields), Annex 8 (ICNIRP Guidelines and Statements), Annex 9 (Biological and Health effects of Electric and Magnetic fields) and Annex 10 (PCB).

**COVID-19**

**COVID-19 (Coronavirus) shall be taken into account on every occasion. The guidance of ADB and World Health Organization should be noticed. Special guidance can be found e.g. from Internet pages maintained by FIDIC (https://fidic.org/COVID-19).**

Basic rules to avoid the spreading of Coronavirus are

- avoid face-to-face meetings and large groups
- practice social distancing (2 m)
- use face masks, wash hands regularly or use hand sanitizer frequently
- clean/sanitize your working environment

As for the potential COVID-19 impacts, the contractor needs to include specifications to the HSEMP (Health, Safety and Environment Management Plan). The provisions may include the following:

- **How to protect from the virus?** Stay home if you have respiratory symptoms (coughing, sneezing, shortness of breath) and/or a temperature above 37.0 C; Leave work if you develop these symptoms while at the workplace; Wash hands often with soap and water for at least 20 seconds or use an alcohol-based hand sanitizer; Shield coughs and sneezes with a tissue, elbow, or shoulder (not the bare hands); It’s sensible to avoid shaking hands entirely to reduce the risk of spreading infection. If there is a meeting, provide room to allow attendees to sit or stand at least six feet/ 2 meters away from others.

- **When to exclude workers or visitors from the workspace?** Public health organizations recommend that companies bar employees or visitors from coming to the workplace for a period 14 days after a “medium” or “high-risk” exposure to the virus — generally meaning having been in close contact with someone who is known to be infected, or having traveled from a high-risk region; Dedicated staff often resist taking sick days, instead dragging themselves into work where they may infect others. Given the threat this epidemic presents, managers shouldn’t hesitate to send employees who present Covid-19 symptoms home.

- **Revising benefits policies in cases where employees are barred from the work site or it is closed?** The likelihood that increasing numbers of employees will be unable to work either because they are sick or must care for others means that companies should review their paid time off and sick leave policies now. Policies that give employees confidence that they will not be penalized and can afford to take sick leave are an important tool in encouraging self-reporting and
reducing potential exposure; Companies should promulgate clear policies on this now and communicate about these with employees.

- **Maximize the employees’ ability to work remotely?** While many jobs (retail, manufacturing, health care) require people to be physically present, work, including meetings, that can be done remotely should be encouraged if coming to work or traveling risks exposure to the virus. Videoconferencing, for instance, is a good alternative to risky face-to-face meetings.

- **Have reliable systems for real-time public health communication with employees?** Dangerous rumors and workers’ fears can spread as quickly as a virus. It is imperative for companies to be able to reach all workers, including those not at the worksite, with regular, internally coordinated, factual updates about infection control, symptoms, and company policy regarding remote work and circumstances in which employees might be excluded from or allowed to return to the workplace; These communications should come from or be vetted by the emergency response team, and they should be carefully coordinated to avoid inconsistent policies being communicated by different managers or functions.

- **Postpone or cancel scheduled conferences or meetings if there is an epidemic on?** Yes. There is mounting evidence that social distancing can delay the epidemic and potentially save lives, so most meetings and conferences should be converted from in-person to virtual; If you have a meeting, discourage hand-shaking and assure that proper handwashing facilities (and/or hand sanitizers) are easily available.

**9.4. Institutional Arrangements and Reporting Needs**

The construction contractor is obliged to implement the ESMP (LOT 1, LOT 2, PACKAGE 4). Doing so, he shall set up a Health, Safety and Environmental Management Plan (HSEMP) and install a Health, Safety and Environmental Management System (HSEMS) during the entire construction period covering all construction sites and all construction activities. The Contractor should have internal HSE Specialists nominated for the Project.

The ‘Social Sector and Environmental Monitoring Department’ within the PMU as a governmental establishment will be responsible for supervising and monitoring the implementation of the ESMP by the Construction Contractor (CC).: For that, the PMU shall perform field visits about twice a month. The PMU is supported by the Project Implementation Consultant (PIC) including international and local Environmental and Social Specialists to supervise the implementation of the Project.

The CC will prepare monthly progress reports about the implementation of the ESMP. Based on these reports and own field visits the PMU shall prepare and submit to the PMU monthly Safeguard Monitoring Reports showing the progress of the implementation of the Environmental and Social Management Plan (ESMP). The reports shall contain all discrepancies from the ESMP and list all HSE relevant incidents and accidents that occur during the implementation of the Project.

Separate report will be prepared by Contractor on inventory results of electric equipment containing oils to be analyzed for hazardous component (as PCB/POPs) and then submitted to PMUES/PIC.

Based on these reports the Social Sector and Environmental Monitoring Department of the PMU will prepare semi-annual safeguard performance and monitoring reports and submit them to ADB, to Barqi Tojik and to other relevant national authorities. In doing
so, the PMU will be supported by the Project Implementation Consultant (PIC).

9.5. **Training Requirements**

As discussed in previous sections the Government of the Republic of Tajikistan set up the ‘Project Management Unit for Elektro-Energy Sector’ (PMU) in order to implement projects. Within this PMU the Social Sector and Environmental Monitoring Department has been established.

Specific training needs related to previous works under this Project (LOT1 and LOT2) have been fulfilled during the previous Project phases. For PACKAGE 4, the Contractor shall organize special training to the workers on Project specific HSE issues such as first aid and oil spills, including training on COVID-19.

9.6. **Budget for implementation of Environmental Management and Monitoring plan**

The costs of implementation of the mitigation and monitoring measures stipulated in the ESMP are included in Project’s overall budget (LOT 1, LOT 2, PACKAGE 4).
10. Conclusion and Recommendations

Ann Environmental and Social Management Plan (ESMP) including mitigation and monitoring measures has been developed for the Project. This ESMP shall be part of the tender documents and the implementation of the ESMP shall be supervised by the future Project Implementation Consultant and the PMU.

In summary, from the results of the assessment it can be seen that the Project will have only low site-specific environmental and social impacts if the proposed mitigation measures are implemented.

The original Category of the Project was preliminary assessed to be Category B. Based on the findings in the original Initial Environmental Examination\(^7\) and revised versions of the IEE, it can be concluded that Project’s 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. Metering Project as such (LOT 1), including additional metering works (PACKAGE 4), can be classified to be a Category C Project. Thus, the classification of the whole Project remains in Category B. A full Environmental Impact Assessment is not needed.

11. Annexes
Specially Protected Natural Areas
This Act was signed by President of the Republic of Tajikistan on 26 December 2011 №786. Present Law on Specially Protected Natural Areas stipulates the legal, institutional and economic frameworks for protected areas, their tasks, mode of operation and zoning.

Depending on the creation purposes, the characteristics of the protection regime and usage, the following categories of protected areas shall be established:
- State natural reserves;
- State parks;
- Nature reserves;
- State zoological parks;
- State nature monuments;
- Ecological and ethnographic zones;
- Arboretums and botanical gardens;
- natural spa, therapeutic and recreational areas.

Specially protected natural areas are the exclusive property of the state, and the state guarantees their effective use in the interests of the people.

The actions directly or indirectly violating the rights of state ownership of the protected areas are prohibited.

For violation of this Act individuals and legal entities shall be liable in accordance with the laws of the Republic of Tajikistan

Environmental Monitoring Law
The given Law No. 707 was signed by the President of the Republic of Tajikistan on 25 March 2011. The Environmental Monitoring Law specifies organizational, legal, economic and social framework for environmental monitoring in the Republic of Tajikistan and governs the relations of the public authorities, local governments of the towns and villages, public organizations and citizens in the sphere.

In accordance with Article 12. Environmental Monitoring Subjects Duties and Responsibilities, the environmental monitoring subjects in relation to their sites included to the National Register of Environmental Monitoring of the Republic of Tajikistan are obliged to:
- From the own funds initiate and implement local monitoring of the human impact sources on the natural environment;
- Ensure the creation of the material and technical base required for the environmental monitoring;
- Carry out local monitoring using tool and means prescribed by the legislation procedures for the measurements unity ensuring;
- Identify officials responsible for the local environmental monitoring; provide training in accordance with the qualification requirements;
- Submit mandatory data on the local environmental monitoring to the state agency authorized for the environmental monitoring arrangement and implementation and local governments for free and in a timely manner and prescribed scopes.

2. The local environmental monitoring is carried out by the natural resources users or entities engaged by them in accordance with the programs (the regulations) requirements developed and agreed with the state agency authorized for the environmental monitoring arrangement and implementation.

3. The organizations and individual entrepreneurs whose activities are related to the natural resources use or risk of the environment negative impact will arrange and carry out the environmental monitoring as stipulated by the legislation.

Ecological audit
Present Act was signed by President of the Republic of Tajikistan in March 25, 2011 №785. Present
Act defines environmental auditing principles and procedures for environmental audit in the Republic of Tajikistan in order to prevent the harmful effects of administrative, economic and other activities on the environment, life and health of the population of the Republic of Tajikistan.

**Tasks and purposes of ecological audit**

Basis of the environmental policy strategy of the economic entity;
prioritizing the environmental plannings of business entity, identification of additional opportunities for its implementation;
- verification of compliance with the business entity laws on environmental protection;
- improving the efficiency of the impact of an economic activity on the environment controlling;
- reduction of the emergencies risks related to environmental pollution.

**Environmental auditing types**

1. Proactive and mandatory types of environmental audit can be established in the Republic of Tajikistan.

2. Proactive environmental audit to be conducted by an environmental audit firm or auditor engaged in entrepreneurial activities without forming a legal entity based on the economic entity resolution.

