Initial Environmental Examination

August 2020

Uzbekistan: Central Asia Regional Economic Cooperation Corridor 2 (Pap-Namangan-Andijan) Railway Electrification Project – Additional Financing

Prepared by O'zbekiston Temir Yo'llari for the Asian Development Bank.

«O'ZBEKISTON TEMIR YO'LLARI»
AKSIYADORLIK JAMIYATI

100060, Toshkent sh., T.Shevchenko ko'chasi, 7-uy, tel.: 238-80-28, fax: 233-69-24
info@uzrailway.uz, uzrailway@exat.uz

20 20-yil «30» 07
№ 382

Ko Sakamoto
Transport specialist
Transport and Communication Division
Central and West Asia Department
ADB

Dear Mr.Ko,

Please find attached Initial Environmental Examination for Pap-Namangan-Andijan Railway Electrification Project – Additional financing.

Sincerely,

A.Djuraev
Head of PIU-ET

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LIST OF ABBREVIATIONS

ADB	– Asian Development Bank
AM	- Accountability Mechanism
BAC	- Big Andijan Canal
BFC	- Big Ferghana Canal
CMR	- Cabinet of Ministers
CPS	– Country's Partnership Strategy
CSC	- Construction Supervision Consultant
CSDP	- Contact System Duty Points
CTC	- Centralized Traffic Control
DPCN	- Duty Point of Contact Network
EA	– Executing Agency
EHS	- Environmental, Health and Safety Guidelines
EIA	– Environmental Impact Assessment
EMP	– Environmental Management Plan
EMR	– Environmental Monitoring Report
EO	- Environmental Officer
ES	- Environmental Specialist
GRM	– Grievance Redress Mechanism
HH	– Household
HV	- High voltage
ICB	– International Contract Bidding
IEC	- Information, Education and Communication Campaign
IEE	– Initial Environmental Examination
IEEE	- Institute of Electrical and Electronics Engineers
IFC	- International Financial Corporation
KRD	- Kokand Railway Department
LARP	– Land Acquisition and Resettlement Plan
MAC	- Maximum Allowance Concentrations
MAWR	- Ministry of Agriculture and Water Resources

MH	-	Ministry of Health
NCB	–	National Contract Bidding
O&M	–	Operation and Maintenance
PCB	-	Polychlorinated Biphenyl
PIU-ET	–	Project Implementation Unit
PMC	–	Project Management Consultant
PNPC	-	Provincial Nature Protection Committee
PPE	-	Personal Protective Equipment
PPTA	–	Project Preparatory Technical Assistance
PRR	-	Primary Regulation Range
PTL	-	Power Transmission Line
RCA	-	Rural Citizen Assemblies
RD	-	Ruling Document
REA	–	Rapid Environmental Assessment (ADB checklist)
RoW	-	Right of Way
RUz	-	Republic of Uzbekistan
SCADA	–	Supervisory Control and Data Acquisition
SEC	-	Statement on Environmental Consequences
SEE	-	State Environmental Expertise
SES	–	Sanitary and Epidemiological Services
SNPC	–	State Nature Protection Committee
SPS	-	Safeguard Policy Statement
SSEMP	-	Site Specific Environmental Management Plan
STD	-	Sexually Communicable Diseases
TA	–	Technical Assistance
TSS	-	Traction Substation
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UTY	-	O'zbekiston Temir Yo'llari

GLOSSARY

Glavgosexpertisa	State Department responsible for Conducting Environmental Expertise Under SNPC
Khokim	Governor of administrative unit
Khokimiyat	Regional government authority
KMK	National acronym for Construction norms and regulations
Makhalla	A community of neighbors, which is based on full independence and self-governance.
OVOS	National acronym for EIA assessment process
PZVOS	National acronym for Concept Statement on Environmental Impact
SanR&N	Sanitary - epidemiological norms and regulations
Som	Local currency
SNiP	Set of basic regulatory requirements and regulations governing the design and construction in all sectors of national economy of Uzbekistan
Uzbekenergo	Managerial body in the electric power and coal industries, which are major structural components of the national economy
Uzhydromet	State governing body specially authorized for the solution of tasks in the field of hydrometeorology in the Republic of Uzbekistan and in its activities, it is accountable to Cabinet of Ministers
ZVOS	National acronym for Statement on Environmental impact
ZEP	National acronym for Statement on Environmental Consequences

NOTE

In this report, "$" refers to US dollars.

EXECUTIVE SUMMARY

1. The Government of Uzbekistan (the government) and Joint Stock Company O'zbekiston Temir Yo'llari (UTY) have requested the Asian Development Bank (ADB) to provide additional financing for the Central Asia Regional Economic Cooperation (CAREC) Corridor 2 (Pap–Namangan–Andijan) Railway Electrification Project, for Modernization of Electrified Line Angren–Pap–Kokand–Andijan–Xonobod Railway Line.[1]

2. The railway network in eastern Uzbekistan consists of a loop linking Pap, Namangan, Andijan, Asaka, Margilan, and Kokand, and a line from Pap through the Kamchik tunnel to Angren and further on to Tashkent. A number of spur lines also extend into the Kyrgyz Republic and Tajikistan. These lines provide a vital connection for both passenger and freight transport, between major cities in the Fergana Valley (home to 9.5 million people), as well as to Tashkent and other regions of Uzbekistan. The lines are also part of regional transport corridors linking East Asia with Europe through Central Asia.

3. The current project is helping to install electrification, signaling and telecommunication systems on the 145.1 km section between Pap, Namangan and Andijan; it will broadly complete the electrification of the eastern section of Uzbekistan's railway network. However, permanent signaling and telecommunications systems are missing for the section between Andijan, Asaka, Margilan, Kokand, Pap and Angren, as well as on certain branch lines, greatly affecting the efficiency and safety of train operations. There are also limits on the number of trains that can be run, due to the shortage of, or capacity of traction substations. The proposed additional financing will address these critical needs.

4. The additional financing will provide for (i) the installation of signaling and telecommunications systems on the Angren–Pap–Kokand–Andijan-Xonobod line, including four branch lines adjacent to the main line,[2] (ii) construction of one new traction substation (TSS) and 2 sectioning posts (iii) the replacement of transformers in four TSSs that were constructed in 2010, and (iv) the upgrading of train control and management systems. Machinery and equipment will also be commissioned for maintenance of electrified lines and upgrading of Kokand Depot. These comprise the scope of the project.

5. The additional financing project is expected to be implemented within a period of approximately four years, commencing in 2020. The estimated completion date is December 2024.

6. The two new TSSs are being connected to 220 kV high-voltage (HV) line, which at the time of assessment was almost completed. It is anticipated that HV line will be fully completed by the beginning of the current project. Since this component was constructed without anticipation of the ADB's financing of the project, it is treated as an existing facility in the context of ADB's Safeguards Policy of 2009 (SPS 2009). The construction of HV line is being implemented by the Joint Stock Company National Electric Network (NES) of Uzbekistan, the successor to Uzbekenergo. Due diligence assessment was conducted for the external power supply in order to evaluate compliance with environmental requirements. The assessment showed that there is no need for development of a Corrective Action Plan.

7. **Project categorization.** In accordance with SPS (2009), the project is category B, as a project with site-specific impacts, few of which are irreversible, and where in most cases mitigation measures can be designed. The project requires an initial environmental examination (IEE), which will be based on data from the feasibility study, preliminary design,

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[1] O'zbekiston Temir Yo'llari (UTY), a joint-stock company (JSC), is the national railroad company of Uzbekistan, with a workforce of over 50,000 employees and over 3,500 km of railroad.

[2] From Kokand to the border with Tajikistan, from Margilon to the border with the Kyrgyz Republic, from Margilon to Fergana 1 station, and from Block Post 331 to border with Kyrgyz Republic. Furthermore, telecoms (but not signaling) will be installed on two more branch lines, namely Asaka-Shakhrikan, and Andijan 2-Tetakcai, in total of 33.3km.

site visits and interviews with technical experts, as well as primary and secondary data including feedback received during the public disclosure process.

8. In accordance with national environmental legislation, the original project (construction of the railway Angren-Pap, and electrification of the railway sections Angren-Pap-Andijan) belongs to Category 1 with respect to its environmental impact (high). The national classification defined category of the project is based on the scope of the railway (interstate and interprovincial levels). Before the commencement of construction for such projects, both an environmental impact assessment (EIA) and an environmental appraisal from the State Committee on Ecology and Environment Protection of Uzbekistan at the national level need to be received by the Executive Agency (EA). In this context, an environmental appraisal was already obtained on November 4, 2017, which endorses the environmental assessment and provides several conditions to be implemented by the EA during the construction phase. These requirements are included in the EMP.

9. Due diligence has been conducted for associated/existing facilities – Kokand Traction Substation and existing facility – 220 kV External Power Supply Lines for Kokand TSS and Asaka TSS. Based on the due-diligence findings corrective action plans are developed.

10. **Implementation arrangements.** The UTY will be the EA. It has a successful track record of implementing similar projects, as well as in the operation and maintenance of electrified and non-electrified lines. The PIU-ET will be the project implementation unit. Established by the UTY, it has experience with ADB procedures and policies, and will be responsible for project implementation. The technical departments of the UTY will also assist the PIU-ET during project implementation.

11. Although the project traverses through variable areas of high population density, agricultural lands and mountain regions, it does not traverse through any protected areas or buffer zones. Rare species of flora or fauna at the project site and along the ROW have not been identified.

12. **Project impacts.** Anticipated environmental impacts were reviewed at three stages – pre-construction, construction and operation. To identify impacts, an impact assessment matrix has been prepared. During the preconstruction stage, it is imperative to ensure that all necessary permits and approvals are received from government agencies, and that the IEE is fully updated (in case of changes in scope of work, project design etc.).

13. **Construction phase.** During the construction phase, primary impacts relate to waste generation, although these impacts can be mitigated through segregation, recycling and the proper disposal of residual waste. Although air pollution will have a permanent character, it can be mitigated. Increased noise levels are expected during construction, notably during TSS construction, however assessments indicate that noise levels at almost all construction sites will not exceed acceptable levels and will be in compliance with national and IFC standards. Additional actions and mitigation measures recommended in the IEE can also be implemented in case norms are exceeded for pollutant (dust), based on the results of environmental monitoring and any complaints from the population.

14. Labor camps may locate within residential areas, the territories of existing railway stations, or on construction sites. To conduct specific works related to the electrification of the railway, special mobile wagons may also be used to house workers. Measures are therefore included to mitigate anticipated negative impacts from labor camps.

15. Besides impacts on air, water and soil quality, a number of risks also relate to the community health and safety of workers. Safe working conditions, and compliance with sanitary, fire protection and other norms related to construction need to be provided in order to prevent accidents, including electric shocks during the construction stage. Contractors will

be required to develop an Occupation Health and Safety Plan, which will cover such topics as the usage of PPE, usage of fire protection equipment, and the handling of fiber cable. Training programs will be conducted based on relevant national regulations (KMKs, SanPiNs) and IFC EHS General Guideline (2007), IFC EHS Railway (2007).

16. All relevant national regulations relating to the implementation of construction works, and the IFC EHS General Guideline (2007) have to be complied with in order to minimize project impacts on community health and safety. The PIU-ET has to work in close collaboration with communities regarding the planning and implementation of project works.

17. **Operation phase.** To evaluate noise impacts during the operation phase, noise levels generated by the railway on buildings and premises located adjacent to the Angren-Pap-Fergana-Andijan railway were modeled. This included the instrumental measurement of baseline noise levels and three-dimensional (3D) expected noise propagation modeling for both the before-project and after-project scenario.[3] The modeling can be considered as conservative, as it did not take into account the walls and fences around buildings and structures that act as acoustic barriers.

18. Based on information provided by the Railway Department of Uzbekistan, twice as many trains cross the project zone at nighttime than during the day. As admissible noise levels are lower at night than during the day, the noise levels for most of the adjacent houses and buildings in the project zone exceed admissible levels. The noise modeling was done for 33 sections defined as sensitive receptors.

19. Conversely, noise modeling for the after-project scenario indicates that noise levels will reduce by 2-3 dB throughout the project area and be in accordance with the admissible limits of the requirements of IFC instructions. Additional mitigation measures to reduce noise levels are therefore not needed within the scope of the planned project.

20. **Climate change impact**. Economic modeling developed for the project under the TRTA provides estimations of GHG emissions both with and without the project. Thus, for the scenario where the additional traffic will be transported by diesel locomotives, GHGs emission in 2025 (the year of project commissioning) will be 31,086 teCO2/year.

21. For the same amount of traffic transported by the railway with increased capacity (after project implementation) however, GHGs emissions for the same year will be only 12,635 teCO2/year. The annual saving of CO_2 emissions will therefore be around 18,451 teCO2/year.

22. Only one alternative was reviewed – the scenario without the project. In that case, the capacity of the existing railway will not be able to respond to the growing demand in transportation for the region. To satisfy demand, the railway will have to combine electric and diesel locomotives. This will lead to a deterioration of air quality in the region due to emissions from diesel and the discharging of more GHGs.

23. Moreover, existing telecom and signaling systems would not be sufficient to ensure timely and safe communications between stations. This will create risks for effective railway operations and risks of accidents on the alignment.

24. Climate change risk assessment shows a tendency towards an increased frequency of emergency situations in mountainous areas, including mudflows and avalanches. Without the installation of warning systems included in the project, trains would therefore be at increased vulnerability to such events

25. **Information disclosure.** As part of information disclosure, a number of meetings were conducted with people living close to the TSS. During public consultations, two official meetings were conducted in settlements. Prior to the public consultations, several meetings

[3] The German software CadnaA was utilized for the modeling.

were also conducted with key stakeholders, such as the representatives of the province and district Khokimiyats, the UTY (PIU-ET's environmental and social specialist), design institutes and others. During the public consultations, the main findings of the environmental assessment, and land acquisition principles were presented. Recommendations provided by the participants were discussed with the engineering group, and they are included in the project as necessary.

26. **Institutional aspects.** Institutional The PIU-ET at the UTY will be responsible for the implementation of the EMP, to comply with ADB's safeguards requirements and environmental national regulations. For this, the PIU-ET has assigned a qualified full-time safeguard specialist, who will be assisted by the civil construction and environmental specialists of the supervision consultant (SC) in overseeing the implementation of the EMP. The following costs will be provided: (i) EMP implementation costs will be included in the construction contracts, (ii) environmental supervision costs will be included in the consulting services of the CSC, and (iii) environmental instrumental monitoring costs will be included in the PIU-ET budget. The PIU-ET is responsible for overall environmental compliance with SPS 2009.

27. Costs required for EMP implementation will cover the following: (i) implementation of instrumental environmental monitoring of air, water and noise levels by contractors, (ii) implementing environmental monitoring measures and obtaining necessary permissions, and (iii) implementing the awareness program.

28. **Conclusion and recommendations.** Conducted IEE for the proposed project "Electrification CAREC Corridor 2 (Pap-Namangan-Andijan) Railway Electrification Project – Additional Financing" showed that the project will play important role in stimulating economic growth in the Fergana Valley, and increasing regional trade along the CAREC Corridor 2. This will be achieved by increasing the capacity of the existing railway through the construction of two TSSs, the replacement of existing transformers, and the installation of telecom, signaling and SCADA systems.

29. Along with economic benefits, the project will result in a reduction of GHG emissions due to the transition from diesel to electric locomotives. Moreover, the installation of signaling, telecom and SCADA systems will contribute to more efficient railway operations, and improve communications between stations and the dispatch center located in Tashkent. Warning systems installed in mountainous areas will improve safety and minimize the negative impacts of climate change in view of the increase in the number of mudflows, landslides and avalanches.

30. As indicated in this IEE, negative impacts are site specific and will occur mostly during the construction phase. Noise modeling indicates that anticipated noise levels will not exceed current noise levels, and in some areas noise levels will decrease. Implementation of the EMP during the construction and operation phases will ensure that impact adversity is minimal.

31. During the operation phase, an environmental impact also relates to safety issues due to the increasing number of trains during the day and night. To mitigate this impact, a special safety program is being developed under the previous project: "Electrification Pap-Namangan-Andijan". This safety program will also therefore be implemented for this project.

32. Implementation of the project's grievance redress mechanism (GRM), coupled with close collaboration between the PIU-ET and involved communities will ensure that any project complaints are resolved professionally and expeditiously.

1. INTRODUCTION

1.1. Overview of the project

33. The Government of Uzbekistan (the government) and Joint Stock Company O'zbekiston Temir Yo'llari (UTY) have requested the Asian Development Bank (ADB) to provide additional financing for the Central Asia Regional Economic Cooperation (CAREC) Corridor 2 (Pap–Namangan–Andijan) Railway Electrification Project, for Modernization of Electrified Line Angren–Pap–Kokand–Andijan–Xonobod Railway Line.[4]

34. The railway network in eastern Uzbekistan consists of a loop linking Pap, Namangan, Andijan, Asaka, Margilan, and Kokand, and a line from Pap through the Kamchik tunnel to Angren and further on to Tashkent. A number of spur lines also extend into the Kyrgyz Republic and Tajikistan. These lines provide a vital connection for both passenger and freight transport, between major cities in the Fergana Valley (home to 9.5 million people), as well as to Tashkent and other regions of Uzbekistan. The lines are also part of regional transport corridors linking East Asia with Europe through Central Asia.

35. The current project is helping to install electrification, signaling and telecommunication systems on the 145.1 km section between Pap, Namangan and Andijan; it will broadly complete the electrification of the eastern section of Uzbekistan's railway network. However, permanent signaling and telecommunications systems are missing for the section between Andijan, Asaka, Margilan, Kokand, Pap and Angren, as well as on certain branch lines, greatly affecting the efficiency and safety of train operations. There are also limits on the number of trains that can be run, due to the shortage of, or capacity of traction substations. The proposed additional financing will address these critical needs.

36. The additional financing will provide for (i) the installation of signaling and telecommunications systems on the Angren–Pap–Kokand–Andijan-Xonobod line, including four branch lines adjacent to the main line,[5] (ii) construction of one new traction substation (TSS), completion of one existing TSS and 2 sectioning posts (iii) the replacement of transformers in four TSSs that were constructed in 2010, and (iv) the upgrading of train control and management systems. Machinery and equipment will also be commissioned for maintenance of electrified lines and upgrading of Kokand Depot. These comprise the scope of the project.

37. The project is aligned to the same impacts as the original project, namely "(i) stimulated economic growth in the Fergana Valley, and (ii) increased regional trade along CAREC Corridor 2". The outcome will be"level of rail passenger and freight service in, to and from the Fergana Valley improved."[6]

38. The additional financing is expected to add the following new outputs (#3-4) to the ongoing project, in addition to the existing 2 outputs of the ongoing project.

Output 1: Railway infrastructure along the Pap-Namangan-Andijan line upgraded.
Output 2: Safety of railway operations improved.
Output 3: Railway infrastructure along the Angren-Pap-Kokand-Andijan-Xonobod line upgraded.
Output 4: Train control and management system upgraded.

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[4] O'zbekiston Temir Yo'llari (UTY), a joint-stock company (JSC), is the national railroad company of Uzbekistan, with a workforce of over 50,000 employees and over 3,500 km of railroad.

[5] From Kokand to the border with Tajikistan, from Margilon to the border with the Kyrgyz Republic, from Margilon to Fergana 1 station, and from Block Post 331 to border with Kyrgyz Republic. Furthermore, telecoms (but not signaling) will be installed on two more branch lines, namely Asaka-Shakhrikan, and Andijan 2-Tetakcai, in total of 33.3km.

[6] ADB. 1998. Report and Recommendation of the President

39. ADB loan proceeds will cover expenses related to construction and equipment of traction substations and section posts; signaling and telecoms, for maintenance machinery and equipment.

40. The Project is expected to be implemented within a period of four years starting from 2020. Preparation and planning activities was done in 2019-2020. The estimated the project's completion date is December 2024.

1.2. The Need for Environmental Assessment

1.2.1. National requirements

41. The national Law "On Environmental Expertise" and Resolution of Cabinet Ministries (RCM) of Republic of Uzbekistan # 949 dated from 2018 requires conduction of Environmental Impact Assessment (EIA) for all type of activities which may have impact on environment. Initial project was categorized as category – electrification of the regional railway. Frist stage of the national EIA was conducted in 2018 and approval from the State Committee on Ecology and Environment Protection (SCEEP)[7]. Before commissioning two traction substations (TSSs) and two section posts, third stage – development of the Statement on Environmental Consequences has to be implemented. The document will be prepared by the design institute under UTY and will be submitted to the SCEEP for examination and approval.

1.2.2. Environmental requirements of ADB

42. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category B as the project with potential adverse environmental impacts which are less adverse than those of category A projects. The 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) is required, which will be based on data from the feasibility study, preliminary design, site visits and interviews with technical experts, as well as primary and secondary data including thus the feedback received during the public disclosure process.

43. The current Initial Environmental Examination (IEE) report provides the findings of IEE conducted as part of Transaction Technical Assistance (TRTA). The IEE is part of the process of compliance with ADB Safeguards Policy Statement (2009) in relation to the additional financing project – "Project".

44. The IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the Project. The IEE provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work.

45. More specifically, the IEE:

(i) Describes the existing socio-environmental conditions within the Project area;
(ii) Describes the project design, its components, construction activities and operational parameters;
(iii) Describes the extent, duration and severity of potential impacts;
(iv) Analyzes all significant impacts; and
(v) Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

[7] The SCEEP is new name of the State Committee of Nature Protection (SCNP)

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK AND STANDARDS

46. The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery for ADB's safeguards policy in relation to environmental safeguards. The ADB has adopted sets of specific safeguards requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff will ensure that borrowers' clients comply with these requirements during project preparation and implementation.

47. The safeguard requirement are operation policies that seek to avoid, minimize or mitigate the adverse environmental and social impacts of projects. ADB safeguard policy framework consist of three operational safeguard requirements: (i) environmental safeguards requirements, (ii) involuntary resettlements safeguards requirements, and (iii) Indigenous peoples safeguards requirements.

48. ADB's SPS 2009 provides for the environmental requirements and review procedures of ADB for all projects and grants they finance. SPS 2009 consists of three key safeguard areas, (i) environment, (ii) involuntary resettlement, and (iii) indigenous peoples; aims to avoid adverse project impacts to both the environment and the affected people; to minimize, mitigate and/or compensate for adverse project impacts; and to help Borrowers to strengthen their safeguard systems and to develop their capacity in managing the environmental and social risks.

49. During the project identification stage, ADB uses a categorization system to indicate the significance of potential environmental impacts and is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts within the project's area of influence. The project categorization system and the assessment required is described in **Table 1.**

Table 1: Environmental Classification and Assessment Requirements (ADB SPS, 2009)

Category	Definition	Assessment Requirement
A	Likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, and may affect an area larger than the sites or facilities subject to physical works.	Environmental impact assessment (EIA)
B	Likely to have adverse environmental impacts that are less adverse than those of Category A. Impacts are site- specific, few if any of them irreversible, and in most cases mitigation measures can be designed more readily than Category A.	Initial Environmental Examination (IEE)
C	Likely to have minimal or no adverse environmental impacts.	No environmental assessment is required but the environmental implications of the project will be reviewed.
FI	Project involves investment of ADB funds to or through a financial intermediary (FI).	FIs will be required to establish an environmental and social management commensurate with the nature and risks of the FI's likely future portfolio to be maintained as part of the FI's overall management system.

50. National Environmental Assessment was conducted in 2017. In compliance with Appendix 2 of the Cabinet Ministers' Decree of the RUz No. 949, (November 2018), project belongs to Category 1 respect to their environmental impact (high impact risk). Prior to construction such projects require to conduct an Environmental Impact Assessment and get

an Environmental Appraisal from the State Committee on Ecology and Environment Protection Committee (SCEEP) of Uzbekistan at the national level.

51. The Appraisal endorses the Environmental Assessment and provides several conditions needed to be implemented by the Implementation Agency during the construction phase and before the project commencement. The Appraisal is presented in Attachment 1.

52. The Environmental Appraisal lists the following issues which have to be reflected during the next stage of national Environmental Assessment:

- Pay attention to re-cultivation of disturbed lands, approved by provincial committee on nature protection;
- way of treatment of generated waste waters (from rehabilitated stations);
- undertaking activities on greenlining of the territory along railway;

53. The **Table 2** presents permissions from national agencies needed to be received prior commencement of civil works and prior the project operation:

Table 2: List of necessary approvals and permissions

#	Name of the document	Time of receiving permission	Agency issuing permission	Responsible entity
1	Permission/license for using existing borrow pits or opening new ones (if any)	Prior commencement of the construction works	Provincial Land cadastre department	Contractor
2	Permission on drilling ground water well	Prior drilling well	State committed on Geology and Mineral Resources	Contractor
3	Permission on water use	Prior starting use of well	Provincial State Committee on Ecology and Environment Protection	Contractor – for usage during construction and PIU-ET – for usage during operation phases
4	Statement on Environmental Consequences	Prior commissioning of Kokand and Asaka TSSs	Provincial State Committee on Ecology and Environment Protection	PIU-ET

2.1. National Institutional Framework for Environmental Assessment

54. The State Committee on Ecology and Environment Protection (SCEEP) of the Republic of Uzbekistan ('Goskompriroda') is the primary environmental regulator. The Goskompriroda reports directly to the Parliament and is responsible at national, regional (oblast) and local (district) levels for the development and enforcement of the national environmental and conservation policy, overseeing environmental compliance, the integrated environmental management across various sectors, and securing healthy environment conditions across the country.

55. The structure of Goskompriroda takes the form of a central body in Tashkent with regional branches and agencies providing scientific and technical support. Regional environmental authorities are structured similarly to the Goskompriroda.

56. Other state bodies of the Republic of Uzbekistan dealing with environment related issues are:

- Ministry of Water Resources (MWR)
- State Committee for Land Resources, Surveys, Cartography and the State Cadastre (or Goskomgeodezkadastr)

- State Committee for Geology and Mineral Resources (or Goskomgeologia)
- Centre of Hydro-meteorological Service (or Uzhydromet)
- Ministry of Health Republic of Uzbekistan (or MHRUz)
- State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector (or Sanoatgeokontekhnazorat)
- Ministry of Internal Affairs (or MVD).

2.2. National Legislation on the EIA

57. The national EIA procedure is regulated by the Law "On the Environmental Examination" and the Regulations "On the State Environmental Expertise" (SEE), approved by the Resolution of the Cabinet of Ministers No. 949 dated November 22, 2018. The Resolution specifies the legal requirements for EIAs in Uzbekistan. According to the Resolution, SEE is a type of environmental examination carried out by specialized expert divisions to set up the compliance of the planned activities with the environmental requirements and determination of the permissibility of the environmental examination object implementation.

58. The special authorized state body in the field of state environmental examination is the SCEEP. A SEE is carried out by the following specialized expert divisions of the SCEEP:

- The state unitary enterprise "The Center of the State Environmental Examination" of the State Committee for Environmental Protection, hereinafter referred to as "The Center of the State Environmental Examination SUE";
- The state unitary enterprise "The Center of the State Environmental Examination" of the Republic of Karakalpakstan; and
- The state unitary enterprises "The Center of the State Environmental Examination" of regions and Tashkent city.

59. "The Center of the State Environmental Examination SUE" carries out the state environmental examination of EIA of the objects of economic activity classified as the I and II categories of environmental impact (high and medium risk).

60. The state unitary enterprises "The Center of the State Environmental Examination" of the Republic of Karakalpakstan and regions carry out environmental examination of EIA of the objects of economic activity classified as the III and IV categories of environmental impact (low risk and local impact).

61. The regulations describe the procedure of arrangement and carrying out of the SEE (Annex 1 to RCM) and the procedure of the SEE (Annex 2 to RCM). The three stages of the EIA and their required results are summarized as follows:

- ✓ **Stage I:** "A Preliminary Statement of the Environmental Impact ("PSEI") shall be carried out at the planning stage of the proposed project prior to the allocation of funds for development.
- ✓ **Stage II:** "A Statement of the Environmental Impact" ("SEI") shall be prepared in due time, in conclusion, by Glavgosekspertiza / State Environmental Expertise at the stage I, to conduct the required additional studies or analyses. The Conclusion shall be submitted to Glavgosekspertiza / State Environmental Expertise prior to the approval of the feasibility study of the project and, therefore, prior to the beginning of the construction.
- ✓ **Stage III:** "State Environmental Consequences" ("EPZ") is the final stage of the SEE process and shall be carried out prior to the start of the project. The report describes in detail the changes in the project made as a result of the analysis of the Glavgosekspertiza / State Environmental Expertise during the

first two stages of the EIA process, the comments received during public consultations, the environmental standards applicable to the project, and the environmental monitoring requirements related to the project, as well as the main conclusions.

62. All types of SEE economic activities are classified into one of four categories:

- Categories I and II are "high and medium risks of environmental impact" (SEE will be within 30 days, all stages of EIA are required);
- Category III is "Low risk of impact" (all stages of EIA are required); and
- Category IV – "local impact" (only the first stage of EIA – PSEI is required).

63. According to paragraph 24 of the "Regulations on SEE", the positive conclusion of a SEE is a mandatory document for opening of financing by banks and other credit institutions, and execution of implementation of the object of the state environmental examination by legal entities and individuals. The Conclusion of the SEE shall be valid for three years from the date of its issuance. If the object is not implemented within three years from the date of issue of the Conclusion, the EIA report needs to be revised and re-submitted to the Center of the State Environmental Examination for revision and approval.

64. The Conclusion of the SEE shall be sent to the relevant regional (city) control inspections in the field of ecology and environmental protection for control. Such inspections under the SCEEP supervise the compliance with the requirements and conditions specified in the Conclusion of the SEE.

65. As per national legislation the project belongs to Category 1 with respect to the environmental impact (high impact risk)[8]. Prior to commencing construction, such project therefore requires the conduct of an Environmental Impact Assessment and Environmental Appraisal from the SCEEP at the provincial level. As mentioned earlier, Environmental Assessment received for this project.

2.3. Environmental regulatory framework

66. The major emphasis of the environmental policy of Uzbekistan is on environmental safety being regarded as a strategic component of national security, and the most important aspect of protecting the vital interests of the state, society and identity. The environmental safety policy of the country is based on the Constitution, national laws, the National Security Concept of the Republic of Uzbekistan, the principles of the Rio de Janeiro Declaration on Environment and Development and the Johannesburg Declaration on Health and Sustainable Development with due regard of national commitments under international conventions and agreements, as well as legislative experience of leading countries.

67. Since the country gained independence, RUz has developed over 100 laws and regulations, and revised old Soviet legislation and policies. One of the country's objectives is the transition to sustainable social and economic development. For this purpose, RUz has revised and improved the national environmental legislation, enacted new environmental laws and regulations, developed programs and action plans to address environmental issues and promoted sustainable use of natural resources.

68. Legal Framework in the field of Nature Protection and Management established in Uzbekistan, provides to the citizens the rights and duties specified in the country's Constitution. Specific articles that address environment protection issues within the Constitution are:

- Article 50. All citizens shall protect the environment

[8] Appendix 2 of the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 949 dated November 22, 2018 "On the Approval of the Regulations on the State Environmental Expertise"

- Article 51. All citizens shall be obliged to pay taxes and local fees established by law
- Article 54. Any property shall not inflict harm to the environment
- Article 55. Land, subsoil, flora, fauna, and other natural resources are protected by the state and considered as resources of national wealth subject to sustainable use.

69. Uzbekistan has enacted several supporting laws and statutes for environmental management, and is party to several international and regional environmental agreements and conventions. The key national environmental law is the Law on Nature Protection (1992). A brief description of this law and the other supporting laws related to environmental protection is presented below.

70. The law **"On nature protection"** (1992) states legal, economic, and organizational bases for the conservation of the environment and the rational use of natural resources. Its purpose is to ensure balanced relations between man and nature, to protect the environmental system and to guarantee the rights of the population of a clean environment. Article 25 of this law states that State Environmental Expertise (SEE) is a mandatory measure for environmental protection, preceded to decision-making process. In addition, article 25 says that the implementation of the project without a positive conclusion of SEE is prohibited.

71. Law of the Republic of Uzbekistan **"On Atmospheric Air Protection"** (1996, amended on 10.10.2006). It describes regulations on atmosphere protection and its objectives. It specifies standards, quality and deleterious effect norms, requirements on fuels and lubricants, production and operation of vehicles and other transport means and equipment, ozone layer protection requirements, obligations of enterprises, institutions and organizations toward atmospheric protection, and compensations for damages from atmospheric pollutions.

72. Law of the Republic of Uzbekistan **"On water and water use"** (1993). It regulates the water relations, rational use of water by the population and economy. The law regulates the protection of waters from pollution and depletion, and prevention and liquidation of harmful effects of water, improvement of water bodies and the protection of the rights of enterprises and institutions, organizations and dehkan farms and individuals in the field of water relations.

73. **Land Code of the Republic of Uzbekistan** (1998). It aims to regulate land relations in order to ensure that present and future generations have science-based, sustainable use and conservation of land, breeding and improvement of soil fertility, conservation and improvement of the environment and creating conditions for equitable development of all forms of management, the protection of individuals and legal entities' right for land, as well as strengthening the rule of law in this area.

74. **Law on Wastes** (2002, as amended on 2011). It addresses waste management, exclusive of emissions and air and water pollution, and confers authority to the SNPC concerning inspections, coordination, ecological expertise and establishing certain parameters with regard to the locations where waste may be processed. Enterprises are responsible for their waste, but, if they recycle, they may be provided with assistance from the state budget, the National Fund for Nature Protection or voluntary payments. The principal objective of this law is to prevent negative effects of solid wastes on people's lives and health, as well as on the environment, reduce wastes generations, and encourage rational use of waste reduction techniques in household activities.