3. Mandatory environmental audit to be conducted by an environmental audit organization based on the resolution made by state authorities.

4. The procedure for appointment of mandatory environmental audit are determined by the Government of the Republic of Tajikistan.

Following the recommendations of EIA, the effect of this law can be extended to the 220 kV "Ayni - Panjakent" OHL construction project.

**Ecological Information Law**

The given Law No. 705 was signed by the President of the Republic of Tajikistan on 25 March 2011 and specifies organizational, legal, economic and social framework for environmental information provision the Republic of Tajikistan and promotes the rights of individuals and legal entities to obtain complete, accurate and timely environmental information and regulates relations in the given sphere. Present law stipulates the environmental information types and main sources, public environmental information resources formation and maintenance procedures, provision of environmental information to individuals and legal entities, that are non-governmental agencies or other government agencies, including:

1. The general environmental information will be provided to the individuals and legal entities by the environmental information insiders (holders) that are not public authority or other government agency (hereinafter - the Applicant), upon the request and free of charge, unless otherwise provided by Tajik legislation.

2. The general environmental information will be provided to the Applicant by the environmental information insiders within ten days from the Application receipt date.

3. Requirements for the general environmental information application are prescribed by Tajik legislation.

4. The general environmental information will be provided in the format, scope and content specified in the application for the provision of general environmental information, and, in case of insufficient technical resources, the environmental information owner will provide the information in the in the existing format and scope, indicating the relevant reasons.

5. If the owner of the requested general environmental information is a legal entity that is not a public authority or other government agency, then the public authority or other government agency in whose address the Application was received and are competent to meet this application shall request needed information from the environmental information insider within ten days from the Application receipt date, with the written notice to the Applicant.

6. Upon the request from the public authority or other government agency to provide general environmental information referred to in Paragraph 5 of this Article, the environmental information insider shall provide the requested information within ten days from the receipt date or notify the
Applicant on refusal in its provision specifying the reasons for such denial within five days upon the receipt request in accordance with the Tajik legislation and international legal acts recognized by Tajikistan.

7. A public authority or other government agency, received the general environmental information in accordance with Part 6 of this Article had, will provide this information to the Applicant within one month from the Application receipt date. In case of the refusal notification receipt from the environmental information insider to provide the environmental information, a public authority or other government agency shall notify the Applicant and specify the reasons for the refusal within five days of the refusal receipt.

8. If compliance with the Application for general environmental information is not a responsibility of the public authority or any other government agency, the Application should be transferred to other public authority or government organization, competent to comply the Application notifying the Applicant within five days from the Application receipt date.

9. In case if the requested environmental information relates to the specialized environmental information type, the environmental information insider shall offer the Applicant to enter into the contract to provide specialized environmental information within five days of Application receipt date.

10. If there are grounds for refusal to provide environmental information stipulated by Tajik legislation and international legal acts recognized by Tajikistan, the environmental information insider notify the Applicant in writing within five days of the refusal to provide environmental information indicating reasons for refusal, explaining the procedures and decision appeal period.

Special Features for Providing Environmental Information to Public Authorities and Government Agencies

1. The general environmental information will be provided to public authorities or other government agencies by the environmental information insider in accordance with the Tajik legislation upon the request, through the information exchange or distribution.

2. The specialized environmental information will be provided to the public authorities free of charge, unless otherwise provided by the Tajik legislation. To other government agencies the specialized environmental information will be provided as per prescribed order and as specified in Article 11 of the given Law PesDMe: Following the recommendations of EIA, the effect of this law can be extended to the 220 kV "Ayni - Penjakent" OHTL construction project.

Additionally:
The Act regulates the establishment, powers and activities of local governments:
- defines the powers of local government. Local government agency and the executive of cities and regions is the Chairman of the city (district), being the representative of the President of the Republic of Tajikistan.
- defines the powers of Majlis deputies, which includes the approval of the city budget, local taxes and tax collection, regulation of water consumption, use of land and other natural resources within its powers
- defines the powers of the President of the city (district) that includes the heads of enterprises, organizations and institutions under the jurisdiction of the city, and the responsibility for the activities of sanitary-epidemiological protection of the city inhabitants.
- defines the fees that local public authorities may impose, which may also include payment for the removal of waste and measures for environment protection

The law regulates issues related to waste management. The Act contains the definition of waste types, including consumer waste, recycled materials, municipal solid waste and hazardous waste.
Article 5 defines the powers of the state executive agency for the field of waste management. So, the competent authorities is the State Committee for Environmental Protection under the Government of the Republic of Tajikistan, as determined by its provisions approved by the Government of Tajikistan.

Powers of state executive authorities in the management of MSW defined in Articles 5 and 6 and, in particular, include:
- State control
- Monitoring and supervision of the state of the environment
- Licensing of hazardous waste management
- The development of government regulations on waste management
- Implementation measures in the aftermath of disasters and accidents related to waste management
- Waste inventory management
- Organization of decontamination and waste disposal with the restoration of the damage caused to the environment on their cost
- Creation of economic and social motivations for waste use by individuals and legal persons.

Law of RT “Certain type of activities licensing”, no. 37 dated 17.05.2004
According to Article 17 of the Act and Article 8 of the Law of RT "On industrial waste and consumption waste", activities for the hazardous waste management shall be licensed by an authorized state body.
Hazardous waste is defined as a substance having one of the following properties:
- Toxicity;
- Infectious;
- Danger of explosion;
- Flammability;
- The high reactivity.

The authority for licensing activities for the hazardous waste management is the Committee of Nature Protection of the Republic of Tajikistan and its organs. Licensing is carried out in accordance with law and regulation of "Hazardous waste management licensing" dated 6.06.2003. This procedure requires the submission of documentation and cost estimation for each stage. The procedure is performed by above committee, but in certain cases, judgment is required to be provided by state authority on sanitary-epidemiological control.

This law establishes the legal, institutional and economic framework, the measures related to the provision of sanitary-epidemiological safety of the population. The law defines the regulatory role of the government for ensuring sanitary and epidemiological rules and defines the organization and structure of the sanitary and epidemiological surveillance.

- Article 21 The law establishes the sanitary and epidemiological requirements for the collection, use, processing, transportation, storage and disposal of industrial and domestic waste environment for human habitation, flora and fauna, conservation and improvement of the purity of air, the establishment of state control over the use of air in the cities and industrial centers and other settlements points, sources of air pollution, as well as strengthening the rule of law in this relationship for the benefit of present and future generations
ANNEX 2: Statement of Forest Department Ayni on the Soy Vota Reserve
Statement of forest department Ayni on the Soy Vota Reserve
Agency on foresting under the Government of the Republic of Tajikistan

№ 108
14.08.20014

To the “State Enterprise of Project
Management Unit on Energy Sector”

We inform you that the 220 kV transmission line project “Ayni-Rudaki” is located in the border of Ayni and Panjakent districts along the river Zarafshon and in the area of Vota, Yovon villages to the reserve of Soy- Vota has no relations to its area and do not harm the reserve.

Director: Kh. Qoriev
## ANNEX 3: Record of Meetings and field visits in 2014

<table>
<thead>
<tr>
<th>Date</th>
<th>Agency/ Institution</th>
<th>Place</th>
<th>Name of Person consulted</th>
<th>Reason for Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>08./09.06. 2014</td>
<td>Field trip</td>
<td>Line routing between Panjakent and Ayni</td>
<td>Bobboev Gurezi Rahmatovich Inspector</td>
<td>Localization of section with possible environmental problems</td>
</tr>
<tr>
<td>25.-28.07. 2014</td>
<td>Environment Protection Department of Panjakent</td>
<td>Panjakent</td>
<td>Khalilov Sharaf Head of Department</td>
<td>Location of Zarafshan Reserve</td>
</tr>
<tr>
<td>25.-28.07. 2014</td>
<td>Environment Protection Department of Ayni</td>
<td>Ayni</td>
<td>Nurali Saidov (Phone call)</td>
<td>Location of Sayvatin Reserve</td>
</tr>
<tr>
<td>25.-28.07.2014</td>
<td>Committee for Environmental Protection</td>
<td>Dushanbe</td>
<td>Director of Committee for Environmental Protection</td>
<td>Maps of Zarafshan Preserve and Sayvatin Reserve in Panjakent and Ayni District</td>
</tr>
<tr>
<td>01.09.2014</td>
<td>Field trip</td>
<td>Soy Vota Nature Reserve</td>
<td>Director of the Forest Department (M. Koriev, together with Hikmat Dzhunaydovich and Turokulov Nazar)</td>
<td>Confirmation of the exact location of the Reserve</td>
</tr>
</tbody>
</table>
ANNEX 4: List of participants public consultation in Zerabad (Dar-Dar, Ayni)

Men
1. Murodov Amin
2. Arbobov Ashur
3. Bekmurodov Elmurod
4. Giyasov Shujoatdin
5. Zokirov Sobir
6. Usmonov Usmonbek
7. Tursunov Jura
8. Ashurov Arbobniyoz
9. Solehov Zavqibek
10. Hydarov Aliqul
11. Mirov Abduquvays – 92 749 77 57

Women
12. Huseynova Ohista
13. Hozirova Niyozbibi
14. Niyozova Risolat
15. Izatulloeva Gulnora
16. Ikromova Uguloy
17. Ismatova Guli
18. Hojaqulova Niyozjon
19. Nurova Odinajon
20. Jobirova Odinajon
21. Ikromova Subhigul
Sulfur hexafluoride (SF₆) is used within Gas Insulated Substations (GIS) substations. This gas is an effective gaseous dielectric that allows the safe transmission and distribution of electricity. SF₆ provides excellent insulation and arc quenching performance. SF₆ gas itself is an inert gas, which has no influence on humans, animals or plants. However, as a result of the electric arc, extremely small traces of agents detrimental to health may be formed.

On the other hand, SF₆ is a very highly effective and persistent greenhouse gas (substances absorbing infrared). One ton of SF₆ corresponds to about 23,900 tons of CO₂. Once emitted into the atmosphere it lasts more than 3,000 years (!) until SF₆ is disintegrated by energy-rich UV radiation.

Up to now, the effects of SF₆ in the atmosphere are minor compared to other industrial greenhouse gases. The total worldwide quantitative contribution to global warming of SF₆ is below 0.1% with respect to the other man-made greenhouse gases. However, actually the SF₆ concentration in the atmosphere is increasing (an exponential increase in the late 90ties and a slight decrease since beginning of this century is reported) which requires consequently specific careful handling with this substance.

Some guidelines for proper handling of SF₆ are given below:

- **DIN EN* 60376** ‘Specification of technical grade sulfur hexafluoride (SF₆) for use in electrical equipment’
- **DIN EN 60480** ‘Guidelines for the checking and treatment of sulfur hexafluoride (SF₆) taken from electrical equipment and specification for its re-use’
- **IEC 62271**: High-voltage switchgear and controlgear - Part 303: Use and handling of sulphur hexafluoride (SF₆)

The amount of SF₆ emitted during the operational phase by GIS stations will be absolutely minimized if:

- **Best Available Technique (BAT) is used**;
- **The guidelines mentioned above are followed**;
- **The recommendations of the International Council on large Electric Systems (CIGRE: SF₆ Task Force: Handling and given Recycling of SF₆ Mixtures) is taken into consideration** (www.cigre.org);
- **ISO 14040 is followed**;
- **Detectors indicate immediately any leak from which SF₆ will be emitted**.
ANNEX 6: Electric and Magnetic Fields

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

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

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

In Annex 10.12 some results of recent scientific researches concerning biological and health effects of electric and magnetic fields are given. Annex 10.10 describes internationally used standards and limit values and in Annex 10.11 an excerpt is given about the guideline of the internationally accepted International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Regarding the project, it has to be stated very clearly that the selected design of the proposed GIS indoor substations is directed to reduce electric and magnetic fields to an absolute minimum. Through their metal-clad construction, GIS substations effectively shield the electrical field from the surroundings. Thus, the electrical field outside GIS substations is practically negligible. There is no exceedance of electric and/or magnetic field expected, as discussed in the Annexes. 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 settlements are closely bypassed and within high voltage substations for workplaces.
ANNEX 7: Internationally Used Standards/Limit Values for Electric and Magnetic Fields

<table>
<thead>
<tr>
<th>Source</th>
<th>El. Field strength [kV/m]</th>
<th>Magn. flux density [µT]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICNIRP recommended 50/60 Hz (see Annex 10.11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference levels for exposure to time-varying electric and magnetic fields (unperturbed r.m.s. values)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>occupational exposure</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>general public exposure</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Limit values according to the European Directive 2004/40/EC exposure of workers</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Limit (r.m.s) value as per 26, BImSchVer 12/96 general public up to 24 hours /day</td>
<td>5</td>
<td>100</td>
</tr>
</tbody>
</table>

r.m.s. = root mean square (value)
ICNIRP=International Commission on Non-Ionising Radiation Protection, BImSchVer=German Bundesimmissionsschutzverordnung.

In countries of the former USSR a formula is used to calculate the exposure time of workers that is:

\[ T_{[hrs]} = \frac{50}{E} - 2 \]

\[ E = \text{electric field [kV/m]} \]

That means that the exposure time in an electric field of 25 kV/m is 0 hrs. Working in an electric field of 25 kV or more is not allowed without special protecting clothing. This formula is used in Tajikistan.

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 10.

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.
ANNEX 8: ICNIRP Guidelines and Statements (Extract). Guidelines for Limiting Exposure to Time-varying Electric, Magnetic & Electromagnetic Fields

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

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

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

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

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

Studies on both direct and indirect effects of EMF are described; direct effects result from direct interaction of fields with the body, indirect effects involve interactions with an object at a different electric potential from the body. Results of laboratory and epidemiological studies, basic exposure criteria, and reference levels for practical hazard assessment are discussed, and the guidelines presented apply to occupational and public exposure.

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

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

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

- Basic restrictions

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

Basic restrictions:
Basic restrictions on exposure to time varying electric, magnetic, and electromagnetic fields are based directly on established health effects. Depending upon the frequency of the field, the physical quantities used to specify these restrictions are current density ($J$), specific energy absorption rate (SAR), and power density ($S$). Only power density in air, outside the body, can be readily measured in exposed individuals.

Different scientific bases were used in the development of basic exposure restrictions for various frequency ranges. For electric power transmission and distribution only the low frequency (50 Hz) fields are relevant which are indicative of much more slighter biological effects than fields caused by high-frequency energy. This is the reason that the basic restrictions for the range of frequencies between 1 Hz and 10 MHz are provided exclusively on current density to prevent effects on nervous system functions. The basic restrictions for current densities, whole body average SAR, and localized SAR for frequencies between 1 Hz and 10 GHz are presented in Table 1.

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

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

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

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

* **Note:**
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 cm$^2$ 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 \( \sqrt{2} \) (1,414). For pulses of duration \( t_p \), the equivalent frequency to apply in the basic restrictions should be calculated as \( f = 1/(2t_p) \).

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

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

The derived quantities are electric field strength (E), magnetic field strength (H), magnetic flux density (B), power density (S), and currents flowing through the limbs (I). Quantities that address perception and other indirect effects are contact current (I_c) and, for pulsed fields, specific energy absorption (SA).

In any particular exposure situation, measured or calculated values of any of these quantities can be compared with the appropriate reference level.

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

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

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

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

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>E-FIELD Strength (V m(^{-1}))</th>
<th>H-FIELD Strength (A m(^{-1}))</th>
<th>B-FIELD Strength (µT)</th>
<th>Equivalent plane wave power density Seq (W m(^{-2}))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupational Exposure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to 1 Hz</td>
<td>-</td>
<td>1.63 x 10(^5)</td>
<td>2 x 10(^5)</td>
<td>-</td>
</tr>
<tr>
<td>1 – 8 Hz</td>
<td>20000</td>
<td>1.63 x 10(^{5}/f^2)</td>
<td>2 x 10(^{5}/f^2)</td>
<td>-</td>
</tr>
<tr>
<td>8 – 25 Hz</td>
<td>20000</td>
<td>2 x 10(^4/f)</td>
<td>2.5 x 10(^4/f)</td>
<td>-</td>
</tr>
<tr>
<td>0.025 – 0.82 kHz</td>
<td>500/f</td>
<td>20/f</td>
<td>25/f</td>
<td>-</td>
</tr>
<tr>
<td>0.82 – 65 kHz</td>
<td>610</td>
<td>24.4</td>
<td>30.7</td>
<td>-</td>
</tr>
<tr>
<td>0.065 – 1 MHz</td>
<td>610</td>
<td>1.6/f</td>
<td>2.0/f</td>
<td>-</td>
</tr>
<tr>
<td>1 – 10 MHz</td>
<td>610/f</td>
<td>1.6/f</td>
<td>2.0/f</td>
<td>-</td>
</tr>
<tr>
<td>10 – 400 MHz</td>
<td>61</td>
<td>0.16</td>
<td>0.2</td>
<td>10</td>
</tr>
<tr>
<td>400 – 2000 MHz</td>
<td>3f(^{1/2})</td>
<td>0.008f(^{1/2})</td>
<td>0.011f(^{1/2})</td>
<td>1.640</td>
</tr>
<tr>
<td>2 – 300 GHz</td>
<td>137</td>
<td>0.36</td>
<td>0.45</td>
<td>50</td>
</tr>
<tr>
<td><strong>General Public Exposure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to 1 Hz</td>
<td>-</td>
<td>3.2 x 10(^4)</td>
<td>4 x 10(^4)</td>
<td>-</td>
</tr>
<tr>
<td>1 – 8 Hz</td>
<td>10000</td>
<td>3.2 x 10(^{4}/f^2)</td>
<td>4 x 10(^{4}/f^2)</td>
<td>-</td>
</tr>
<tr>
<td>8 – 25 Hz</td>
<td>10000</td>
<td>4000/f</td>
<td>5000/f</td>
<td>-</td>
</tr>
<tr>
<td>0.025 – 0.8 kHz</td>
<td>250/f</td>
<td>4/f</td>
<td>5/f</td>
<td>-</td>
</tr>
<tr>
<td>0.8 – 3 kHz</td>
<td>250/f</td>
<td>5</td>
<td>6.25</td>
<td>-</td>
</tr>
<tr>
<td>3 – 150 kHz</td>
<td>87</td>
<td>5</td>
<td>6.25</td>
<td>-</td>
</tr>
<tr>
<td>0.15 – 1 MHz</td>
<td>87</td>
<td>0.73/f</td>
<td>0.92/f</td>
<td>-</td>
</tr>
<tr>
<td>1 – 10 MHz</td>
<td>87(^{1/2})</td>
<td>0.73/f</td>
<td>0.92/f</td>
<td>-</td>
</tr>
<tr>
<td>10 – 400 MHz</td>
<td>28</td>
<td>0.073</td>
<td>0.092</td>
<td>2</td>
</tr>
<tr>
<td>400 – 2000 MHz</td>
<td>1.375f(^{1/2})</td>
<td>0.0037f(^{1/2})</td>
<td>0.004f(^{1/2})</td>
<td>1.640</td>
</tr>
<tr>
<td>2 – 300 GHz</td>
<td>61</td>
<td>0.16</td>
<td>0.20</td>
<td>10</td>
</tr>
</tbody>
</table>

*Note:*
1. \(f\) as indicated in the frequency range column.
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, \(S_{eq}, E^2, H^2,\) and \(B^2\) are to averaged over any 6-min period.
4. For peak values at frequencies up to 100 kHz see Table 13-1, note 3.
5. For peak values at frequencies exceeding 100 kHz see Figs. 1 and 2. Between 100 kHz and 10 MHz, peak values for the field strengths are obtained by interpolation from the 1,5-fold peak at 100 kHz to the 32-fold peak at 10 MHz. For frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width does not exceed 1000 times the \(S_{eq}\) restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz, \(S_{eq}, E^2, H^2,\) and \(B^2\) are to be averaged over 68/f\(^{1.05}\)-min period (\(f\) in GHz).
7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields. Electric shock from low impedance sources is prevented by established electrical safety procedures for such equipment.