75. Other laws and standards applicable for the current project are:

- Law on Protection and Usage Objects of Archeological Heritage (2009);

- SanR&N RUz No.0179-04. List of Maximum Allowable Concentrations (MACs) of pollutants in ambient air of communities in the Republic of Uzbekistan including Annex 1;
- ShNK 4.02.33-04 Transmission lines;
- ShNK 4.02.67-07 Electric installation works. Repair and construction works;
- KMK 2.01.11-97 Engineering protection of the territories, buildings and constructions against the hazardous geological processes. Main provisions of the design KMK 3.05.06.97 "Electrotechnical devices";
- KMK 3.01.02-00 * "Safety measures in construction";
- The Rules for Electrical Equipment Installation, Tashkent, 2004;
- RD (Guidance Document) 34.20.501-05. Operating Rules for the Power Plants and Electric Networks;
- RD (Guidance Document) 34.03.202.95. Safety Rules for the Electrical Equipment Operation;
- SanR&N 0236-2007 "Sanitary norms and rules (SNR) on the effects of the electric field generated by overhead transmission lines of alternating currents of industrial frequency";
- "Instructions for design of fire protection of the power enterprises"
- "Rules of organization and technical operation of the contact network of the electrified railways of SJSRC "Uzbekiston Temir Yullari";
- SanR&N No.0267-09 Admissible noise level into the living area, both inside and outside the buildings;
- "O'z DSt 1057:2004 Vehicles. Safety requirements for technical conditions" and "O'z DSt 1058:2004 Vehicles. Technical inspection. Method of control";
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Approval of the collection and disposal of used mercury-containing lamps. No. 266 of 21.09.2011;
- Decree of Cabinet Ministries of RUz on the procedure of settlement usage of biological resources and procedure of issuing permits in the field of nature use, No. 290 of 20.10.2014.
- Sanitarian Rules and Norms #0172-06. Hygienic requirements for protection of surface water on the territory of the Republic of Uzbekistan

Nosie and vibration level standards

76. National and international noise standards are presented in the **Table 3**. National norms comply with international for both – day time (55 dB) and night time (45 dB) for residential area and they are stricter for offices on 10 dB.

Table 3: Comparison table of national and international standards of maximum allowable noise standards (dB)

Receiver	National[9]		International[10] (IFC)	
	Day time (7.00 am – 11 pm)	Night time (11.00 pm – 7.00 am)	Day time (7.00 am – 10.00 pm)	Night time (11.00 pm – 7.00 am)
Residential	55	45	55	45
Offices, commercial	60	-	70	70

77. According to KMK 2.10.08-96, acceptable equivalent noise level generated from transport (road, rail, air) is on 10 dB higher than noise level indicated in Table 3 for day time.

[9] Sanitarian Norms and Rules (SanPiN) # 0267 (2007) SanR&N No.0267-09 Admissible noise level into the living area, both inside and outside the buildings, and KMK 2.01.08-96 Protection from Noise, Table 1

[10] IFC EHS Guidelines, General EHS Guidelines: Environmental, Noise, Table 1.7.1

78. The IFC EHS does not provide standards for noise from trains. The IFC indicates only noise standards for living, offices and commercial (Table 3). Therefore, for new construction are standards indicated in Table 3 have to be applied. For existing alignment, which will be upgraded under the current standards, IFC requirements "that noise impact should not result in a maximum increase in background levels of 3 dB at the nearest location off site" (IFC, General EHS Guideline, 2007, Chapter 1.7).

79. National standards ***for vibration*** level in residential houses are provided in Sanitarian Norms and Rules (SNR) № 0146-04 "Design of the living houses in climatic conditions of Uzbekistan". For living houses the standards is 67 dB for night time and 72 dB for day time with frequency in 37 and 61 Hz. For the non-continuous vibration, the standards should decrease on 10 dB (**Table 4**).

Table 4: National standards for vibration

	Permanent vibration, dB
Day time	72
Night time	67

80. International standards for impact of vibration on people and structure are provided in Transportation and Construction Vibration Guidance Manual (2013). California Department of Transportation Division of Environmental Analysis Environmental Engineering Hazardous Waste, Air, Noise, Paleontology Office developed the Manual.

81. The manual provides vibration level on people and houses and on structures (**Table 5**). FTA's standards for impact on people is stricter than national, therefore, these standards are used for evaluations. Since number of trains per day will be less than 70, vibration level for infrequent events (80 dB) is used as a standard for operation period and 72 dB – for construction phase.

Table 5: Federal Transit Administration (FTA) Vibration Impact Criteria

Land Use Category	Vibration Impact Level for Frequent Events (VdB)	Vibration Impact Level Infrequent Events (VdB)
Category 1: Buildings where low ambient vibration is essential for interior operations	65	65
Category 2: Residences and buildings where people normally sleep	72	80
Category 3: Institutional land uses with primarily daytime use	75	83

Note: "Frequent events" is defined as more than 70 events per day. "Infrequent events" is defined as fewer than 70 events per day.

82. More standards are provided in general guidance on human response to building vibrations is given in AS 2670.2–1990 "Evaluation of human exposure to whole-body vibration—continuous and shock-induced vibration in buildings (1 to 80 Hz), ISO 2631–2:2003 Mechanical vibration and shock— evaluation of human exposure to whole body vibration—Part 2: Vibration in buildings (1 Hz to 80 Hz), BS 6472 –1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting. Based on these guidelines, ground vibration limits are presented in **Table 6**.

Table 6: Ground vibration limits for human comfort[11]

Category	Period	Peak component particle velocity (mm/s)	Vibration, dB
Residential	Night-time	0.2 mm/s	72
	Daytime	0.3 mm/s	76
Offices	When occupied	0.6 mm/s	82
Occupied non-sensitive sites, such as factories and commercial premises[a]	When occupied	2.5 mm/s	94

mm/s = millimeters per second

[a] A 'sensitive site' includes houses and low-rise residential buildings,theatres, schools, and other similar buildings occupied by people.

83. The **Table 7** presents maximum continuous vibration level for preventing damages for different type of buildings. This data could be used as thresholds for both phases – construction and operation for structural integrity of buildings/houses.

Table 7: Maximum continuous vibration levels for preventing damage (mm/s)

Description of building type	AASHTO (1990)		SAS (1992)	
	mm/s	dB*	mm/s	dB*
Historic sites or other critical locations	2.5	94	2.5	94
Residential buildings with plastered walls / Building with foundation walls and floors in concrete, wooden ceilings and walls in masonry	5.1-7.6	100-104	5.1	100
Residential buildings in good repair/ Building with foundation walls and floors in concrete, walls in concrete or masonry	10.2-12.7	106-108	7.6	100
Engineered structures without plaster / Buildings in steel or reinforced concrete	25.4-38.1	114-118	12.7	108

AASHTO = American Association of State Highway and Transportation Officials, SAS = Swiss Association of Standardization

Note: Converting into dB was done based on formula provided in para 70

Source: California Department of Transportation (2013), US Transportation Research Board (2012)

84. To convert vibration level presented in dB into vibration velocity presented in mm/s and vice versa the following formulas were used[12]:

i. $V_{dB} = 20 * Lg10(V) + 86$

ii. $V = 10^{(V_{dB}-86)/20}$

iii. Where the V_{dB} – vibration level in dB and V – vibration velocity in mm/s

85. Based on above analysis, and taking in account presence only living houses and industrial facilities along the railway, more stringent standards have been accepted for assessment of vibration – national standards: for day time – 0.2 mm/s (which is equivalent 72 dB) and for night time - 0.1 mm/s (which is equivalent 65 dB) indicated in the **Table 7**.

86. SanR&N RUz No.0179-04 - Hygienic norms. List of Maximum Allowable Concentrations (MAC) of pollutants in ambient air of communities in the Republic of Uzbekistan including Annex 1" defines standards for the main pollutants in the living area (**Table 8**).

[11] https://industry.gov.au/resource/Programs/LPSD/Airborne-contaminants-noise-and-vibration/Vibration/Pages/Ground-vibration-limits.aspx

[12] http://vibrocenter.ru/vibroacc.htm

Table 8: Summary of the relevant Ambient Air Quality Standards for Protection of Human Health (mg/m³)

Air quality parameter	Maximum allowed during 30 min	Maximum allowed average day	Maximum allowed average monthly	Maximum allowed average year
NO_2	0.085	0.06	0.15	0.04
NO	0.6	0.25	0.12	0.06
SO_2	0.5	0.2	0.1	0.05
CO	5	4	3.5	3
Dust (PM_{10})	0.15-0.5	0.1-0.35	0.08-0.2	0.05-0.15

87. The WHO standards[13] are presented in the **table** below.

Table 9: WHO standards for air quality

Air quality parameter	Period	Guideline value mg/m³
SO_2	24 hours 10 minutes	20 500
NO_2	1 year 1 hour	40 200
PM_{10}	1 hour 24 hours	50 20
$PM_{2.5}$	1 hour 24 hours	25 10

88. The air quality standards recommended to use for assessment of ambient air quality is presented in **Table 10**.

Table 10: WHO Ambient Air Quality Guidelines (General IFC Guidelines ,2007)

Pollutant	Average Period	Guideline value in µg/m³	Guideline value mg/m³	Source of standards
SO_2	10 min	500	0.5	WHO
	30 min	500	0.5	Uzbekistan
	24 hour	20	0.02	WHO
	1 month	500	0.5	Uzbekistan
	1 year	50	0.05	Uzbekistan
NO_2	10 min	200	0.2	IFC/Uzbekistan
	30 min	85	0.085	Uzbekistan
	24 hours	60	0.06	Uzbekistan
	1 month	50	0.05	Uzbekistan
	1 year	40	0.04	WHO /Uzbekistan
NO_x	30 min	600	0.6	Uzbekistan
	24 hours	250	0.25	Uzbekistan
	1 month	120	0.12	Uzbekistan
	1 year	600	0.6	Uzbekistan
CO	30 min	5000	5.0	Uzbekistan
	24 hours	4000	4.0	Uzbekistan
	1 month	3500	3.5	Uzbekistan
	1 year	3000	3.0	Uzbekistan
PM_{10}	1 year	20	0.02	WHO
	24 hour	50	0.05	WHO
PM_{25}	1 year	10	0.1	WHO
	24 hour	25	0.025	WHO

[13] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Clobal Update 2005, Summary of Risk Assessment

2.4. International Legislation

89. It is important that the Project meets international lending requirements. The following international guidelines are relevant to the Project and will be considered during the EIA process:

- ADB's Safeguards Policy Statement (June 2009);
- ADB´s Operations Manual Bank Policies: Safeguard Policy Statement (March 2010);
- ADB`s Environmental Safeguards a Good Practice Sourcebook Draft Working Document (December 2012);
- Guidelines for estimating greenhouse gas emissions of Asian Development Projects (additional guidance for transport project), (2016);
- Transport Emissions Evaluation Model for Projects developed by Clean Air Asia, together with ITDP, ADB, Cambridge Systematics and UNEP-GEF.

2.4.1. World Bank IFC Environmental, Health and Safety Guidelines

90. ADB Safeguard Policy Statement indicates that during the design, construction and operation promoter must apply pollution prevention consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group´s Environment, Health and Safety Guidelines.

91. In this project, the following IFC (World Bank Group) EHS guidelines have been taken into account to:

- *General EHS IFC guideline (2007)* – (i) provide prevention and control measures for each source of pollution applicable to this type of industry Environmental Monitoring programs; and (ii) provide occupational health and safety sources of threats, prevention and control measures and monitoring;
- *EHS IFC Railway (2007);*

92. The GAP analysis between ADB environmental safeguards requirements and national legislation is provided in **Table 11**. The table also presents information how the identified GAP have been harmonized.

Table 11: Gap analysis between ADB safeguards requirements and Uzbek national environmental legislation

Aspect	Asian Development Bank	National Uzbek Regulations	Harmonized Framework
Environmental Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: i. Environmental safeguards, ii. Involuntary resettlement safeguards, and iii. Indigenous people safeguards	Environmental assessment and permitting procedure in Uzbekistan is set out in the following laws and regulations: i. The Law on Nature Protection (1992); ii. The Law on Environmental Expertise (2000), and iii. Resolution of Cabinet Ministries (RCM) # 949 (2018)	
Screening	ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose using REA checklist. Categorization into Category A, B, C, FI	The category of the project is defined in accordance with Appendix 1 to RCM # 949. The Appendix provides a list of activities divided on 4 categories.	The Project is Categorized in to 'Category B' (ADB classification) and category 2 (national legislation)
Scoping	Avoid, minimize, mitigate and/or offset for adverse impacts and enhancement of positive impacts through environmental planning and management	The environmental assessment should evaluate: (i) compliance of proposing project with environmental requirements, (ii) level of risk related to project implementation on people's health and environment, and (iii) efficiency of developed measures to mitigate identified impacts.	Conduct a process of Environmental Assessment that will consider in an integrated manner the potential environmental (including labor, health, and safety) risks and impacts of the project.
	EA takes into account potential impacts (direct, indirect and cumulative) and risks on physical, biological, resettlement, socio-economic (including health and safety), and physical cultural resources	Environmental assessment considers the project's potential impacts on the **physical, biological, socio-economic and cultural resources, including cumulative impacts.**	The Environmental Assessment will take into account natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts Consider no project alternative.	For the ZVOS (national Environmental Assessment), consideration of **alternatives** is required. Alternatives that may be assessed include alternatives in; processing, technical design, location of the facility, architectural and planning options. Another mandatory requirement is consideration of the **zero option.**	Assessment of alternatives will include the location and design.

Aspect	Asian Development Bank	National Uzbek Regulations	Harmonized Framework
EIA Report	Guidelines and Table of Contents are provided for EIA report in SPS (2009): (i) Executive Summary, (ii) Policy, Legal and Administrative Framework, (iii) Description of the Project, (iv) Description of the Environment, (v) Anticipated Environmental Impacts and Mitigation Measures, (vi) Analysis if Alternatives, (vii) Information disclosure, Consultations, and Participation, (viii) Grievance Redress Mechanism, (ix) Environmental Management Plan, and (x) Conclusion and Recommendation. EMP will include proposed mitigation measures, monitoring and reporting requirements, institutional arrangements, schedules, cost estimates and performance indicators	The RCM # 949 defines activities which are needed to be undertaken under ZVOS preparation. Description of undertaken activities needs to be included into the ZVOS report. The RCM requires conduction of the followings: (i) assessment of existing environmental conditions and socio- economic conditions, (ii) project description, (iii) anticipating discharges, emissions, wastes, their impact on environment and way disposal, (iv) collection, storage and disposal of wastes (v) analyst of alternatives, (vi) institution, technical and technological mitigation measures, (vii) analyze of emergency risk, probability of occurrence and emergency containment measures, (vii) forecast of changes in environment after project commences operation. The complexity of the report depends on category of the project.	The IEE and EMP reports will follow the table of contents proposed in ADB's SPS (2009).
Public Consultations	Carry out meaningful consultation with affected people and facilitate their informed participation Ensuring women's participation in consultation. Involving stakeholders, project- affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account The consultation process and its results are to be documented and reflected in the environmental assessment report	Public meetings are held if required at the time of the ZVOS (second stage). But this requirement is not mandatory. The need for public consultations is identified at the time of the PZVOS. Participants at public meetings include the author of the PZVOS, the project developer and stakeholders. Public consultation meetings have to be announced in the media. If Public Consultation have been conducted, the results of the public meetings are formalized by the minutes and verified by the signatures of the attendees. The minutes of the public meeting or the shorthand records shall be attached to the materials of draft IEE. As a result of the public meetings, the people have an opportunity to state their proposals, to	Consultations will be carried out with the stakeholders, affected people, NGOs. Questions and concerns raised during public consultations held in Feasibility stage is considered. Rural Citizen Assembly level consultations will be held with the affected people with inviting the main stakeholders. All questions and concerns raised during public consultation will be included in IEE. Signed list of participants, photos from meetings will be attached to this IEE.

Aspect	Asian Development Bank	National Uzbek Regulations	Harmonized Framework
		influence on the decision making and if required to appeal for their reconsideration	
Public Disclosure	Draft IEE will be published in ADB website	National environmental legislation does not require publishing PZVOS (ZVOS).	IEE report (English and Russian) will be published in ADB and UTY websites. The copies of the IEE report will be made available with the district hokimiyats and Angren, Pap, Kokand, Andijan branch of State Committee on Ecology and Environment Protection.
Monitoring and Reporting	The borrow/client has to monitor and measure the progress of implementation of the EMP and prepare periodic monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions if any	Monitoring of implementation of mitigation measures developed under IEE is responsibility of design company developed Feasibility Study (author's supervision). External monitoring could be conducted by Representatives of State Nature Protection. There are no requirements on submission report during construction period in national environmental legislation	Environmental Monitoring Plan will be developed under this IEE to monitor implementation of EMP requirements. The IEE also includes requirements on preparation of semi-annual Environmental Monitoring Reports and their submission to ADB for further disclosure on ADB and UTY's websites.
Grievance Redress Mechanism	The GRM has to be established to receive and facilities resolution of affected peoples' concerns, complaints, and grievances about the project/s environmental performance.	A grievance redress procedure in Uzbekistan is also regulated by the national legislation of Republic of Uzbekistan, in particular by the law "On Citizens' Applications" and the "Law on the order of submission of appeals of physical and legal entities" ((#378, 03 December 2014), and others	The GRM for this project will be developed on ADB requirements with taking into account national requirements

2.4.2. International conventions

93. The Republic of Uzbekistan has ratified the following international conventions that are part of this IEE. These are shown in the **Table 12** below. Fulfillment of the terms of these commitments contributes to environmental sustainability, attracts external funding for the stabilization and prevention of degradation of natural resources and cultural heritage, and enhances the country's capacity to use its natural and cultural resources as a basis for poverty reduction and socio-economic development.