More information about the work of ICNIRP can be found in the Internet under www.icnirp.org.
ANNEX 9: Biological and Health Effects of Electric and Magnetic Fields

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

The electric field denotes the difference in electric potential measured as a voltage between two points one meter apart. If an electric current flows in a conductor, a magnetic field will always build up around it.

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

The magnetic field around a power line is generated by the current in the conductors. Since the current is proportional to the line’s load, the magnetic field often varies both over 24 hours and from one season to another. The magnetic field under a power line is strongest in roughly the same areas as the electric field. The magnetic field is expressed in terms of teslas [T] (1 T = 1 V·s/m²), which is a measure of the field’s flux density. In the context of power lines, microteslas [µT] are used. An older unit, Gauss [G], is used in e.g. USA (1 mG = 0.1 µT). Magnetic fields are not shielded by walls and roofs. Around power lines they are often weaker than those one may come into contact with in many other contexts in everyday life at work.

In Tajikistan, electricity is transmitted with alternating current at a frequency of 50 Hz (change of polarity at 50 cycles per second).

The field which this gives rise to is referred to as an alternating electric and magnetic field. There follows a brief discourse on the status of knowledge concerning the influence of 50 Hz electromagnetic fields on the environment.

Investigations and research on these effects of low frequency electromagnetic fields have been more intensive worldwide since the early seventies.

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

The International Radiation Protection Association (IRPA), a body working under the auspice of the World Health Organization (WHO), has initiated activities concerned with non-ionizing radiation by forming a working group in 1974. At the IRPA Congress in Paris in 1977, this working group became the International Non-Ionizing Radiation Committee (INRC). An excerpt of the “Guidelines for limiting exposure to time varying electric, magnetic, and electromagnetic fields” is given in Annex 10.11.

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

The above effects are felt especially in the higher frequency range. The general rule is the higher the cycling rate of the alternating electromagnetic field, the more its effects become relevant to health. High-frequency fields in the range above 30,000 Hz, which occur, for example in communications in the form of radio waves, have a disproportionately high significance for the human organism, as these give rise to heating effects.

The biological effects of electric and magnetic fields depend primarily on their field strengths. Greater biological impact is ascribed to magnetic fields than to electric fields. Electric fields can be screened
relatively 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 has been conducted only in the last 25 years. Today, among scientists there is still a considerable difference of opinion as to the degree of possible detrimental health influence caused by these fields. There are several investigations and publications reporting a severe influence of electromagnetic fields, but the discussion about biological and health effects is still going on. The International Council on Large High Voltage Electric Systems (CIGRE), a permanent non-governmental and non-profit-making international association based in France, publishes from time to time summaries of latest researches on biological and health effects of electric and magnetic fields. An excerpt of the actual results is given below:

Cancer
In October 1996 a large-scale evaluation was published in the U.S. (U.S. National Research Council EMF Committee, 1996) reviewing more than 500 studies from 1979 on. The report came to the conclusion that ‘no clear, convincing evidence exists to show that residential exposures to electric and magnetic fields (EMF) are a threat to human health’. The same conclusion was drawn by WHO (Radiation and Environmental Health Department of Protection of the Human Environment) in 2002 as discussed in the publication ‘Establishing a Dialogue on Risks from Electromagnetic Fields’. Some other epidemiological studies have demonstrated statistical associations between childhood cancer, especially leukemia, and proximity to power lines. However, childhood leukemia is a rare illness and the number of cases is very small what makes statistical statements very difficult. In addition, a statistical association is not synonymous with proof that a causal connection exists. Although several studies show that leukemia and brain tumors are more common in ‘electrical occupations’, animal-experiment studies have failed to link exposure to electric or magnetic fields with an elevated cancer risk.

However, electric and magnetic fields have an influence on melatonin rhythm. Melatonin is a hormone formed in the pineal gland of the brain and from that hormone it is known that it plays a role in the development of certain hormone-dependent types of cancer, such as breast cancer.

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

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

Conclusion
The descriptions given above show that much research has been undertaken with contradictory results and results that are often hard to interpret. However, some large-scale research is now underway in Germany, USA, Canada, UK, and Sweden, and it is expected that knowledge in this field will grow substantially over the next few years.
ANNEX 10: Polychlorinated Biphenyls (PCB)

In former times, PCBs have been widely used as coolants and lubricants in auto-transformers, capacitors, and other electrical equipment because PCBs possess good insulating properties and are fire-retardant.

PCBs are a group of manufactured organic chemicals. There are no known natural sources of PCBs. PCBs are oily liquids and are colorless or light in colour. They have no known smell or taste. These substances consist of two phenyl rings that can contain different amounts of chlorine. Due to this fact, there are 209 individually chlorinated chemicals possible, known as congeners. Some of them have a chemical similarity with 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). That is why the WHO considers the toxicity of these PCBs to be similar to the toxicity of TCDD.

However, in general the acute toxicity is small, but looking at the chronic effects a high toxic potential of PCBs has to be stated. So, in 1968 about 1,200 people got severely sick in Japan after having used polluted rice oil for cooking. Several people died. The sickness was called “Yusho sickness”. In addition, PCBs are suspected to cause cancer if people are exposed to these substances over a longer period.

Extraordinary problems, however, arise when PCBs are exposed to high temperature as they occur during e.g. transformer fires. Between 600°C and 900°C, PCBs form highly toxic and carcinogenic furans (PCDF) and dioxins (PCDD). The toxicity of dioxins is well known since the accident in Seveso, Italy in 1976. Destroying of PCB molecules without generating dioxins requires temperature of about 1,200°C as prevailing in special incineration plants.

As it is not possible to analyze all congeners of PCBs, it is internationally accepted to measure six different typical PCBs following DIN 38414 S20 E according to Ballschmiter and Zell. (Analysis of Polychlorinated Biphenyls (PCB) by Glass Capillary Gas Chromatography, Fresenius Z. Anal. Chem. 1980, 302, 20-31). These measurements allow to draw conclusions about the total PCB content in oil samples.

The mentioned PCB congeners are:
- PCB 28 2,4,4-trichlorobiphenyl
- PCB 52 2,2,5,5-tetrachlorobiphenyl
- PCB 101 2,2,4,5,5-pentachlorobiphenyl
- PCB 138 2,2,3,4,4,5-hexachlorobiphenyl
- PCB 153 2,2,4,4,5,5-hexachlorobiphenyl
- PCB 180 2,2,3,4,4,5,5-heptachlorobiphenyl.

US EPA gives now the following definitions: a transformer is ‘a transformer that contains PCB’ if the concentration of PCBs is higher than 500 ppm. Oil containing between 50 and 499 ppm PCBs is considered to be polluted with PCB and specific methods for disposal are necessary (e.g. specific incineration plants). According to EU Directive 75/439/EEC oil containing less than 50 ppm PCBs can be considered to be PCB free and can be burned in a regular incineration plant. Annex A of the ‘Stockholm Convention’ requires to cease production of new PCBs immediately and to eliminate the use of equipment containing PCBs by 2025. Tajikistan is a signatory of this convention.
# ANNEX 11: Revised Environmental Management Plan and Environmental Monitoring Plan (For PACKAGE 4)

## ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

<table>
<thead>
<tr>
<th>PHASES/ ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION</strong></td>
<td><strong>General (1 of 1)</strong></td>
<td><strong>- All environmental impacts</strong></td>
<td><strong>- Contractor</strong></td>
<td><strong>- Included in construction costs</strong></td>
</tr>
<tr>
<td></td>
<td><strong>- All Health and Safety issues</strong></td>
<td><strong>- Preparation of a Project specific HSE Policy</strong></td>
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<td></td>
<td><strong>- All environmental impacts</strong></td>
<td><strong>- Constitute a Project HSE organization</strong></td>
<td><strong>- Contractor</strong></td>
<td><strong>- Included in construction costs</strong></td>
</tr>
<tr>
<td></td>
<td><strong>- All Health and Safety issues</strong></td>
<td><strong>- Nominate HSE Manager</strong></td>
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<tr>
<td></td>
<td><strong>- All environmental impacts</strong></td>
<td><strong>- Preparation of Project Specific Construction HSE Plan (later referred as Contractor's Environmental Management and Monitoring Plan)</strong></td>
<td><strong>- Contractor</strong></td>
<td><strong>- Included in construction costs</strong></td>
</tr>
<tr>
<td></td>
<td><strong>- All Health and Safety issues</strong></td>
<td><strong>- Preparation of Site Specific HSE Plans for all sites</strong></td>
<td><strong>- Contractor</strong></td>
<td><strong>- Included in construction costs</strong></td>
</tr>
<tr>
<td>PHASES/ACTIVITIES</td>
<td>IMPACTS</td>
<td>MITIGATING MEASURES</td>
<td>RESPONSIBLE PARTIES</td>
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<tr>
<td><strong>PRE-CONSTRUCTION</strong></td>
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<td><strong>Substations (1 of 1)</strong></td>
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<tr>
<td>Execution of works</td>
<td>- Disturbance for local people</td>
<td>- Grievance Redress mechanism established and functional.</td>
<td>- Barqi Tojik/PMU</td>
<td>- Included in Project’s overall budget</td>
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<tr>
<td></td>
<td>- Dissatisfaction for compensations</td>
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<tr>
<td>Design</td>
<td>- Transformer and equipment noise</td>
<td>- Use of sulfur hexafluoride (SF₆) circuit breakers which have low noise level compared with air or oil circuit breakers.</td>
<td>- Barqi Tojik/ Contractor/PMU</td>
<td>- Included in design budget</td>
</tr>
<tr>
<td>Site works</td>
<td>- Health and safety; Emergency situations</td>
<td>- Preparation of Emergency Preparedness and Response Plan.</td>
<td>- Contractor</td>
<td>- Included in Project’s overall budget</td>
</tr>
<tr>
<td>Site works</td>
<td>- Health and safety</td>
<td>- Preparation of Traffic Management Plan</td>
<td>- Contractor</td>
<td>- Included in Project’s overall budget</td>
</tr>
<tr>
<td>PHASES/ACTIVITIES</td>
<td>IMPACTS</td>
<td>MITIGATING MEASURES</td>
<td>RESPONSIBLE PARTIES</td>
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<td><strong>CONSTRUCTION</strong></td>
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<td><strong>Substations (1 of 6)</strong></td>
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<tr>
<td>Execution of works</td>
<td>- Disturbance for local people</td>
<td>- Grievance Redress mechanism established and functional</td>
<td>Barqi Tojik/PMU</td>
<td>Included in Project’s overall budget</td>
</tr>
</tbody>
</table>
| Site clearance and levelling works | - Loss of topsoil  
- Increase in suspended solids and turbidity in receiving drainage systems  
- Increase in air pollution from suspended particulates from soil carried and left on the road by trucks used in construction | - Conserve and stock top soil separately for use in site landscaping.  
- Compact and cover excavated material stock pile especially during the rainy season.  
- Add a silting basin at the end of the main drain prior to discharge.  
- Wet or cover the excavated soil pile and dusty construction materials such as sand, lime etc. during the dry season to reduce dust.  
- Wet the work area and other areas with exposed surfaces to reduce dust.  
- Wash truck wheels before leaving the site, construction trucks should be properly covered while on transit. | Contractor | Included in construction costs |
| Site clearance and levelling works | - Grease and oil from leaks and spillage affecting surface and ground water quality and soil contamination | - Periodic checkup and maintenance of equipment especially oil seals, proper training and supervision of persons operating the equipment to report leaks, adsorbent mats, removal of contaminated soil.  
- Refueling and limited maintenance of vehicles/equipment will be only done on an impermeable surface.  
- Washing equipment, machinery and vehicles will only be permitted in designated areas, with impermeable surfaces and dedicated drainage systems that lead to separate treatment facilities and/or lined evaporation ponds. | Contractor | Included in construction costs |
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<tr>
<th>PHASES/ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
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<tr>
<td>CONSTRUCTION</td>
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<tr>
<td>Substations (2 of 6)</td>
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</table>
| Site works and construction | - Noise from heavy equipment | - All equipment should be provided with mufflers and noise reduction equipment.  
- Noisy equipment and activity should be done only at daytime and if it is not possible prior notice should be given to the neighboring areas.  
- Admissible noise level into the living area, both inside and outside the buildings according to have to follow IFC General EHS Guidelines 2007..  | - Contractor | - Included in construction costs |
| Site works and construction | - Increase of air pollutants such as PM2.5, sulfur dioxide, nitrogen oxides from heavy trucks  
- Grease, oil and fuel from leaks and spillage affecting surface and ground water quality and soil contamination  
- Increase of traffic congestion around the construction area especially when equipment is delivered | - Use vehicles and machinery in good status, proper maintenance, use catalysators, turn off engines when possible, National emission standards should be followed.  
- Periodic checkup and maintenance of equipment especially oil seals, proper training and supervision of persons operating the equipment to report leaks, adsorbent mats, removal of contaminated soil.  
- Refilling and maintenance works must take place in dedicated areas.  
- Coordinate with the local authorities and assign special personnel to direct the traffic.  | - Contractor | - Included in construction costs |
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<tr>
<th>PHASES/ACTIVITIES</th>
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<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
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<tr>
<td>CONSTRUCTION</td>
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<td>Substations (3 of 6)</td>
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<tr>
<td>Construction</td>
<td>- Soil contamination, health and safety hazards caused by improper change procedures and waste management of batteries</td>
<td>- Change of batteries according to specific instructions.</td>
<td>- Contractor/Barqi Tojik</td>
<td>- Included in construction costs</td>
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<td></td>
<td></td>
<td>Comply with Contractor's Environmental Management and Monitoring Plan.</td>
<td>- Contractor - Spare parts: Barqi Tojik</td>
<td>- Included in construction costs</td>
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<td></td>
<td></td>
<td>- A waste management hierarchy that consider prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes should be considered. Final disposal and management of every kind of waste must be undertaken in an environmentally sound manner by a certified waste management company.</td>
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<td>- All the waste must be removed from the substations in a period of time no longer than 3 months after the beginning of the works in that substation.</td>
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<td>- The removed equipment that is going to be stored by Barqi Tojik to be used as source of spare parts must be taken out of the substation in a period of time no longer than 6 months after the beginning of the works in that substation.</td>
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<tr>
<td>Construction</td>
<td>Waste Management; motor oil and other hazardous liquids</td>
<td>Used motor oil and other hazardous liquid waste should be stored on sealed containers on top of seal (top put it in the container and temporarily store it). Waste oil and other hazardous liquid must be transported and disposed by licensed companies according to National regulations.</td>
<td>- Contractor</td>
<td>- Included in construction costs</td>
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<td>PHASES/ACTIVITIES</td>
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<tr>
<td><strong>CONSTRUCTION</strong></td>
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</table>
| Substations (4 of 6) | Climate change (Emissions to air from circuit breakers, | - Installation of SF₆ circuit breakers must be done according to norms specified in international standards IEC 62271 and IEC 60694.  
- User’s manual should be provided to sites.  
- Circuit breakers shall be fitted with automatic leak alarm system. Appropriate training for permanent staff regarding handling of SF₆. | Contractor/PMU | Included in construction costs |
| Demolition works | Waste management; asbestos (no foreseen dealing with asbestos) | - Implement waste management plan for obsolete electrical equipment (see Annex 15)  
- Asbestos containing material (e.g. floor panels) should be removed following special procedures described in Contractor’s Environmental Management and Monitoring Plan.  
- Asbestos containing waste shall be transported using special procedures to an appropriate landfill and covered immediately with soil. | Contractor | Included in construction costs |
<p>| Demolition works | Waste Management; scrap metal | - Scrap metal should be transported either to Khujand or Dushanbe for further processing or to be sold. | Barqi Tojik/PMU | Recycling company pays for the metal |
| Demolition works | Waste Management; ceramic waste | - Ceramic waste is inert and can be used as landfilling material, e.g. for road construction (see also Waste Management Plan). | Contractor | Included in construction costs |
| Site works and construction | All environmental impacts | - Contractor’s Environmental Management and Monitoring Plan is prepared and followed. | Contractor/PMU/Mercedes | Included in Project’s overall budget |</p>
<table>
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<tr>
<th>PHASES/ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
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<td><strong>CONSTRUCTION</strong></td>
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<td>Substations (5 of 6)</td>
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<tr>
<td>Site works and construction</td>
<td>- Health and safety;</td>
<td>- Proof of age above 18 years old will be required prior to employment.</td>
<td>Contractor</td>
<td>Included in Project’s overall budget</td>
</tr>
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<td></td>
<td>- Employment of minors for unsuitable task</td>
<td>- Give economical opportunities to locals by giving locals priority in employment.</td>
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<td></td>
<td>- Spread of contagious and communicable diseases by outside workers</td>
<td>- External workers hired must have proper medical examination prior to employment. New workers will be properly briefed on the basics of how common communicable and contagious diseases are spread, symptoms and effects, including COVID-19 and AIDS. Include COVID-19 preventive measures (management plan) as part of HSE plan</td>
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<td></td>
<td></td>
<td>- Proof of age above 18 years old will be required prior to employment.</td>
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<tr>
<td>Site works and construction</td>
<td>- Occupational Health, accidents, hazards and other work area related concerns</td>
<td>- Develop a Contractor’s Environmental Management and Monitoring Plan to the construction activities and implement the Project specific HSE Policy, aim should be Zero Accidents. Specific issues: handling of oil and batteries, working under high voltage conditions.</td>
<td>Contractor</td>
<td>Included in Project’s overall budget</td>
</tr>
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<td>- PPE, first aid kit, and alarm system should be provided and used in the construction activity. &quot;NO PPE NO WORK&quot; policy should be properly implemented.</td>
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<td>- Hearing protection devices shall be used when 80 dB(A) is exceeded.</td>
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<td>- Working sites will be kept tidy and efficient housekeeping has to be in place. This will reduce the probability of trip accidents and other kind of injuries as well as COVID-19 infections.</td>
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</tr>
<tr>
<td>Site works and construction</td>
<td>- Occupational Health, accidents, hazards and other work area related concerns</td>
<td>- Workers should be properly briefed on proper work conduct, chain of command and responsibilities, and action to take during an emergency.</td>
<td>Contractor</td>
<td>Included in Project’s overall budget</td>
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<td>- HSE training is compulsory for all workers.</td>
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<td>- Key personnel will be trained on first aid. Periodic drills will be carried out.</td>
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<td>- Teams and personnel with good safety record will be properly acknowledged.</td>
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<thead>
<tr>
<th>PHASES/ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
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<tr>
<td>CONSTRUCTION</td>
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<tr>
<td>Substations (6 of 6)</td>
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</table>
| Site works                            | - Fire                               | - Proper firefighting equipment available.  
- Grounding of equipment, provision of interlock, and automatic power cut off.  
- Equipment are properly labeled, and procedures defined in case of fire such as isolation of other equipment.  
- External support such as the local fire department and civil defense offices.  
- Drills and exercises to test personnel preparedness for fire and other emergency. | - Contractor/Barqi Tojik/Substation management | - Included in Project's overall budget/Construction costs |
| Site works and construction           | - Power shut down                    | - Minimize power interruptions (number, length), avoid over 8 hours shut downs.  
- Notify people potentially affected by the shutdown at least 3 days in advance by posting notices on public popular places.  
- Interruptions should be done during times of low power demand | - Contractor/PMU                      | - Included in Project’s overall budget |
| Site works                            | - Health and safety; Natural hazards (earthquakes) | - Workers should be properly briefed on chain of command and responsibilities, and action to take during an emergency, including earthquakes.  
- Comply with Emergency Preparedness and Response Plan. | - Contractor                          | - Included in construction costs |
| Site works and construction           | - Health and safety; Spreading of diseases  
- Contamination of the environment | - Proper use of toilet and washing facilities by the workers at substations, keeping cleanliness, provision of necessary sanitary means  
- Provide access of workers to sanitary facilities | - Contractor/Barqi Tojik/PMU           | Included in construction costs |
| Site works and construction           | - Accidents and hazards caused by high voltage equipment | - Fencing of the construction site area  
- Prohibition of outsiders to enter construction area  
- Ascertaining that all conductors and accessories have no live load prior to handling them. | - Contractor                          | - Included in construction costs |
<table>
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<tr>
<th>PHASES/ACTIVITIES</th>
<th>IMPACTS</th>
<th>MITIGATING MEASURES</th>
<th>RESPONSIBLE PARTIES</th>
<th>COST</th>
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<tbody>
<tr>
<td><strong>OPERATION AND MAINTENANCE</strong></td>
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<tr>
<td>Substations</td>
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</tbody>
</table>
| Operation | - Climate Change (Emissions to air from circuit breakers) | - Appropriate training for permanent staff regarding handling of SF₆.  
- User’s manual should be placed at relevant sites.  
- Careful handling of SF₆, always follow specific guidelines.  
- Circuit breakers shall be fitted with automatic leak alarm system (gas monitoring system). | - Barqi Tojik and substation management | Initial training included in Project’s overall budget  
Part of OM cost |
| Operation and maintenance | - Electric shock causing death or injury | - Security fences in good status and minimum 2,5 m high around sites  
- Establishment of warning signs  
- Careful design of maintenance works  
- Training | - Barqi Tojik and substation management | Part of OM cost |
| Operation and maintenance | - Improper waste management practices causing littering and surface water, groundwater and soil contamination | - Proper waste management practices: waste separation, recycling, reuse, proper storage and disposal. Special procedures for hazardous waste. | - Barqi Tojik and substation management | Part of OM cost |
| Maintenance | - Occupational and health safety risks | - Routine maintenance to check the condition of the structures and equipment. Use of PPE.  
- Care in handling and isolating equipment to be inspected | - Barqi Tojik and substation management | Part of OM cost |
| Operation and maintenance | - Natural hazards (earthquakes) | - Workers should be properly briefed on chain of command and responsibilities, and action to take during an emergency, including earthquakes. | - Barqi Tojik and substation management | Part of OM cost |
**ENVIRONMENTAL MONITORING PLAN (For PACKAGE 4)**