Table 12: Uzbekistan Republic participation in international conventions relevant to the Project

International Conventions and Treaties	Date of Ratification	Date of coming into force for Uzbekistan	Main objectives
United Nations Framework Convention on Climate Change	20 June 1993 (acceptance)	21 March 1994	Stabilizing greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.
Kyoto Protocol	20 August 1999	16 February 2005	Setting internationally binding emission reduction targets.
United Nations Convention Combat Desertification	31 August 1995	29 January 1996	Reversing and preventing desertification and land degradation in affected areas in order to support poverty reduction and environment sustainability.
United Nations Convention on Biological Diversity	6 May 1995 (accession)	17 October 1995	Conservation of biodiversity, sustainable use of its components, and equitable sharing of the benefits.
Convention on the Conservation of the World Cultural and Natural Habitats	22 December 1995	15 June 1996	Protection of natural and cultural heritage.
Convention on International Trade in Endangered Species of Wild Fauna and Flora	25 April 1997 (accession)	8 October 1997	Ensuring that international trade does not threaten wild animals and plants.
Convention on the Conservation of Migratory Species	1 May 1998 (accession)	1 September 1998	Global platform for the conservation and sustainable use of migratory animals and their habitats.
Ramsar Convention on Wetlands of International Importance Especially as Wildlife Habitat	30 August 2001 (accession)	8 February 2002	Conservation and wise use of all wetlands through local and national actions and international cooperation to achieve sustainable development.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	22 December 1995 (accession)	7 May 1996	Regulation, reduction and restriction of hazardous wastes transboundary movement.
Stockholm Convention on Persistent Organic Pollutants	22 May 2001	8 May 2019	The Convention is a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have

International Conventions and Treaties	Date of Ratification	Date of coming into force for Uzbekistan	Main objectives
			harmful impacts on human health or on the environment.

3. PROJECT DESCRIPTION

3.1. Existing situation

94. The existing electrified Andijan-Kokand-Pap-Angren-Xonobod railway line runs through the territory of four provinces – Andijan, Namangan, Ferghana and Tashkent (**Figure 1**). The total length of the railway is 306 km. Andijan's section of the railway is about 27 km, Ferghana's is about 131 km, Namangan's 86 km and Tashkent part's is 62 km. The railway line runs through settlements, agricultural lands and mountain areas. The project starts from Andijan-1 station located in Andijan city and crosses the following stations and settlements with the same name: Asaka (Andijan province), Kuva, Akravad, Akhubabaev, Margilan, Altyarik, Mekhnatabad, Furqad, Kakir, Buvayda (Ferghana province), Pap (Namangan province) and Angren (Tashkent).

95. The existing railway line is a single-track line. The section has 13 separate points, two of which are sectional stations (Kokand station and Andijan-1 station), and others – intermediate stations. The total number of artificial structures is 561 (Pap-Andijan – 326 and Angren-Pap – 263), of which 45 are bridges, 9 are galleries, and 531 are pipes. There are also 8 passages in the section of Angren-Pap. The entire section under consideration has 59 crossings, of which 37 are non-guarded, and 22 are guarded.

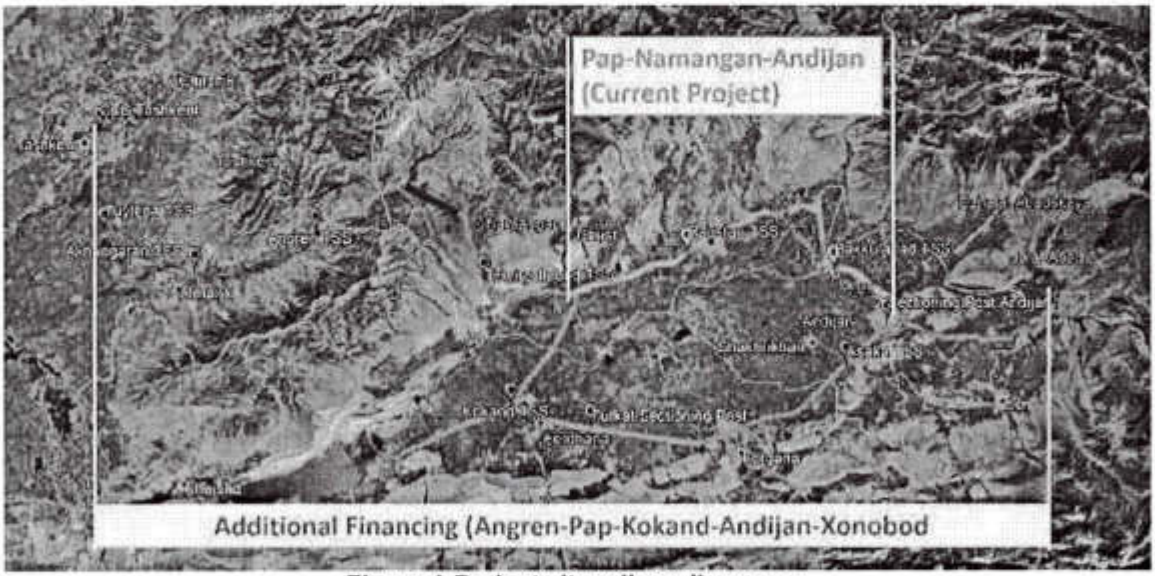


Figure 1:Project site railway lines map

96. Based on technical parameters, the railway is divided into two sections: Angren-Pap and Pap-Andijan. The first section meets the requirements of Category II Railway Lines Code for lines with a speed of up to 80 km/h, while the second part – category III with a speed up to 120 km/h. The major parameters of the railway line (Pap-Andijan) are given in the **Table 13**.

Table 13: Parameters of the railway

№	Name	MU	Indicators by sections							
			Pap (exclusively)-Buvaida	Buvaida-Kokand	Kokand-Altiarik	Altiarik-Margelan	Margelan-Ahunbabaeva	Ahunbabaeva-Asaka	Asaka-Andijan 1	Pap (exclusively)-Andijan (inclusively)
	Pap-Andijan									
1	Category of the railway line		II	II	II	II	II	II	II	II
2	Operational length	km	20,38	23,61	51.84	18.64	2.96	46.08	17.94	181.45
3	Number of artificial (engineering) structures									
	total		15	22	137	34	4	39	85	299
	including pipes	pc	12	18	124	31	4	34	83	296
	bridges and passes	pc	3	4	13	3	-	5	2	30
	galleries	pc	-	-	-	-	-	-	-	-
4	Level-crossings	pc	5	9	11	3	1	7	6	42
5	Permanent way									
	sleepers		reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE	reinforced concrete, FASTENING OF KB TYPE
	rails		P65	P65	P65	P65	P65	P50-P65	P50	P50-P65
	ballast		Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL	Ballast stone/ SANDY GRAVEL
6	Signaling and telecom system		Semi-automatic blocking, Fiber Optic Cable 2B-12-3	Automatic Blocking -14 FIBER OPTIC CABLE 2B-12-3	Automatic Blocking-14 FIBER OPTIC CABLE 2B-12-3	Automatic Blocking -14 FIBER OPTIC CABLE 2B-12-3	Automatic Blocking -14 FIBER OPTIC CABLE 2B-12-3	РПБ ГТСС, FIBER OPTIC CABLE 2B-12-3	РПБ ГТСС, FIBER OPTIC CABLE 2B-12-3	РПБ ГТСС, FIBER OPTIC CABLE 2B-12-3

97. As per the financial analysis for this Project, adopted World Bank forecast14 expected freight and passenger traffic estimates for Ferghana valley are provided in Table 13. It has been assumed that 30% of the total rail freight traffic will use the Pap-Namangan-Andijan route (i.e. the Northern loop) post electrification, and 70% of the traffic will be transported via Kokand and Margilan (i.e. the Southern loop).

[14] 2015. Uzbekistan - Pap-Angren Railway Project, Project Appraisal Document. Washington DC

98. For passenger traffic, the World Bank estimated that the number of annual passenger journeys would increase from 0.7 million in 2018, to 1.7 million in 2030, and to 2.6 million in 2040. Only a proportion of these journeys will be on the electrified Pap-Angren line (Northern loop). The World Bank forecasts assume an annual growth rate of 3.5% up to 2030, and increasing to 4.3% per annum after that. Table 14 shows that the average annual growth in passenger journeys on the UTY network, which has been above 4.3% for most years. Given this, and expected annual GDP growth of 5%, the World Bank estimates of rail passenger journeys and annual growth rates in the Fergana Valley are considered reasonable.

99. According to the World Bank Pap-Angren report, the UTY will have to operate 5 train pairs a day (10 trains in total) in the Fergana Valley by 2040 in order to meet the expected passenger forecasts. Based on current traffic levels in the Northern and Southern loops, it has been estimated that 4 trains per day will have to operate on the Northern loop, and 6 per day on the Southern loop. Based on these service numbers and train capacity, it has been estimated that around 62% to 68% of passenger journeys will be on the Pap-Margilan-Andijan electrified route (Southen loop). The forecast annual passenger journeys are given in **Table 14**

Table 14: Freight and passenger traffic estimates

(Mln. Tons and mln passenger's)	2018	2020	2030	2040
Ferghana valley				
Freight	4.6	6.7	13.4	19.8
Passenger	0.7	1.2	1.7	2.6
Pap-Kokand-Margilan-Andijan				
Freight	3.22	4.69	9.38	13.86
Passenger	0.455	0.78	1.1	1.69

Source: World Bank, 2015

3.2. Project components

100. Under the project electrification of the Angren-Pap-Margilan-Andijan-Xonobod (APMA) railway track section, the following activities will be implemented:

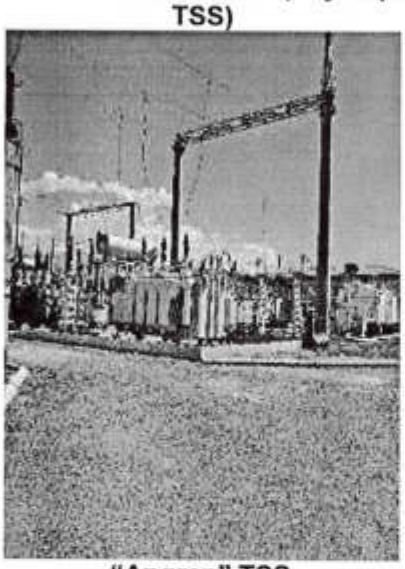
- Construction of Asaka TSS and completion of Kokand TSS;
- Transformer upgrades for 4 TSSs (Akhangaran, Angren, Toytepa and Temiryolobod);
- Construction of 2 section posts;
- Installation of SCADA signalling, and telecommunications systems;
- Provision of machinery/equipment for maintenance.

101. In addition to the main Angren-Pap-Margilan-Andijan railway track section, the project will provide signaling and telecom systems for the following branch lines:

- Kokand – Suvanabad;
- Margilon – Fergana 1 station;
- Axunbabaev – Fergana 2 station – Kuvasoy;
- Block post 331km to Hanobod.

"ECHE-1 Razezd-135" (Toy-Tepa TSS)

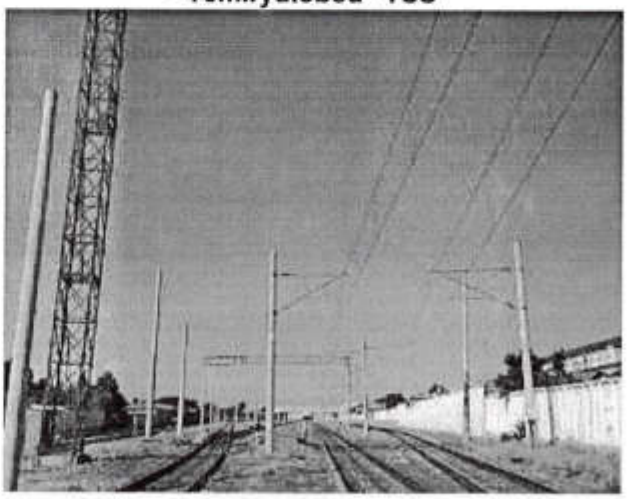
"ECHE-3 Oxangaron"



"Angren" TSS

"Temiryulobod" TSS

"Furkat" Section Post in Fergana



"Andijan1" Section Post in Andijan

Figure 2: Project's components

Construction of traction substations

102. Contact power supply will be provided from two projected TSSs: TSS 220 / 27.5 / 10 kV "Asaka" and "Kokand". The locations and capacities of traction substations have been selected based on the results of traction and electric calculations and revision alternatives. The locations of Kokand and Asaka TSS layouts are shown **in Figures 3 and 4.**

Figure 3: Location of "Asaka" traction substation (Andijan province)

Figure 4: Location of "Kokand" TSS

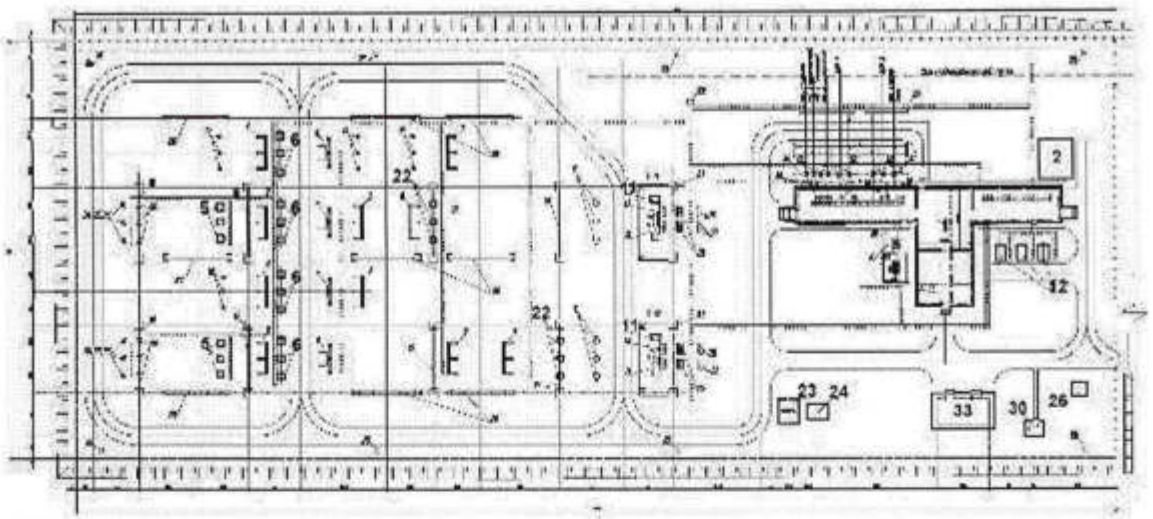


Figure 5: Draft layout of traction substation: 1-TSS's building, 2 – outdoor switch gear, 5-6 – transformer (220 kV), 11 – traction transformer (40 MBA), power transformers (10 kV), 23 – emergency oil collection reservoir (50 m^3), 24 – reservoir for spare oil, 26 – toilet, 33 – warehouse.

103. As the construction of the main building of the Kokand TSS has almost been completed, it is therefore considered as an existing/associated facility. The results of the conducted due diligence and recommended corrective actions are presented in subsequent chapters. Under this project, works to complete the construction of the Kokand TTS and install equipment will be undertaken.

104. The scheme of main electrical connections has been determined based on the following: (i) external power supply schemes; (ii) the type and quantity of traction transformers and back-up methods; (iii) schemes of power supply and sectioning of the contact system; and (iv) schemes of feeding of 10kV automatic blocking lines.

105. This includes the following: (i) outdoor switchgear 110kV-220kV (ORU -110kV-:-220kV); (ii) outdoor switchgear 27,5kV (ORU-27,5rV); (iii) outdoor switchgear 10kV (ORU-10kV); (iv) separately installed transformers 10kV for signaling system and auxiliary needs (TSN); (v) traction substation building comprising of indoor switchgear 27.5kV (ZRU-27.5kV), indoor switchgear 10kV (ZRU 10kV), premises of control and management of the system, and also service and technical premises and sanitary and household premises; (vi) bucking-out (compensating) device 27.5kV; and (vii) auxiliary buildings and structures (warehouse, toilet, and reservoirs for the emergency oil stock).

106. The TSS is equipped with equipment of modular construction. Switchgear RU – 110 -:- 220 of outdoor installation; RU-27,5 and RU-10kV of indoor installation. For the purpose of installation of switchgear equipment RU -27,5, RU-10 kV, control equipment, protection and automatics devices, batteries, service and technical and sanitary and household premises it is envisaged one-story building. All TSS equipment shall be installed at the yard with the dimension 68 x137 meters, that is 0.93 hectares.

107. Outdoor switchgears ORU – 110 -:- 220 kV, and indoor switchgears ZRU-27,5 kV, ZRU-10 kV shall be equipped with protection devices of local and remote control, and also devices of tele-control from the power dispatching center of the UTY.

108. Operational control is provided by a voltage of 220V from a UPS device with a battery of appropriate capacity. Power supply for outside consumers from a 10 kV switchgear is not provided. The traction transformer is triple winding, while the power of the 10 kV winding will be 30% of the primary winding of the transformer, which is enough to connect the auxiliary transformer type TM-250-10 / 0.4 kV to the 10 kV winding and reduces the cost of the traction transformer.

109. To create sanitary conditions, it is envisaged to provide water supply, sewage and heating supplies. On the territory of the substation, vehicles are allowed to travel for repair and replacement works. Internal roads shall be paved. In order for the vehicles to enter the territory of substation, a paved access road from the local road network shall be provided. A railway access road is also provided for the importation and installation of heavy equipment at TSSs.

110. All TSSs have similar configurations, differing only in location and the connection of communications (roads and railway dead end). Land plots under the territory of TSSs with the dimensions indicated on the plans are allotted in the prescribed manner with the execution of the necessary acts on land acquisitions. On the plans, in accordance with applicable standards and the "Rules for Electrical Installations," electrical equipment will be installed in compliance with the dimensions required for the construction of electrical installations.