<table>
<thead>
<tr>
<th>ENVIRONMENTAL CONCERN</th>
<th>PERFORMANCE INDICATOR and ACTIVITIES</th>
<th>FREQUENCY TO MONITOR</th>
<th>TIMING TO CHECK</th>
<th>LOCATION</th>
<th>RESPONSIBILITY</th>
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</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION (1 of 2)</strong></td>
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<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Review the Construction Environmental Management Plan and the Construction Environmental Monitoring Plan according to ADB Guidelines and National laws</td>
<td>Once</td>
<td>Before taking any possession at sites</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Review of the Project Specific HSE Policy (Contractor)</td>
<td>Once</td>
<td>Before taking any possession at sites</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Review of the Constitution of Contractor’s Project HSE organization, nomination of Contractor’s HSE Manager</td>
<td>Once</td>
<td>Before taking any possession at sites</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Review of the Contractor’s Project specific HSE Plan (Contractor’s Environmental Management and Monitoring Plan)</td>
<td>Once</td>
<td>At least 10 days before taking any possession at sites</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Emergencies</td>
<td>Review of the Contractor’s Emergency Preparedness and Response Plan</td>
<td>Once</td>
<td>Before taking any possession at sites</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Review of HSE briefing and training for Contractor’s staff completed</td>
<td>Once (later on regularly)</td>
<td>Before field work execution</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>ENVIRONMENTAL CONCERN</td>
<td>PERFORMANCE INDICATOR and ACTIVITIES</td>
<td>FREQUENCY TO MONITOR</td>
<td>TIMING TO CHECK</td>
<td>LOCATION</td>
<td>RESPONSIBILITY</td>
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<tr>
<td>All environmental impacts and health and safety issues</td>
<td>In general, ensure that mitigation activities are implemented and executed. Main mitigation activities are presented in the Contractor’s Environmental Management and Monitoring Plans (Project specific and Site specific).</td>
<td>Regularly</td>
<td>Throughout the Project Phase</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Mitigation Measures reviewed to cover any unidentified impacts</td>
<td>During detailed design</td>
<td>By completion of detailed design</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Grievance Redress Mechanism</td>
<td>Grievance Redress Mechanism established</td>
<td>Once</td>
<td>Before Project implementation</td>
<td>N/A</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>ENVIRONMENTAL CONCERN</td>
<td>PERFORMANCE INDICATOR and ACTIVITIES</td>
<td>FREQUENCY TO MONITOR</td>
<td>TIMING TO CHECK</td>
<td>LOCATION</td>
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<tr>
<td>CONSTRUCTION (1 of 2)</td>
<td>Elaboration of the monthly ESMP implementation report. Minimum contents, - Project Activities During Current Reporting Period. Percentage of completion of each main activity. - Number of workers employed during the reporting period - Description of Any Changes to Project Design or construction methods - Performed Environmental Safeguard Activities - Status of non-conformities identified in previous reporting periods - Unanticipated Environmental Impacts or Risks - Material Resources Utilization during the current period and cumulative (petrol in liters, generated waste per type in tons (domestic waste and hazardous waste)) - H&amp;S: Community H&amp;S, accidents; Workers H&amp;S, training, performed actions</td>
<td>Monthly. It will be submitted by day 15 of the following month.</td>
<td>Throughout the Project Phase</td>
<td>All project sites</td>
<td>Contractor</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Contractor’s internal HSE inspections performed by HSE Manager and site supervisory personnel</td>
<td>Monthly</td>
<td>Throughout the Project Phase</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Contractor’s internal HSE audits performed by HSE Manager and site supervisory personnel</td>
<td>Monthly</td>
<td>Throughout the Project Phase</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>1.In general, ensure through field inspections that mitigation activities are implemented and executed. 2.Main mitigation activities are presented in Environmental Management Plan and Contractor’s Environmental Management and Monitoring Plan.</td>
<td>1.Regularly 2.Monthly</td>
<td>Throughout the Project Phase</td>
<td>All project sites</td>
<td>1.PMU and Mercados 2.PMU and Mercados</td>
</tr>
<tr>
<td>ENVIRONMENTAL CONCERN</td>
<td>PERFORMANCE INDICATOR and ACTIVITIES</td>
<td>FREQUENCY TO MONITOR</td>
<td>TIMING TO CHECK</td>
<td>LOCATION</td>
<td>RESPONSIBILITY</td>
</tr>
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<td>CONSTRUCTION (2 of 2)</td>
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</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>In general, ensure through inspections that mitigation activities are implemented and executed. Main mitigation activities are presented in Environmental Management Plan and Contractor’s Environmental Management and Monitoring Plan.</td>
<td>Twice a year</td>
<td>Throughout the construction Phase</td>
<td>All project sites</td>
<td>Barqi Tojik/PMU/external international environmental expert</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>Mitigation Measures reviewed to cover any unidentified impacts</td>
<td>Monthly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>All environmental impacts and health and safety issues</td>
<td>HSE briefing and training for Contractor’s staff completed; field inspections, Contractor’s HSE audit and inspection reports</td>
<td>Regularly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Soil erosion and contamination</td>
<td>Proper Waste Management practices, land clearing, vegetation removal, spills; field inspections, Contractor’s HSE audit and inspection reports, HSE Incident Reports</td>
<td>Regularly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Air quality</td>
<td>Condition of vehicles and machinery; field inspections</td>
<td>Regularly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Noise and vibrations</td>
<td>Condition of vehicles and machinery; field inspections</td>
<td>Regularly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Waste management</td>
<td>Proper Waste Management practices; field inspections, Contractor’s HSE audit and inspection reports, HSE Incident Reports</td>
<td>Regularly</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
</tr>
<tr>
<td>Safety hazards</td>
<td>Contractor’s Emergency Preparedness and Response Plan implemented and training given to all workers; field inspections, Contractor’s HSE audit and inspection reports</td>
<td>Ongoing</td>
<td>Throughout the Project</td>
<td>All project sites</td>
<td>PMU and Mercados</td>
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<tr>
<td>Grievance Redress Mechanism</td>
<td>Grievance Redress Mechanism functional; amount of grievances and processing time of grievances, paid compensations</td>
<td>Ongoing</td>
<td>Throughout the Project implementation</td>
<td>N/A</td>
<td>PMU and Mercados</td>
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<td>ENVIRONMENTAL CONCERN</td>
<td>PERFORMANCE INDICATOR and ACTIVITIES</td>
<td>FREQUENCY TO MONITOR</td>
<td>TIMING TO CHECK</td>
<td>LOCATION</td>
<td>RESPONSIBILITY</td>
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<tr>
<td>Noise and emissions</td>
<td>1. Company’s Environmental Management System and related instructions implemented</td>
<td>Ongoing</td>
<td>During operation and maintenance</td>
<td>Substations</td>
<td>Barqi Tojik/sub- station management</td>
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<td></td>
<td>2. Routine maintenance program implemented</td>
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<td></td>
<td>3. Use of sulfur hexafluoride circuit breakers which have low noise level compared with air or oil circuit breakers</td>
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<td>4. Construction of flanks or blank blind to contain the noise if needed</td>
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<td>5. Monitoring of emissions to air (SF₆)</td>
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<td>Soil contamination</td>
<td>Company’s Environmental Management System and related instructions implemented (e.g. oil change)</td>
<td>Ongoing</td>
<td>During operation and maintenance</td>
<td>Substations</td>
<td>Barqi Tojik/sub- station management</td>
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<tr>
<td>Waste management</td>
<td>Company’s Environmental Management System and related instructions implemented (e.g. oil change)</td>
<td>Ongoing</td>
<td>During operation and maintenance</td>
<td>Substations</td>
<td>Barqi Tojik/sub- station management</td>
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<tr>
<td>Health and Safety</td>
<td>Company’s H&amp;S plan implemented</td>
<td>Ongoing</td>
<td>During operation and maintenance</td>
<td>Substations</td>
<td>Barqi Tojik/sub- station management</td>
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ANNEX 12: List of subject substations (PACKAGE 4)
<table>
<thead>
<tr>
<th>Name of Network</th>
<th>Number of subject SS</th>
<th>Number of SS in relation to the network. Name of the Substation</th>
<th>Location</th>
<th>Metering panel</th>
<th>Meters</th>
<th>Current transformer</th>
<th>Voltage transformer</th>
<th>Arresters</th>
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<tbody>
<tr>
<td>Central (Markazi) EN</td>
<td>1</td>
<td>1 SS «Regar-500» - 500/220/35 kV</td>
<td>Tursunzoda</td>
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<td>2 SS «Ordzonikizeabad-2» - 220/110/10 kV</td>
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<td>Qty.</td>
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<td>3 SS «Jangal» - 220/110/10 kV</td>
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<td>5 SS «Novaya» - 220/110/10 kV</td>
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<td>6 SS «Rogun» - 220/110/35/10 kV</td>
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<td>10 SS «Choryakoron» - 110/35/10/6 kV</td>
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<td>9</td>
<td>11 SS «Djerzinskaya» - 110/35/10 kV</td>
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<td>14 SS «Pugus» - 110/35/10 kV</td>
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<td>1 SS «Kolkhozobod»</td>
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ANNEX 13: Public Consultation Documents (PACKAGE 4)
Кумитаи хифзи муҳити зисти наъди Хукумати Ҷумҳурии Тоҷикистон

Муассисаи давлатии «Маркази идораи лоиҳаҳои бахши электрэнергетика» ба маълумоти Шумо мерасонад, қи лоиҳаҳои «Чорй намудани системаи хисоби яклуҳти интиқоли қуввани барқ ва бехдошти шабакаи интиқоли барқ» тибки Созишшоман грантин байни Хукumatи Ҷумҳурии Тоҷикистон ва Бонки Осиёни Рушд амали шуда истодааст.

Чиҳати истифодаи маблағҳои бокимондаи лоиҳа васлу насьби хисобкунаҳои барқ, трансформаторҳои шиддат ва чараён дар 175 зеристоҳҳои барқини мавчудула ба накш а гарифта шудааст.

Вобаста ба ин, тибки талаботи Бонки мазкур боъд хисоботи «Арзёбини таъсиррасонӣ ба муҳити зист» ҳомда карда шавад ва маълумотномаи мухтасар онд ба хисоботи мазкур барои маълумот ва пешниход (агар бошад) ба шўъбахои хифзи муҳити зисти шахру ноҳияҳои дайҳдор ирсол карда мешавад.

Бинобар ин, аз Шумо эҳтиромона хошиш менамоем, ки чиҳати пешниходи маълумотномаи мазкур ба шўъбахои хифзи муҳити зисти шахру ноҳияҳои номбурда мусоидаат намоед.

Замима: Рўйхати шахру ноҳияҳо, қи дар ҳудуди оъндо лоиҳаи мазкур амали мешавад.
Маълумотномаи мухтасари хисоботи «Арзёбини таъсиррасонӣ ба муҳити зист»

Бо эҳтиром,

Директори ичроия

Н. Назархода

Ичро: Каримов С.
Тел: 919 60 27 24
State Established «Project Management Unit for Energy Sector» informs you that the “Wholesale Metering and Transmission Reinforcement Project” is implemented under the Grant Agreement between the Government of the Republic of Tajikistan and the Asian Development Bank.

To use the remaining funds of the Project, it is planned to install electricity meters, voltage and current transformers in 175 already existing power substations.

In this regard, at the Bank’s request, an "Environmental Impact Assessment" should be prepared and a summary of this report should be sent to the relevant city and district environmental departments for information and submission of comments (if any).

Therefore, we kindly ask you to assist the Environmental Protection Department of these cities and districts in conveying this information.

Attachments:
- List of cities and districts on which this sub-project is implemented
- Summary of the report "Environmental Impact Assessment"

Sincerely,

Executive director  N. Nazarzoda

Prepared by: Karimov S.
Tel: 919 60 27 24
Республика Таджикистан: Проект оптового учета и усиления передачи. ЛОТ 3 Подпроект. Финансируется Азиатским Банком Развития

СФЕРА ОХВАТА, ЦЕЛЬ И ПРИРОДООХРАННЫЕ МЕРОПРИЯТИЯ
Целью дополнительного подпроекта (лот 3) является совершенствование энергосистемы, позволяющее ей по пунктам контролировать потоки энергии в передающей сети. Цель-увеличение избыточности измерений на верхних уровнях и полный контроль потерь. Кроме того, он может предоставлять актуальную информацию о потоках энергии между различными сегментами сети. Для этих целей на 175 подстанциях будут установлены счетчики, трансформаторы тока, напряжения и разрядники. Проект планируется запустить в 2020 году, а завершить его планируется к 2022 году.

Замена или установка новых счетчиков и трансформаторов будет происходить внутри подстанций. Для новых трансформаторов напряжения и тока должны быть построены фундаменты. Новые счетчики и счетчики взамен старых будут установлены в шкафах внутри центра управления подстанциями.

Проект реализуется Центром управления проектами для электро-энергетического сектора (ЦУП) “Барки Точик”, а экологический и социальный надзор и мониторинг осуществляется Отделом ЦУП по социальному сектору и мониторингу окружающей среды.

Подпроект лот-3 относится к экологической и социальной категории С по классификации АБР, что означает, что он оказывает минимальное воздействие.

Первоначальная экологическая экспертиза проекта (ПЭЭ) была обновлена, чтобы включить в нее деятельность по лоту-3. ПЭЭ описывает потенциальные последствия, формулирует меры по смягчению последствий и устанавливает институциональные механизмы и экологический мониторинг для проекта. Учитывая, что подпроект лот-3 относится к категории С, не было необходимости разрабатывать оценку экологического и социального воздействия (ОЭСВ).

МЕСТОНАХОЖДЕНИЕ ПОДПРОЕКТА
Подпроект будет реализован в рамках 175 подстанций, которые уже принадлежат компании Барки Точик. Они расположены в следующих районах по всей стране:

4. Согдийская область: Масчох, Ашт, Зафаробод, Спитамен, Джалбор Расулов, Конибад, Исфара, Истаравштан, Панджакент и Айни.

5. Районы республиканского подчинения: Душанбе, Турсунзада, Гиссар, Варзоб, Вахдат, Рашт, Рудаки, Файзобод, Рогун, Нуробод, Тоджикобод и Тавильдара.

6. Хатлонская область: Хуросон, Яван, Нурек, Бальджувон, Ховалинг, Дангара, Темурмалик, Боттар, Восе, Кулоб, Шахритуз, Фархор и Пяндж.

Расположение мероприятий подпроекта ЛОТ 3 можно увидеть на карте ниже,
ОЖИДАЕМЫЕ ВОЗДЕЙСТВИЯ

Работы будут проводиться внутри подстанций, поэтому никаких серьезных помех для жителей не ожидается. Строительство фундаментов может быть осуществлено без отключения подстанции от электросети. Подключение трансформаторов тока и напряжения к электросети потребует отключения подстанции от электросети на срок до одного дня. Замена или установка счетчиков может быть произведена в короткие сроки. Около 50% отключений подстанций не приведут к отсутствию энергоснабжения населения, так как они будут подаваться с других подстанций. Остальные 50% отключений подстанций, которые приведут к отключениям электроэнергии, планируется осуществить в электрических сетях Чануби (подстанция Ломоносова), Исфара (подстанция Исфара), Истаравшан (подстанция Узловая) и Куляб (подстанция Исмоилова).