111. The substation layout plans provide for the entry of 110 (220) kV power feeding lines, implemented under external power supply sections, installation of masts for the outgoing lines of feeders 27.5, and the outgoing lines of feeders for 10 kV signaling systems.

112. Within the territory of substations, an in-ground tank shall be installed for the collection of transformer oil in case of damage to a traction transformer. To carry out inspections of equipment and repairs at nighttime, mast floodlighting shall be provided, on which lightning protection rods shall be also installed.

113. For the purpose of preventing unauthorized access, fencing will be provided with a height of not less than 2 meters. Fire-fighting measures and arrangements will also be provided.

114. Traction transformer in outdoor switchgear shall be installed on the railway sleeper panel of the special foundation with the device for acceptance of transformer oil and organization of drainage of oil into the underground oil collecting reservoir, that shall ensure fire-fighting requirements. Cable channels (conduits) shall of the 'on-the-ground' type made of reinforced concrete with removable plate covers.

115. There are no buildings on the Asaka site: a land plot has however been allocated for the construction of the Asaka TSS (**Figure 6**).

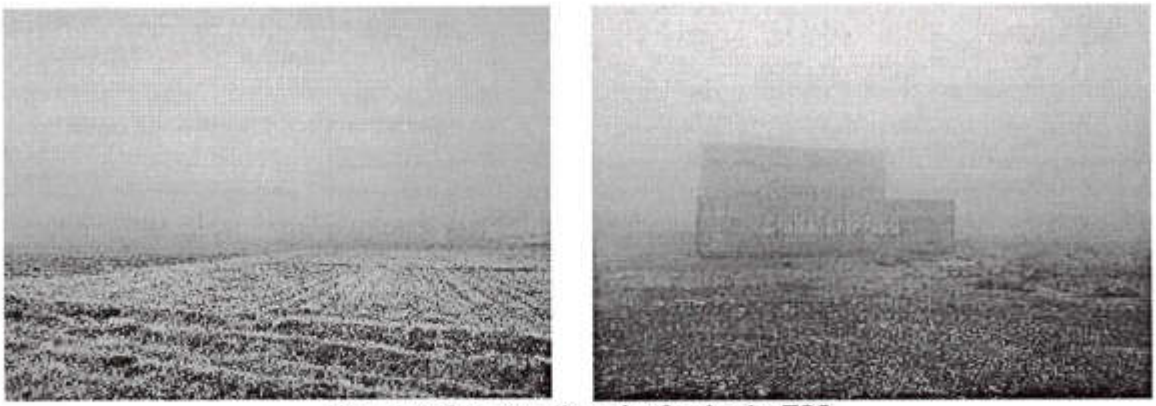


Figure 6: Construction plot for Asaka TSS

Installation of Signaling and Telecom Devices

116. **Signaling devices for open line sections.** The Angren-Pap-Margilan-Andijan-Xonobod section has four branches (Kokand – Suvanabad; Margilon – Fergana 1 station; Axunbabaev – Fergana 2 station – Kuvasoy).

117. All stations of the section Pap (exclusive) – Andijan are existing stations. The single track section of the railway line Pap (exclusive) – Andijan is electrified for electric traction of the alternating current of 50Hz.

118. All non-guarded level crossings shall be converted into guarded level crossings. Open-line section level crossings will be equipped with microprocessor-based automatic level crossing signaling systems, auto-barriers and with COD. Station level crossings will be equipped with auto barriers and with COD. In accordance with the technical conditions of the Signaling and Telecommunications Department of Uzbekistan Temir Yollari JSC, open-line section level crossings shall be equipped with an automatic control system for level crossing signaling: Pap-Kokand section shall be based on microprocessor-based automatic level crossing units; and the Kokand-Andijan section shall be based on automatic level crossing signaling systems of the computer-based principles of the NSU.

119. On level crossing light signals, LED heads shall be installed. Level crossing signaling equipment shall be installed in containers. Control over the operation of level crossings shall be transmitted to the nearest station with the use of fiber optic cable.

120. **Station signaling devices.** All stations shall be equipped with devices of electrical interlocking with the central dependency and central electric power supply. For operating points (stations), a computer-based interlocking (CBI) system has been adopted for electrical interlocking. The type of CBI shall be determined through the bidding process. To superimpose new devices of electrical interlocking, the schemes of track development of stations prepared under this design were adopted.

121. For the remote control of the points, signals and other signaling devices, and also for the purpose of control of their operational condition, automated workstations of the station controller (APM DSP) shall be installed at the stations, and utilizing personal computers.

122. At all stations, it is envisaged to install automatic voice notification (warning) systems for track workers regarding approaching trains. Voice notifications shall be given by means of loud speaker devices through voice informers.

123. All section stations shall be equipped with computer-based dispatching interlocking and shall interface with existing centralized dispatching systems, with control from the CTC in Tashkent.

124. **Railway Telecommunication Devices.** Technical solutions of the project, the scope of design documentation for railway telecommunication devices and its preparation shall be in accordance with the national inter-departmental norms of technological designing of electrical telecommunication at railway transport and other guiding technical materials for development of design of digital, and digital and analogue networks of operative and technological communication, existing at the time of design development.

125. **Designed Telecommunication Devices** provide for:

- subterranean installation of fiber optic armored cable with 32 fibers;
- installation of telecom equipment SDH of the main trunk level that permits organization of the trunk of hierarchy STM-16 at the stations Kokand, Station Alti-Arik and station Andijan;
- installation of equipment of access level STM-4 at all section stations;
- system of operative and technological communication with the installation of digital switching equipment for the organization of the main trunk and departmental OTS, network SRTC, additional switching equipment, work stations and other equipment at all stations from Kokand (exclusive) – Andijan (inclusive);

- organization of the communication system at the designed TSS with installation of 8 fiber optical cables and installation of SDH equipment of the level STM-1 at stations Kokand, Altiarik, Asaka and appropriate multiplexors in TSS buildings;
- installation at the station and guarded level crossings of stationary (fixed) radio stations of the train radio communication systems operating in two-band modes (HF, VHF) using as distribution media for HF signal the wave-carrying channel TWR;
- organization of station radio communication system at all stations with shunting operations;
- organization at the stations: Kakir, Furkat, Station Margilan, Station Ahunbabaeva and Station Kuva and Station Asaka of two-way fleet load speaking communication systems (Public Address System);
- organization of the system for notification of track workers about approaching of trains;
- organization of communication with power supply objects and power systems;
- organization of communication system at contact system duty maintenance posts (DPKS);
- protection of telecom devices from impacts of the electrified railway line.

126. The planned digital technological communication system is planned to be organized along the railway line.

127. **Installation of Telecom Cable.** Installation of fiber optic cable (FOC) in the embankments of the railway track is included in the project. The cable will be placed at 1.2 meters depth.

128. The utilization of the FOC is preconditioned by the following: (i) the transmission capacity of the optical fiber; (ii) protection from the external electromagnetic fields, as a result of which no measures are required to protect against dangerous and interfering influences of power lines and electrified railways, with the exception of cable armor; (iii) high noise protection of digital channels; and (iv) a low attenuation coefficient in a wide frequency band, which provides long regeneration sections.

129. At the intersections with underground utilities, railways and roads, FOC will be laid in polypropylene pipes of diameter 110 mm and thickness 10mm.

130. Protection of the FOC from hazardous electromagnetic influences is carried out by grounding the armor of the FOC using linearly protective grounding. Grounding devices will be located at the joints at the junctions of building lengths. Grounding conductors from the ground electrode and armored covers of each of the connecting cables will be displayed in the instrumentation. The cross-section of each grounding conductor from armored covers FOC will be 4 mm^2.

131. Telecommunication equipment shall be installed in the existing electrical interlocking posts at the operating points (stations) (**Figures 7-8**).

Figure 7: Room in Angren station (old) where telecom equipment will be installed

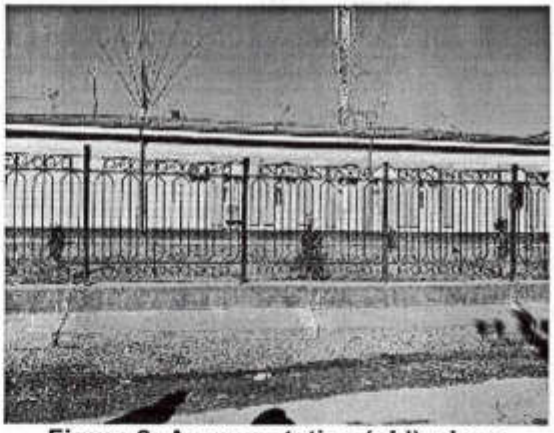


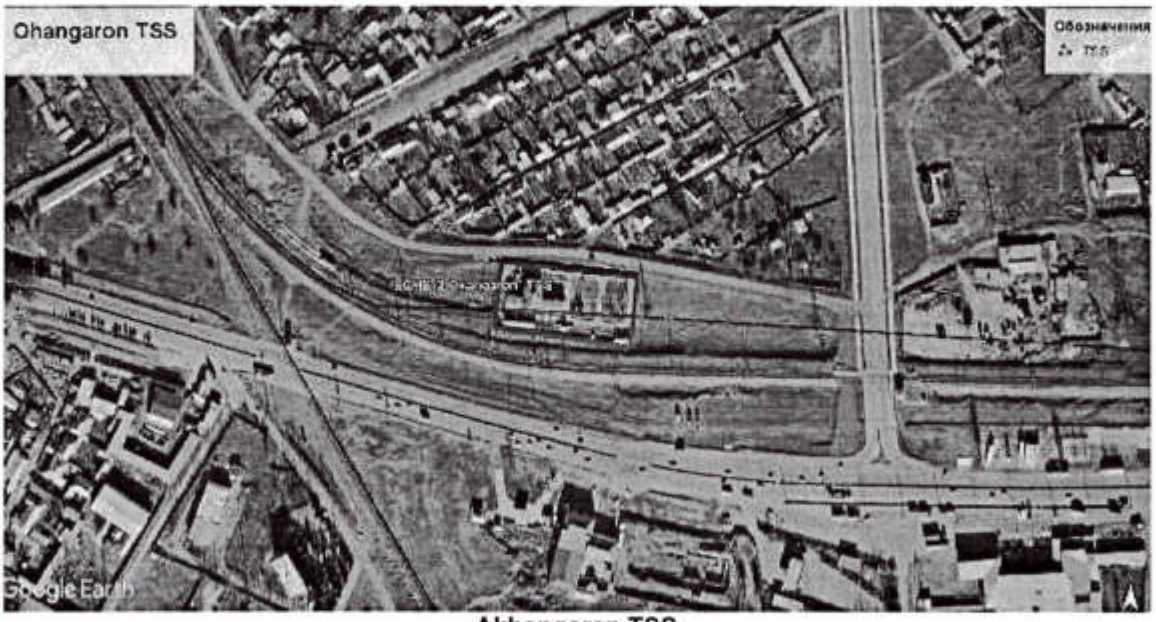
Figure 8: Angren station (old) where telecom equipment will be installed

Replacement of transformers in existing TSSs

132. To enhance the transportation capacity of the railway, transformers in four operating TSSs will be replaced. These are the Akhangaran, Angren, Toytepa and Temiryolobd TSSs. The 16 kV and 25 kV transformers will be replaced by 25 kV and 40 kV transformers. All TSSs are located next to railway track (**Figure 9**)

Temiryolobod TSS

Toytepa TSS



Akhangaran TSS

Angren TSS

Figure 9: Location of existing TSSs where transformers will be replaced

133. All TSSs were constructed based on the typical design during the period 2007-2010. The replacing transformers have been produced during the same period (2007-2010). Transformers installed in the Toytepa, Angren and Akhangaran TSSs were manufactured in Russia, while the transformers in the Temiryolobod TSS were manufactured in China. The production of PCBs in Russia was terminated in 1987-1993. In 1991, the State Environmental Protection Agency of China banned production and use of PCBs[15]. As a result, oil in the replacing transformers should not contain PCBs[16].

134. The TSSs have good sanitarian conditions. They are properly equipped with fire protection devices and all workers are provided with PPE (**Figure 10**).

135. The Akhangaran and Angren TSSs are connected to the existing municipal water supply network, while the Temiryolobod and Toytepa TSSs use groundwater wells for water supply. Sewage water is collected in septic tanks and disposed of at the closest municipal wastewater treatment plants in Angren and Namangan cities.

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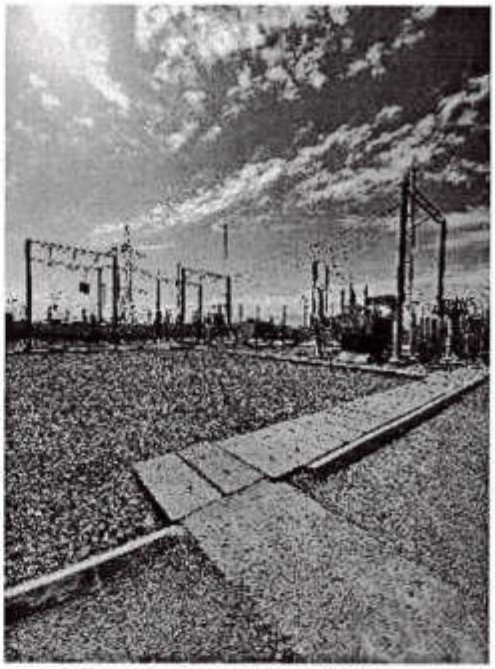
[15] https://ipen.org/sites/default/files/documents/Case%20Study%20Report%20Ziyang%202014r.pdf, p.4

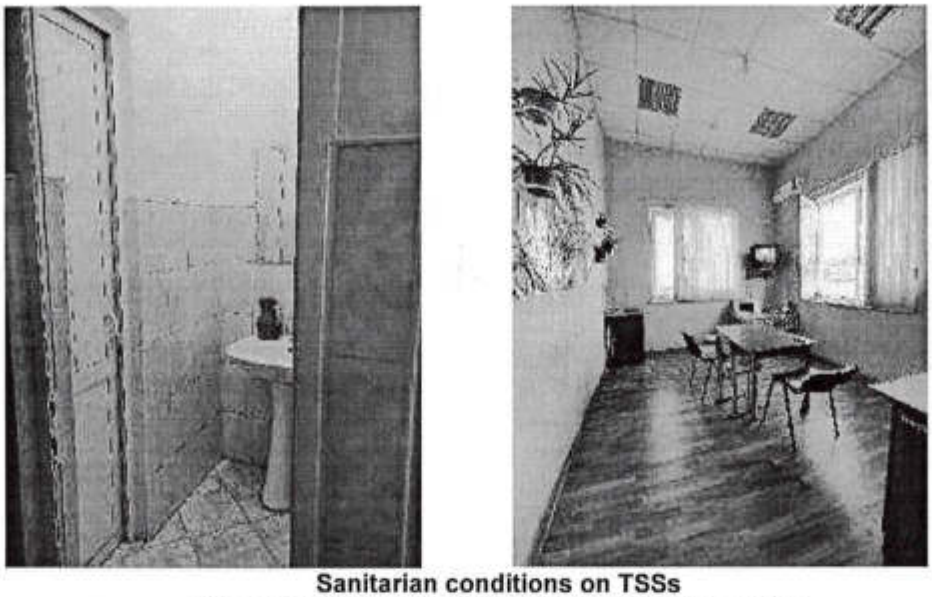
[16] PCB in the Russian Federation: Inventory and proposals for priority remedial action, ISBN 82-7971-008-6, Arctic Monitoring and Assessment Programme (AMAP), Oslo. 2000, p.4

General view of TSS "Toytepa"



General view of TSS "Akhangaran"

PPE and fire protection eqipment on TSS



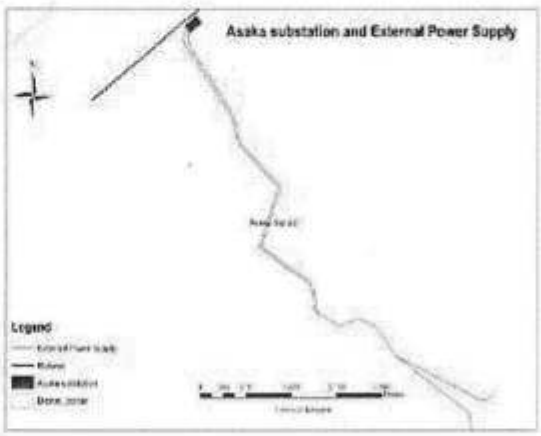
Sanitarian conditions on TSSs

Figure 10: PPE and sanitarian conditions on TSSs

136. All TSSs are equipped with special tanks for the emergency collection of transformer oil. The capacities of the tanks vary between 40 tons and 60 tons. This capacity is sufficient to store oil from the new transformers as well. After replacement, the old transformers will be re-used at other TSSs. All transformers and associated equipment will be transported to the TSSs through the railway.

3.3. Brief Description of External Power Supply Lines (Existing Facility)

137. Two traction substations (Kokand and Asaka) will be fed through two transmission lines of external power supply. 220kV external powers supply lines (EPSL) will connect the TSSs with existing transmission lines (**Figure 11**).



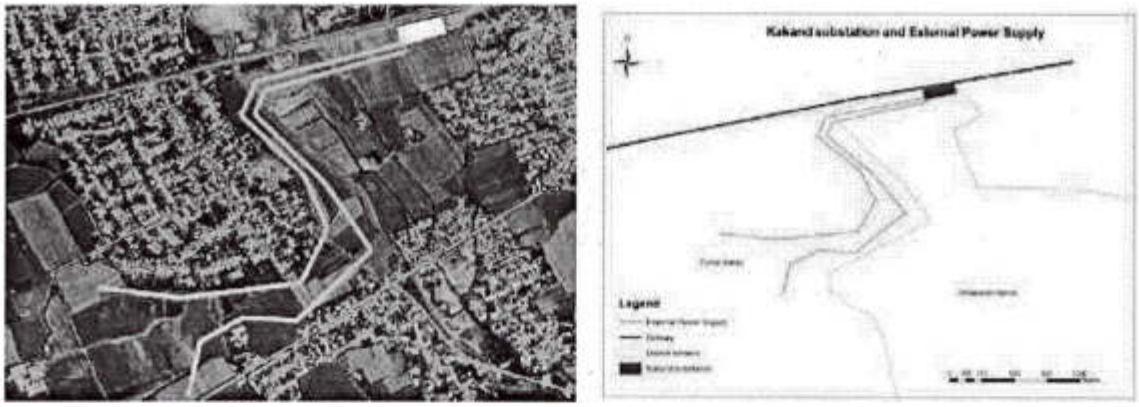


Figure 11: Scheme of external power supply for Asaka TSS (upper) and Kokand TSS (lower)

138. The length of constructed transmission lines to the Kokand TSS is 8 km, and to the Asaka TSS is 3 km. Since each TSS will have two lines (entrance and exit), the total length will be 16 km and 6 km accordingly. General information regarding the external power supply lines (EPSL) is presented in **Table 15.**

Table 15: Brief data on external power supply lines

Characteristics	EPSL – ASAKA	EPSL-Kokand
Province	Andijan	Fergana
Districts	Asaka	Uzbekistan, Furkat
EPL length (km)	8 (16 in & out)	3 (6 in & out))
Total number of EPSL towers	56	26
Number of installed towers	56	24
Number of remaining towers (tower erection)	0	2
Completed cabling-stringing (km)	16	4.5
Remaining cabling-stringing (km)	0	1.5

Source: SDDR, PNA-AF, 2020

139. The towers have a typical design which is presented on **Figure 12.**

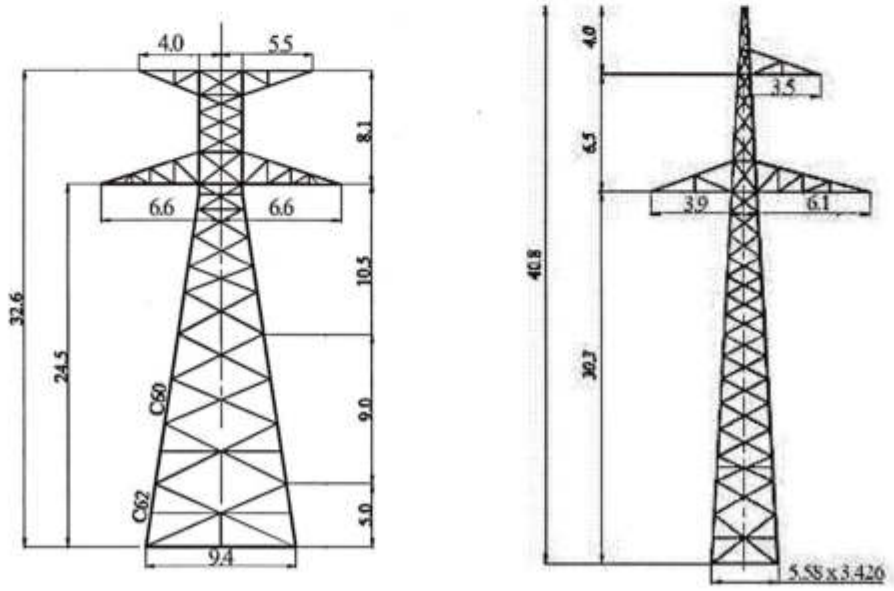


Figure 12: Scheme of 220 kV towers used for construction power supply

140. The foundations of the transmission lines will be constructed of reinforced concrete blocks. The type of concrete should provide for the placement of normal foundations and be suitable for the specific carrying capacity of the terrain. In case of weak terrain conditions, relevant specific technical solutions will be adopted, depending on the findings of geotechnical investigations. Typical foundation dimensions are shown in **Figure 13**. All reinforced concrete structures will be made from sulphate resistant concrete.

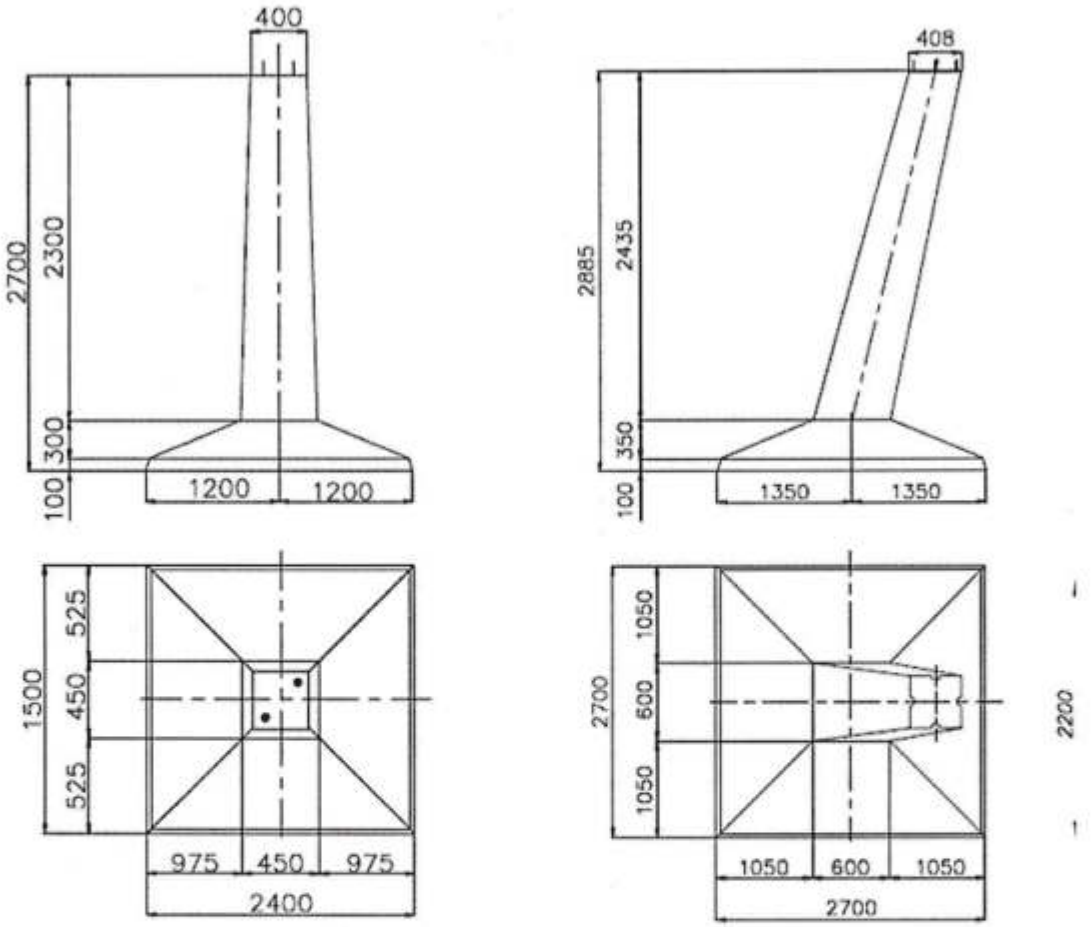


Figure 13: Foundations FK-4 and F5-Amk

141. As shown in **Table 16**, most parts of the towers have already been installed. The remaining part of works on tower installation and stringing cables should be completed before project commissioning.

142. Social due diligence has been conducted for the EPSL to confirm compliance with social aspects, including appropriate land allocation, and meeting standards regarding buffer zones. The following national regulations and norms for the construction and operation of transmission lines defines buffer zones:

a. The State Construction Norms and Rules (CNR) 2.10.08-97 provides standards and guidance for the design, construction, and operation of transmission line (TL). It outlines requirements for permanent and temporary land acquisition for transmission line (TL) with a voltage of 0.4-500 kV;

b. The Resolution of the Cabinet of Ministries (RCM) № 93 on "Rules of protection of transmission facilities" (2010) provides safety rules for TL protection;

c. National standards – SanPiN # 0236-07 dated from 2007 "Sanitarian Norms and Rules on safety ensure for population living areas close to high voltage lines".

143. In accordance with these norms, the safety zone for transmission lines with a loading of 220kV is 30 m from the farthest wire. The SanPiN # 0236-07 also prohibits the construction of buildings under the TL, however agricultural activities under the TL are allowed[17]. Information about allocated land is presented in the **Table 16.**

Table 16: Land allocated for construction TL

#	Installation of tower and transmission line (TL)	Area (m^2)	
		Temporary land acquisition	Permanent land acquisition
1	Suspension tower	560	5.5
2	Anchor angular tower	700	5.5
3	Width of land during the construction (TL)	16m corridor	-

Source: SDDR, PNA-AF, 2020

144. In accordance with the SDDR, all compensations for temporary and permanently acquired lands have been paid. All towers are located at a distance more than 30 meters, which therefore comply with buffer zone requirements.

Figure 14:EPSL for Asaka TSS goes through agricultural lands

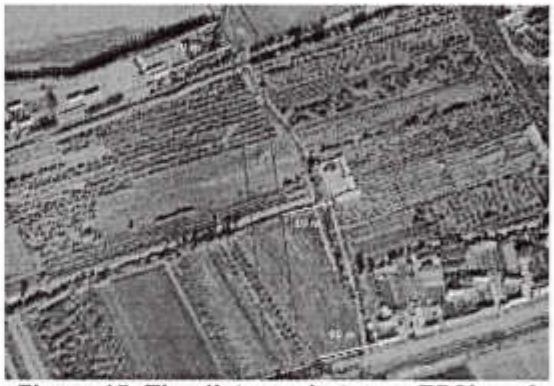


Figure 15: The distance between EPSL and the nearest residential houses (70m, 60m, 60m)

Figure 16: Connection of EPSL to existing 220 kV line between SS "Obi-Hayot" and SS "Ozgarish" (in red 220 kV EPSL, in yellow – existing 220 kV transmission line)

[17] Regulated by Resolution of COM № 93 on "Rules of protection of transmission facilities" from 17 May, 2010 and Sanitarian Norms and Rules # 0236-07, 2007.

145. **EPSL to the Asaka TSS** connects to existing 220kV line between SS "Obi-Hayot" and SS Ozgarish" The alignment crosses five small irrigation canals with a capacity of between 0.25 - 0.5 m^3/sec

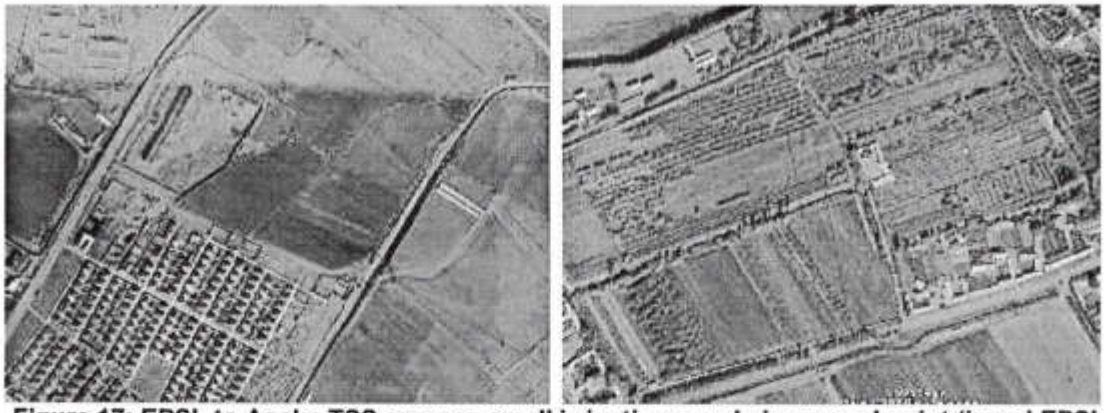


Figure 17: EPSL to Asaka TSS crosses small irrigation canals in several point (in red EPSL, in blue irrigation canals)

146. The entire alignment traverses through agricultural lands. The construction of the towers was implemented between 2018 and the first half of 2020. During the construction period, land was temporary allocated, however by the time of IEE preparation, agricultural activities under the EPSL has fully recovered.

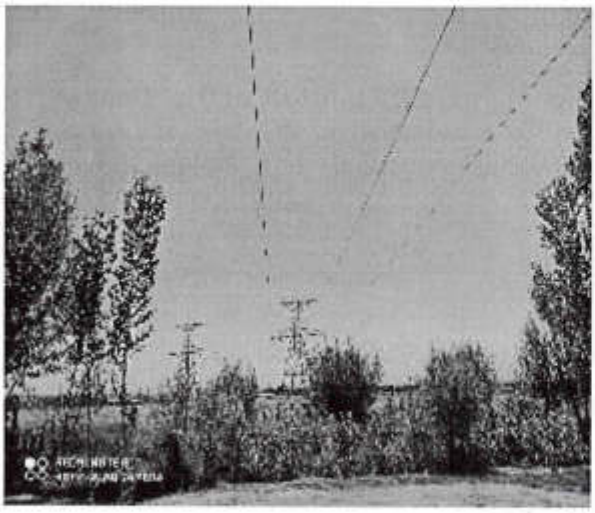


Figure 18: Installed towers in Asaka district

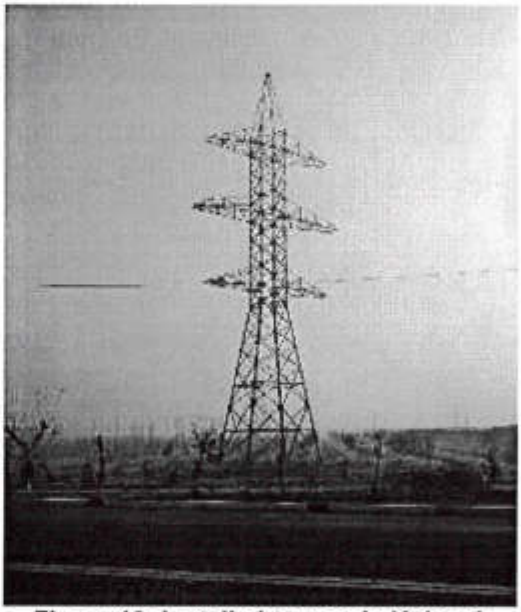


Figure 19: Installed towers in Kokand district

147. The **EPSL to Kokand TSS** crosses two irrigation canals with capacities about 0.25 m^3/sec and 2 m^3/sec. The distance between the network and the closest residential area is no less than 30 meters. The TL is connected to an existing 220kV line connecting SS "Yulduz" and SS "Lochin".

Figure 20: EPSL connects to existing 220 kV,

Figure 21: The distance between nearest houses and EPSL. Line crosses two irrigation canals

148. The installed towers do not have any bird protection devices. Due diligence review of the labor camp areas is not possible as they have already been demobilized. Although public consultations were not conducted prior and during construction works, impacts from the

transmission line during the operation phase were discussed during public consultations conducted for this project during January 2020.

149. During the construction works, the GRM has not been established. People are however now aware how to apply in case of any of compliance or inconveniences due to the project operations.

3.4. Corrective Measures for External Power Supply

150. Based on the results of due diligence, a corrective actions plan (CAP) was developed for associated facilities in order bring these components into compliance with ADB safeguards requirements.

Table 17: Corrective Action Plan

Identified Issue	Required Action	Responsible	Implementation Period
Absence of Statement on Environmental Consequences (SEC)	Develop a SEC and submit for approval to SCEEP	PIU-ET	Before commissioning of Asaka and Kokand TSS
People in the nearby settlement are not aware about GRM	Conduct Public Consultation and introduce GRM	Kokand Regional department of Railway	July-August 2020
Lack of knowledge among population about high voltage transmission lines impacts on human health	1.Establish monitoring system to ensure compliance with buffer zone 2. Implement awareness program on impact of High voltage transmission lines on people health	National Electric Networks in Uzbekistan	August-September 2020

3.5. Brief description of Kokand TSS (existing/associated facilities)

151. Regarding the second TSS is the Kokand TSS, by the time of IEE preparation, around 80% of the buildings and structures of this TSS had already been completed (**Figure 22**).

152. The national environmental impact assessment for the Kokand and Asaka TSSs was conducted in 2016. The environmental appraisal required the preparation of the next step of environmental assessment – a Statement of Ecological Consequences. By the time of IEE preparation, the Statement has not yet been prepared.

153. The territory of the Kokand TSS was assessed during a site visit in January 2020. At that time, the following works had been completed: land leveling, and construction of the main buildings. The remaining works are the construction of a fence and auxiliary buildings, installation of equipment, the connection to the external power supply line, and landscaping.

Figure 22: Existing facilities on Kokand TSS and non completed fence of Kokand TSS

154. No other works had been implemented at the time of the site visit. One watchman living in a house next to the TSS was looking after the facilities.