Ожидаемые основные экологические и социальные последствия строительства заключаются в следующем:

- Образование отходов (сталь, керамика, отработанное масло) в результате демонтажа оборудования, такого как старые автоматические выключатели и замена старых трансформаторов тока и напряжения; образование бытовых отходов рабочими;
- Разлив масло;
- Повышенный график и пыль из-за транспортировки оборудования;
- Потенциальное воздействие на здоровье и безопасность (например, работы под высоким напряжением, распространение COVID-19 или СПИДа);
- Шумовые выбросы и вибрации из-за строительства фундаментов;
- Ограниченные возможности для работы.
СМЯГЧАЮЩИЕ МЕРЫ

В целях смягчения возможных негативных воздействий подрядчик будет обязан:

- Подготовить политику в области ЗБОС
- Создать команду проекта по охране труда, промышленной безопасности и охране окружающей среды (ЗБОС)
- Разработать план управления ЗБОС
- Подготовить планы ЗБОС для конкретного участка
- Внедрить планы ЗБОС для конкретного участка
- Отчет о реализации планов по ЗБОС для конкретных участков.

В обязанности "Департамента социального сектора и мониторинга окружающей среды" ЦУП входит обеспечение соблюдения плана экологического менеджмента и мониторинга и информирование АБР о его выполнении. Вы сможете проверить эти отчеты на

МЕХАНИЗМ РАССМОТРЕНИЯ ЖАЛОБ И ВОЗМЕЩЕНИЯ УЩЕРБА

Если подпроект вызвал у вас недовольство, вы имеете право подать жалобу. Шаги:

1. Подайте жалобу
2. Получите разъяснение
3. Пожалуйста, уделите внимание, будет предложено новое решение
4. Реализация решения

Вы имеете право передать дело в суд в любой момент процесса.

КОНТАКТЫ ДЛЯ ПОЛУЧЕНИЯ ИНФОРМАЦИИ И ЖАЛОБ

- Директор департамента "Социального сектора и экологического мониторинга" ЦУП г-н Сироджиддин Каримов, (+992) 919-60-27-24
- Главный специалист отдела "Социального сектора и мониторинга окружающей среды" ЦУП г-н Азиз Холов, (+992) 985-48-73-78
- E-mail: pmu_tj@mail.ru
Republic of Tajikistan:
Wholesale Metering and Transmission Reinforcement Project. PACKAGE 4: «Installation of wholesale meters at 500kV, 220kV, 110kV, and 35kV levels» financed by the Asian Development Bank.

OBJECTIVE AND ENVIRONMENTAL ARRANGEMENTS
The objective of the additional subproject (PACKAGE 4) is to enhance the power system enabling it to control the fluxes of energy in the transmission grid item by item. The goal is increasing redundancy of measurements on the top levels and full control of losses. Besides, it can provide relevant information of fluxes of energy between different segments of the grid.

For these purposes, meters, current transformers, voltage transformers and arresters will be installed in 175 substations. The Project is planned to start in 2020 and it will be completed by 2022.

The replacement or installation of new meters and transformers will take place inside the substations. For new voltage and current transformers foundations have to be constructed. The new meters and meters in replacement of old ones will be installed in cabinets inside the control center of the substations.

The Project is implemented by the State Establishment “Project Management Unit for the Elektro-Energy Sector” (PMU) under the Government of the Republic of Tajikistan and the environmental and social supervision and monitoring is done by the PMU’s “Social Sector and Environmental Monitoring Department”.

LOT-3 sub-project belongs to environmental and social Category C according to ADB’s classification which means that it has minimal impacts.

The Project Initial Environmental Examination (IEE) has been updated to insert the LOT-3 activities. The IEE describes the potential impacts, formulates mitigation measures, and sets the institutional arrangements and environmental monitoring for the project. Given that LOT-3 sub-project is category C, there was no need to develop an Environmental and Social Impact Assessment (ESIA).

LOCATION OF THE SUB-PROJECT
The Sub-project will be executed within 175 substations that are already owned by Barqi Tojik. They are located in the following districts around the country:

1. Dushanbe city;
3. Sughd region: cities and districts of Maschoh, Asht, Zafarobod, Spitamen, Jabbor Rasulov, Konibodom, Isfara, Istaravshan, Panjakent and Ayni;

The location of the PACKAGE 4 sub-project activities can be seen in the map below:
ANTICIPATED IMPACTS

The works will be carried out inside the substations, so no major disturbance for residents is expected. The construction of the foundations can not be done without disconnecting the substation from the grid. The connection of the current and voltage transformers to the grid will require a disconnection of the substation from the grid for up to one day by substation. The replacement or installation of meters can be done in a short time. Energy disconnections at the substations to implement works will not lead to a lack of energy supply for the population since they will be supplied from other substations. During the work implementation at the substations under the Lot-3 energy disconnection are envisaged to happen in Chanubi Electricity Network (Lomonosova Substation), Isfara Electricity Network (Isfara Substation), Istaravshan Electricity Network (Uzlavaya Substation) and Kulyab city (Ismoilova Substation).

The anticipated key environmental and social impacts during the construction are the following:
- Waste generation (steel, ceramics, used oil) due to demolition of equipment like old circuit breakers and replacement of old current and voltage transformers; domestic waste generation by the workers;
- Oil spills;
- Increased traffic and dust due to the transport of the equipment;
- Potential impacts on health and safety (e.g. works under high voltage, spread of COVID-19);
- Noise emissions and vibration due to the construction of the foundations;

MITIGATION MEASURES

In order to mitigate potential negative impacts the Contractor will be obliged to:
- Prepare a HSE Policy
- Constitute a Project Health, Safety and Environment (HSE) team
- Establish a HSE Management Plan
- Prepare Site-specific HSE Plans
- Implement Site-specific HSE Plans
- Report on the implementation of Site-specific HSE Plans
Under the responsibility of the “Social Sector and Environmental Monitoring Department” of the SE PMU ES is to ensure that the Environmental Management and Monitoring Plan is followed and to inform on its implementation to the ADB. You will be able to check those reports on the webpage of the ADB.

**GRIEVANCE AND REDRESS MECHANISM**

If the Sub-project has caused you a grievance, you have the right to complaint. Steps:

- **File your complaint**
  - Send an email or give a call to the PMU

- **Clarifications will be sought**
  - Within 7 days after receiving the grievance

- **Suggested solution will be informed**
  - If dissatisfied, a new solution will be suggested
  - Within 2 weeks after receiving the notification of dissatisfaction

- **Implementation of the solution**

**CONTACT FOR INFORMATION AND COMPLAINTS**

- Project manager of the «Wholesale Metering and Transmission Reinforcement Project» SE «PMU ES»
  Nematov Shodmon (+992) 917-15-51-51

- Head of the Environmental and Social monitoring department of the SE «PMU ES» Karimov Sirojidin (+992) 919-60-27-24

- Chief specialist of the Environmental and Social monitoring department of the SE «PMU ES»
  Kholov Aziz (+992) 985-48-73-78

- E-mail: pmu_tj@mail.ru
ANNEX 14: Types of Current and Voltage Transformers
<table>
<thead>
<tr>
<th>Types of activity related to waste generation</th>
<th>Environmental parameters that may be affected by waste generation</th>
<th>Type of waste</th>
<th>Impact mitigation measures</th>
<th>Responsibility</th>
<th>Supervision</th>
</tr>
</thead>
</table>
| Identification and analysis of wastes (hazardous vs. non-hazardous) | Soil and occupational health and safety | Any waste which may contain hazardous components such as, but not limited to, persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs), etc. | • Prepare inventory of wastes (type of waste, source, quantity, date of dismantling, and photo-documentation)  
• Analyze wastes for hazardous characteristics (this may involve 3rd-party laboratories or subcontractors)  
• Segregate non-hazardous from hazardous wastes. Non-hazardous wastes are those that confirmed not to contain POPs/PCBs.  
• For hazardous wastes, prepare detailed hazardous waste management plan for handling, storage, treatment and disposal.  
• Include inventory of wastes and photo-documentation in environmental monitoring report | Contractor | PMUES/CSC “Mercados” |
| Dismantling of electric equipment not containing PCB | Soil | Generation of solid waste as a result of dismantling of obsolete equipment | • Hermetically isolated equipment containing oil can be stored at a specially equipped site as backup equipment;  
• Dismantled equipment will be used for spare parts;  
• Spare parts, which can be used safely for the environment, will be used as back-up materials  
• Spare parts as scrap metal will be transferred to a specialized company for recycling under the agreement between Barqi Tojik and the company engaged for these purposes;  
• Gas-insulated switches will be kept indoors until their utilization issue is resolved;  
• The packaging of the new equipment will be utilized of with permission of CEP.  
• Include inventory of non-hazardous wastes and photo-documentation in environmental monitoring report  
• PMUES to confirm in writing disposal of construction wastes are done properly and would not cause environmental deterioration, pollution, or inconvenience to communities and public. | PMUES/Barqi Tojik | CSC “Mercados” |
| Demolition of old concrete pillars or foundations | Soil | Construction waste (concrete, | • Construction nontoxic waste will be removed from the site to locations agreed with Committee on | Contractor | CSC “Mercados” |

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8 SanPiN 2.1.7.010-03 “Hygienic requirements for the placement and disposal of production and consumption waste”
| any other non-toxic waste | reinforcement) and other nontoxic waste | environmental protection and local governments according to legislation of Tajikistan  
- Include inventory of construction wastes, photodocumentation, and disposal records in environmental monitoring report  
- PMU ES to confirm in writing disposal of construction wastes are done properly and would not cause environmental deterioration, pollution, or inconvenience to communities and public. | PMUES/Barq Tojik |