155. The following non-compliances were observed at the Kokand TSS: the presence of solid waste inside and outside the TSS, and the lack of an information desk regarding the project, the Contractor and relevant contact details.

Figure 23: Solid wastes on the territory of TSS

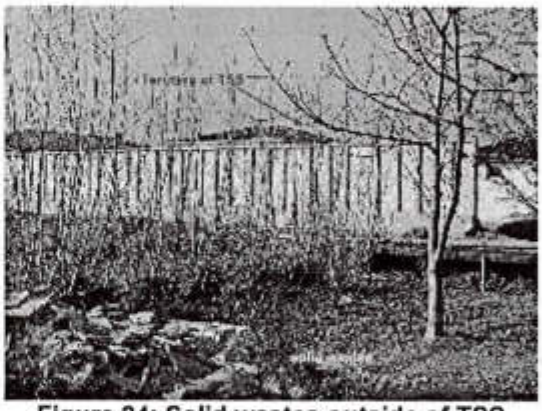


Figure 24: Solid wastes outside of TSS

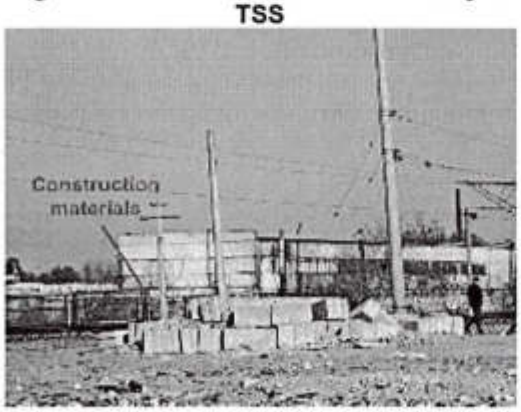


Figure 25: Construction materials within the railway ROW, but outside of TSS's territory

Figure 26: Storage of construction wastes outside of TSS

156. A small drainage channel is located 100 meters from the site. Reportedly, water flows in the channel only during the irrigation period (June-August) and winter months January-February. Other than this, there are no open water sources near the project site. The water supply of the TSS will be from a groundwater well which has already been drilled. Wastewater

will be collected into a septic tank constructed in the TSS territory and will be disposed into the Kokand Waste Water Treatment Plant (WWTP).

Figure 27: Location of drainage canal

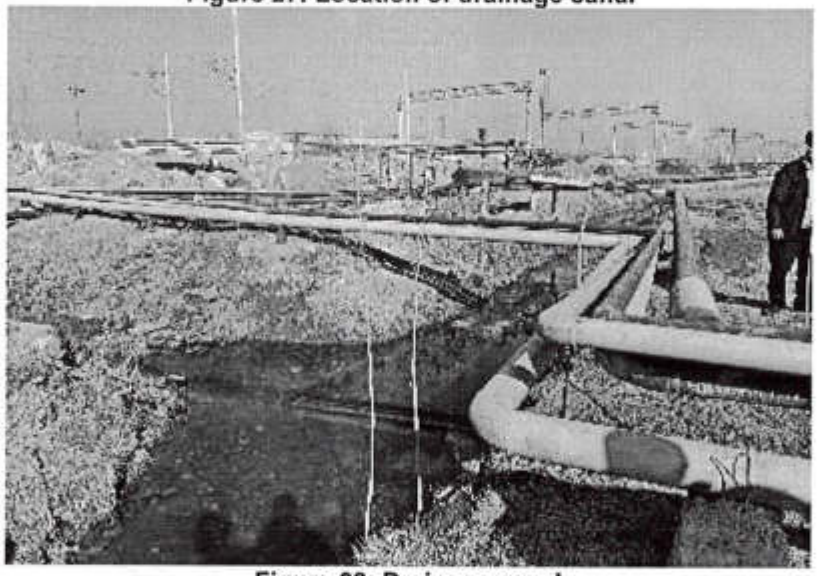


Figure 28: Drainage canal

157. The monitoring of air quality and noise had not been implemented during the construction period.

158. During a meeting with the local population, it was found that public consultations had not been conducted before and during construction. As part of this IEE preparation, public consultations were therefore conducted in the mahalla located next to the Kokand TSS. During the public consultations, issues regarding the placement and distribution of information about the TSS were raised. Information regarding these public consultations, including the questions raised, is provided in Chapter 7.

159. There is no site-specific environmental management plan (SSEMP). The environmental specialist of Kokand Regional Department does not have the capacity to develop the SSEMP by himself.

3.6. Corrective Measures for Kokand TSS

160. Based on the results of due diligence, a CAP has subsequently been developed for the associated facilities in order to bring these components into compliance with ADB safeguards requirements.

Table 18: Corrective Action Plan

Identified Issue	Required Action	Responsible	Implementation Period
Absence of Statement on Environmental Consequences (SEC)	Develop SEC and submit to State Committee on Ecology and Environment Protection	UTY, PIU-ET	Before commissioning of Kokand and Asaka TSSs
Absence of Site-Specific Environmental Management Plan	Development of Site-Specific Environmental Management Plan. Topic specific plan (Waste Management Plan) will also need to be prepared.	Kokand Regional department of UTY with assistance of Supervision Consultant for Pap-Namangan-Andijan project	Before starting civil works on Asaka and Kokand TSS.
Construction wastes are located on the territory of Kokand TSS and outside	Clean up territory of TSS and nearby from wastes and to the places indicated by local municipality	Kokand Regional department of UTY	August 2020
Construction materials are storage outside of TSS territory	Ensure that all construction materials are storage inside TSS	Kokand Regional department of UTY	August 2020
Absence of environmental monitoring and impact on air quality and noise level	Establish environmental monitoring system through: - Monitoring of air quality (dust NOx, SO2) at the construction sites close to residential areas (quarterly). The standards for pollutants are indicated in Chapter 2, Table 9. - noise and vibration level houses located close to construction site (weekly) Monitoring arrangements are indicated in Table 43	Contractor implements, PIU-ET and Supervision Consultant monitor	Baseline - before construction Regular – during construction phase with frequency as indicated in column 2.
Lack of information about information on TSS	Establish information desk with data about TSS, Contractor, construction period and contact information for complaints and questions related to construction and operation of TSS	Kokand Regional department of UTY	July-August 2020
Lack of capacity and awareness on environmental	Conduct training for Kokand Regional department on	Supervision Consultant for	Before starting civil works at Asaka and Kokand TSS

supervision, monitoring, importance of environmental values in Kokand regional UTY	implementation of environmental supervision, monitoring, importance of environmental values	Pap-Namangan-Andijan project	

161. Following the completion of construction, and during the installation of equipment, the requirements indicated in EMP will be applied.

3.7. Provision of machinery/equipment

162. Within the project, the following machinery, equipment and materials will be procured for the maintenance of the catenary system, and for the signaling, telecommunications and SCADA systems. A detailed list of machinery, equipment and materials will be finalized during the detailed design stage.

163. Although goods packages (maintenance machinery, TSS equipment) will not have EMPs attached to the bidding documents, they will be subject to environmentally-related technical specifications such as emission and noise level standards. In particular, the toxic levels of machinery must meet "Euro 3" environmental requirements as defined by national regulations[18]. In addition, machinery noise levels should not exceed 87 dB[19].

164. Goods procured for project implementation will comply with the ADB Prohibited Investment Activities List, as set forth in Appendix 5 of the Safeguard Policy Statement (2009). It is also necessary to ensure that transformers for the signaling systems procured within the national contract bidding (NCB) process do not contain oil with polychlorinated biphenyl (PCB). Transformers containing PCBs are not allowed for purchase under the project.

165. These environmental-related technical specifications are included in the EMP for the construction of the catenary systems and the TSSs.

3.8. Implementation Arrangements

166. The UTY will be the executive agency (EA) for the project. It has a sound track record of the implementation of projects financed by ADB and other financial institutions. The Project Implementation Unit for Electrification and Renewal of Rolling Stock (PIU-ET) with staff experienced in international financing institutions' procedures and policies, will be responsible for project implementation. The technical and administrative departments of the UTY will also assist the PIU-ET during project implementation.

167. Procurement will tentatively consist of (i) one goods package for the procurement of maintenance machinery and equipment, (ii) one plant contract with two lots, for signaling and telecommunications, and traction substations, and (iii) a shopping package for train control and management systems.

3.9. Project Activities

168. The entire life cycle of the project includes the following general phases:

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[18] Resolution of President of RUz "On measures for further development of production at the Samarkand automobile plant and renewal automobile park", dated from December 14, 2006

[19] Attachment # 6 to Cabinet Ministries Resolution # 192 dated from July 4, 2012 "On approval of general technical regulations "On safety during operation of railway transport""

- **Planning and design** phase: This phase includes the preparation of relevant planning documentation, including technical and design documentation and analysis of the environment aspects, undertaking surveys, and preparation and selection of final design.
- **Construction** phase: Activities of this phase will include construction activities and the installation of the necessary infrastructure and equipment.
- **Operational** phase: This project phase will include operational activities of the railway, including maintenance and control.

169. According to initial plans, the total duration of the construction phase is estimated to be 48 months. The final construction schedule will be specified during the detailed design phase based on the defined work to be performed. Construction works will start from the preparation of the final design, on connection of the TSSs to the transmission line, mobilization of contractors, set-up of temporary construction camps or the organization of accommodation of workers in nearby settlements and etc.

170. Construction works will include the construction of the TSS's main and auxiliary buildings in Asaka, and completion of the construction of fencing and remaining buildings in the Kokand TSS.

171. More detail information about the project implementation activities is provided in Chapter 5.

4. DESCRIPTION OF ENVIRONMENT

4.1. Physical conditions

Climate

172. The climate of Ferghana Valley is arid, extremely continental and somewhat different across districts depending on their elevation, proximity to mountains and remoteness from the western open, the most arid, windy part of the valley.

173. ***Andijan province.*** The climate of Andijan province is extremely continental, with relatively mild winters and continuous hot summers. The basic peculiarity of the Central Ferghana's climate is a hot dry summer and an especially cool and humid winter.

174. Based on observations, the average monthly temperature of the coldest month of the year, January, is -3.4°C, and the hottest, July – +26.8°C. The absolute maximum positive temperatures reach 44°C (in the shade) and the maximum of subnormal temperatures – 29°C. The average year-round temperature is 13.4°C.

175. The average yearly precipitation is 208 mm, around 89% of which falls in the winter and spring months. The precipitation minimum falls in the months of June, July, August and September. March accounts for the largest amount of precipitation – 33 mm.

176. Mainly north and north-westerly winds are characteristic of this province. Heavy dust storms cause wind erosion, normally observed during April and May.

177. ***Namangan province.*** The climate is continental, with hot and long summers and relatively mild and short winters. There is wide diurnal fluctuation in temperature, and little precipitation. The January temperature in the plains averages 3.5°C, and in July it is +25°C. The annual precipitation on the plains and in the vicinity of the mountains is about 100-200 mm, and in the foothills is up to 600 mm. The vegetation period in Namangan province lasts for 229 days. It is the longest period with respect to the southern and eastern parts of the Ferghana Valley.

178. The climate of ***Ferghana province*** is also sharply continental, arid, and with an abundance of heat and light. The temperature regime is also positive, with the average annual average air temperature being + 13°C. The coldest month is January: the average monthly air temperature is -3.2°C, with an absolute minimum of -28°C. The hottest month is July with an average monthly air temperature of + 26.8°C and an absolute maximum of + 43°C. The province enjoys 227 frost-free days per year, where its freezing depth is 31 cm. The province's summers are hot and dry, and winters are mild. Annual precipitation is 172 mm, which is almost seven times less than evaporation.

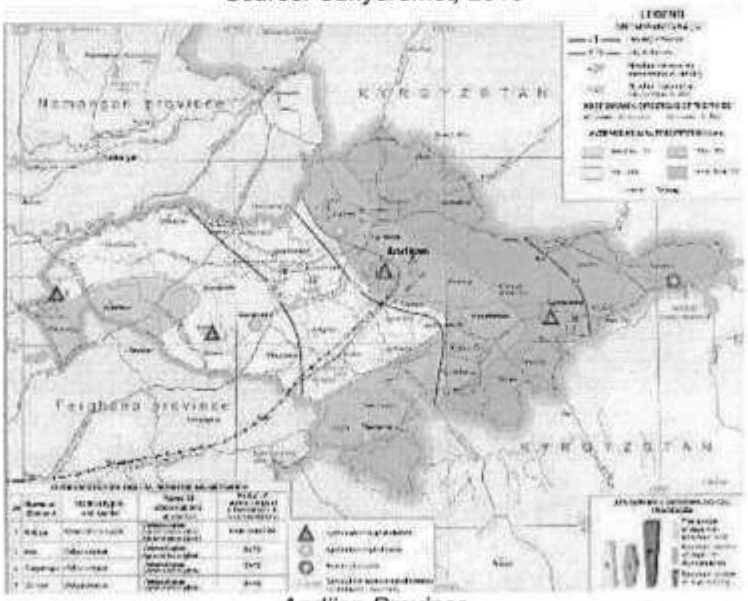
179. ***Tashkent province, Akhangaran*** **district.** The climatic conditions of the project area in part of Angren station was evaluated based on the data from a meteorological station located in Angren city. The average maximum temperature is in July - +36°C and minimum is in February -12 °C. The amount of precipitation during 2018 was 507 mm. The average year-round temperature is 13.6°C.

180. Meteorological data for Andijan, Namangan, Ferghana and Tashkent (Angren) provinces is presented in **Table 19**.

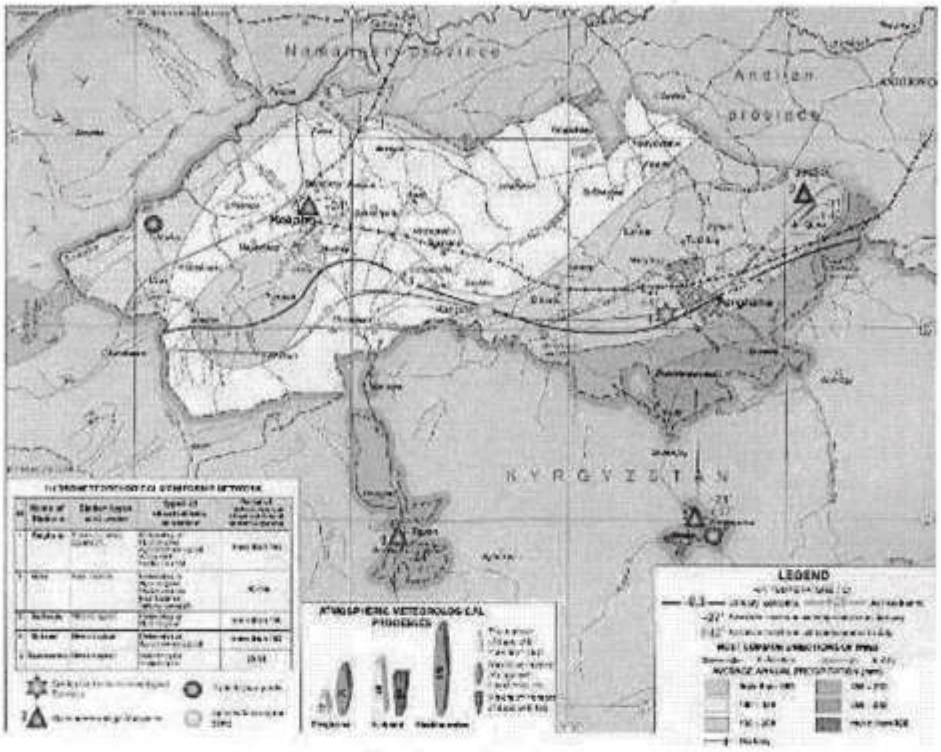
Table 19: Meteorological data for Andijan and Namangan provinces

Weather station	Average annual precipitation (*mm*)	Temperature, °C		
		Average annual	Average, January	Average, July
Andijan	226	13.1	- 3.0	27.3
Ferghana	172	13.0	- 3.2	26.8
Namangan	205	13.4	- 3.4	27.6
Angren	507	13.6	- 10	26.2

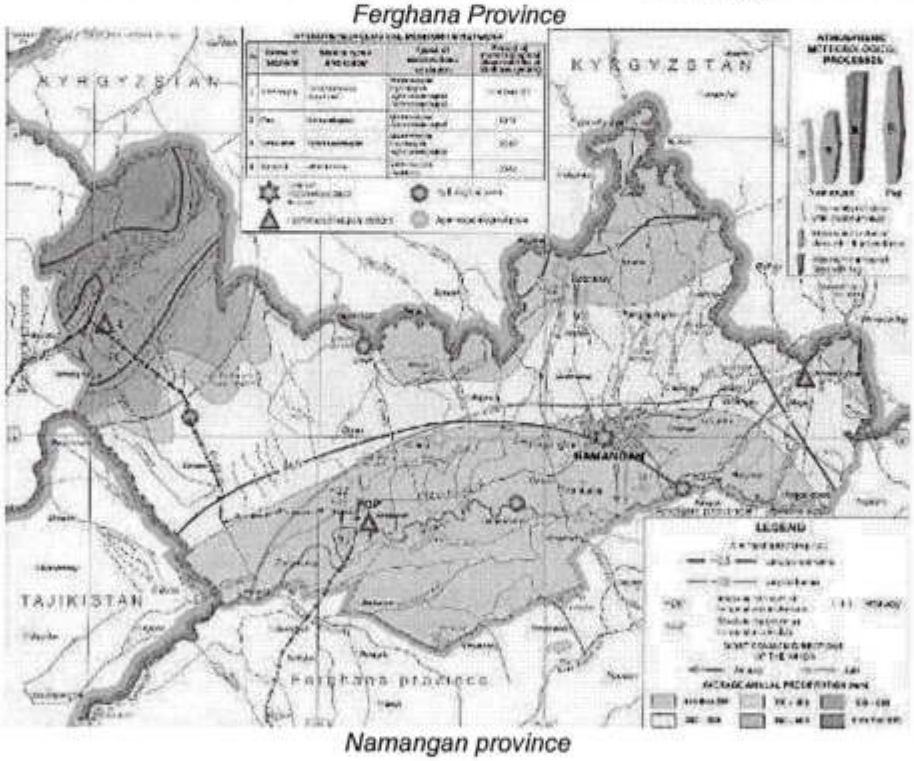
Source: Uzhydromet, 2018



Andijan Province



Ferghana Province



Namangan province

Tashkent Province

Figure 29: Climatic maps of the project's provinces

Geological and hydrogeological peculiarities

181. The geological structure of he ***Ferghana Valley*** is extremely complicated. Mountain borders are of massive folds and block uplifts of Paleozoic sandstones, shale, limestones, conglomerates, gneisses, and volcanic tuffs. Piedmont and forest ridges of mountain ranges are formed by Meso-Cainozoic sedimentary rocks (conglomerates, sandstones, limestones, clays, and siltstones). On the plains, they are buried under thick masses of quaternary deposits. Adyr ridges are formed by poorly defined masses of lower quaternary deposits represented by conglomerates, pebble-beds, and gravel.

182. Orographic features of the Ferghana Valley have determined a great variety of hydrogeological conditions. The following zones are differentiated: (i) a submersion zone with stably deep groundwater occurrence and low mineralization (adyrs and upper parts of alluvial cones); (ii) a fringe zone with stably close groundwater occurrence with low and medium mineralization (middle part of alluvial cones); and (iii) a dispersion zone with unsecured outflow and unstably close occurrence of groundwater with increased mineralization (lower part of alluvial cone and interconal declines). The Ferghana Valley belongs to the 8-9 points seismic zone.

183. ***Tashkent province, Akhangaran district.*** In terms of the seismic conditions for construction purposes, the area under survey belongs to the zone with 7 and 8 magnitude of earthquake intensity.

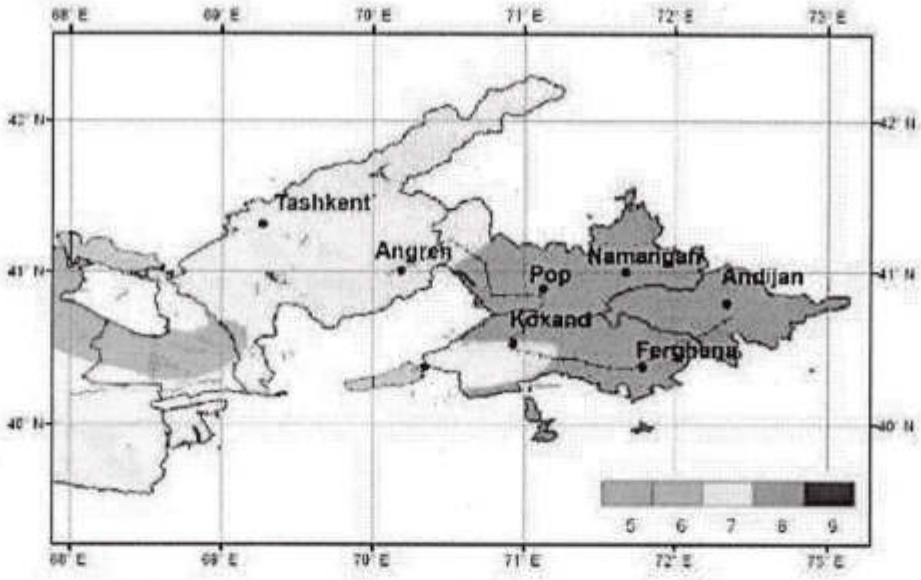


Figure 30: Seismic zones in East Part of Uzbekistan[20]

Soil conditions

184. Historically, the Ferghana Valley soils are the most productive in Uzbekistan, which, together with climatic conditions, is a major prerequisite for the agricultural importance of the project area. Other factors contributing to this are regulated river runoff and adequate natural drainage.

185. The Ferghana Valley soils are formed by the main soil formation conditions as follows: climatic, lithological, geomorphological, hydrogeological, and ameliorative processes.

186. ***Andijan province.*** At the foothills and in the intermountain valleys of Andijan province, nonsaline bright, typical and fuscous sierozems are developed in good drainage conditions of the upper terraces of river valleys, alluvial cones, and deeply defined loessial terraces.

187. ***Namangan province.*** Sierozem soils predominate: bright sierozems – up to a height of 700-850 m, typical and fuscous sierozems – from 850 to 1,200 - 1,500 m, and chestnut and chernozem-like soils – from above. Depending on the nature of the relief, the railway runs mostly embankments in height from 2 to 6 meters, and recesses with depth up to 14 m. Soils grounds mound represented mainly by loess loams, sandy loams with interlayers and lenses of sand, detrital soils. Subgrade deformation undergone as a result of compaction of soil embankments. Embankments are broadened due to launching soil from reserves on slopes.

188. The soil cover of the **Ferghana province** is composed of soils of desert conditions of soil formation, which, under the influence of a close occurrence of groundwater, were transformed into meadow and desert-meadow.

189. ***Tashkent province, Akhangaran district.*** The soils in the Chirchik-Akhangaran physic-geographical district are diverse. In the lower parts of the valleys of the Chirchik and Akhangaran rivers, serozems are common. They have been irrigated since ancient times and turned into cultivated soils.

190. At an altitude of 300-500 meters above sea level, light gray soils (with a content of 1-1.5% humus) are common. At an altitude of 500–1200 m – are typical and dark gray soils

[20] Source: http://uzgeo.uz/Hujjat/referat/a3248036-0b1e-4fb2-9b5f-3b41d4cce0e3.pdf

(containing 4–6% humus). These soils are also almost completely developed, turned into valley cultivated soils.

191. Mountainous brown, and mountain-forest soils are widespread in the mountains at an altitude of 1200–2500 m; they contain up to 10% humus. In the belt of alpine meadows, at an altitude of over 2500 m, mountain meadow, mountain-bog, and stony-pebble soils are developed.

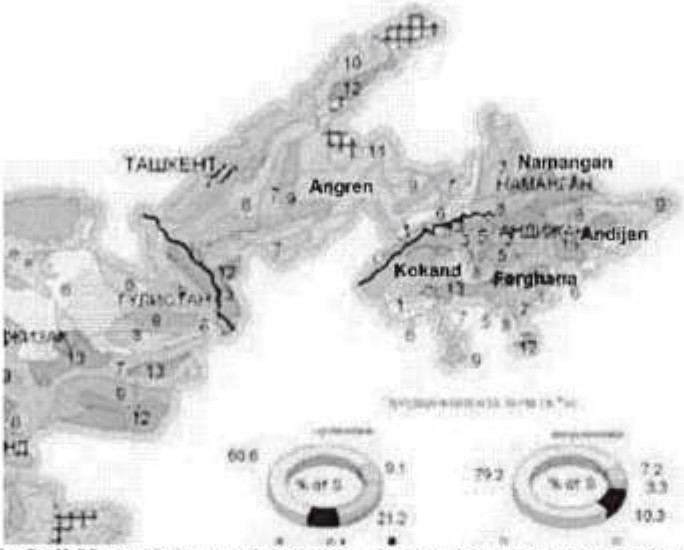


Figure 31: Soil Map of the project area: 1-gray-brown desert soil, 3 – saline, 5 – desert sands and sands, 6 – light sierozems, 7 - typical sierozems, 8 – meadow sierozems and meadow, 9 – dark sierozem, 12 – mountain and high mountain soils.
Source: Environmental Atlas of Uzbekistan, 2007

4.2. Water resources

Surface water resources

192. The main source of surface water in the provinces being considered is the Syr Darya River. It is a typical mountain river with snow- and glacier-derived nourishment, low runoffs in April-May and high runoffs from late June until the second half of August, and a wide discharge range during a day. There are main canals (BFC and BAC) constructed to balance the runoffs with the irrigation needs, and to transfer excess water from the rivers to water scarcity zones.

193. Big Fergana Canal (BFC) consists of two sections:

- Naryn, consisting of two mains that are connected to each other at the 20th kilometer and deliver to Karadarya river (through Tentaksoy);
- Kara Darya, having a length of 205.3 km.

194. Big Andijan Canal (BAC) with a length of 109.1 km and a forced discharge of 330 m^3/s in the head originates from the Uchkurgan hydrosystem at the Naryn River. The existing left-bank regulator at the head of the BFC feeding canal is used as a head structure, through the reconstructed bed of which BAC canal runs for its first 6.6 km.

195. A map showing large rivers and canals of the Ferghana Valley is presented in **Figure 32.**

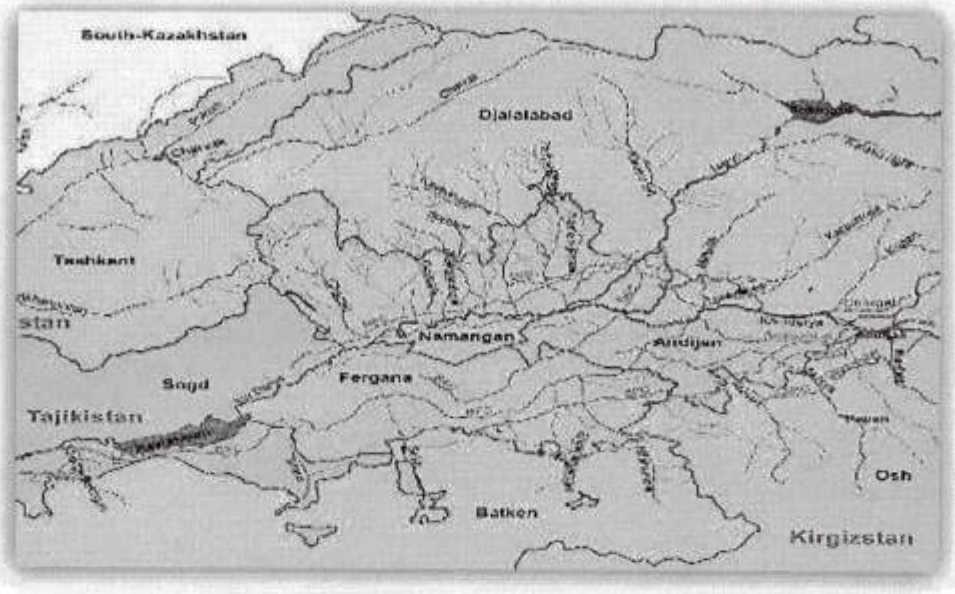


Figure 32: Hydrological network of Ferghana Valley

196. **Andijan province.** The main water artery of the province is the Kara Darya River that crosses the province from the east to the west, its water is mainly used for irrigation. There are three reservoirs and several lakes.

197. Andijan province is famous for its springs, the water of which has a pleasant taste and is useful. Thus, there are natural areas of protection in the province's territory, namely Baliqchi district, where the springs like Sariq Suv, Kul, Uch Buloq, and Tuzloq Buvi are located. The settlements of Nayman, Bouta Qori, Olim, Doustlik, Imom Ota hold the springs of Qora Bosh Buloq, Olim Buloq, Qirq Buloq, Qambar Ota, and Imom Ota. In total, there are 26 springs, predominantly of ascending type, registered in the territory. All of the springs have approaches and power grid.

198. **Namangan province.** The main water artery of Namangan province is the Syr Darya River that is formed within the province by the confluence of the Naryn and Kara Darys rivers. Podshaotasoy, Chortoqsoy, Namangansoy, Kasansoy, Novasoy, Chodaksoy, Govasoy, and others flow down to it from the mountains slopes. Kosonsoy, Chortoq, Eski Yer reservoirs were built to regulate the rivers' runoff. There are more than 15 lakes.

199. The province has about 90 springs with cold water, the most famous of which are the Imom Ota spring located in Parda Tursun settlement, the Kengulsoy spring, the Chust in Chust city, and the Abdullah Bur in the boundaries of Yangi Qourghon settlement.

200. **Ferghana province.** Many rivers of the Ferghana Valley have a great importance for irrigation. The main river is the Syrdarya River.[21] Numerous tributaries flow from the surrounding mountains to the Syrdarya - Sokh, Aksu, Shakhimardansay, Kasansay, Isfara, Akbura and others. There are several reservoirs and lakes in the region. In the mountainous and foothill areas of the region, there are more than 10 springs.

201. **Tashkent province, Angren river.** The main river in the project area located in Tashkent province is the Akhangaran Rive. Originating under the Boshravat pass at the

[21] The Podshaotasoy, Chortoqsoy, Namangansoy, Kasansoy, Novasoy, Chodaksoy, Govasoy, and others also flow down to it from the mountain slopes.

confluence of small rivers – Aktashay and Urtalyksay, it flows down from the southern slopes of the Chatkal and Kuraminsky ranges. The length of the river, along with Aktashsay, is 236 km, and the basin area is 7,710 km^2.

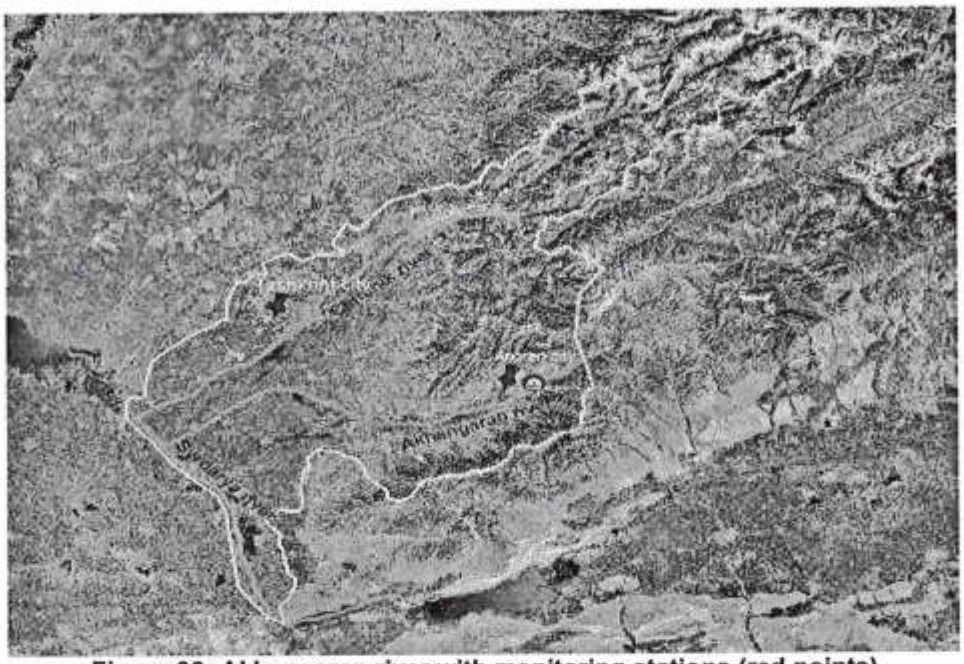


Figure 33: Akhangaran river with monitoring stations (red points)

202. The average annual water discharge (for 2014-2018) varied from 15.6 m^3/s (2018) to 29.9 m^3/s (2017). The type of river feeding is snow-rain. The flow of the Akhangaran River is regulated by two reservoirs: the Akhangaran in the upper reaches, and the Tuyabuguz (Tashmore) in the middle reaches.

Table 20: Average monthly flow of Akhangaran river

Years	Months												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Akhangaran river below Akhangaran dam													
2014	5,09	5,45	10,6	36,9	106	44,6	36,2	30,2	9,74	7,97	5,05	4,99	**25.2**
2015	4,52	9,30	18,5	41,5	70,2	31,3	28,6	23,6	8,81	6,54	5,73	8,60	**21.4**
2016	5,40	9,23	20,4	37,1	63,0	34,1	31,8	28,1	16,1	10,2	7,18	6,14	**22.4**
2017	6,50	7,28	17,2	90,1	111	42,0	31,9	27,2	7,24	7,57	6,68	3,54	**29.9**
2018	3,56	3,24	6,22	28,4	45,6	23,9	28,1	23,6	7,49	5,18	6,81	4,96	**15.6**

Source: Uzhydromet, 2019

203. The proximity to the largest city of Central Asia - Tashkent led to intensive development of the Akhangaran river basin and associated agriculture and industry. Therefore, the main water consumers of Akhangaran River's water are agriculture, industrial complexes and public utilities. The water of the river flows through canals and is used for irrigation in the Akhangaran, Urtachirchik, Pskent and Buka districts of Tashkent province. The Angren-Almalyk-Akhangaran agro-industrial region is located here, including the largest industrial complexes in Uzbekistan (coal mining, energy, mining and metallurgical). Water quality of the Uzhydromet's monitoring points comply with national standards (**Table 21**).

Table 21: Water quality in Chinaz city in Akhangaran river

Indicator	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	MAC
Suspended matter	3	44	107	23	21	7	11	6	4	9	20	48	15
Chloride	5,64	5,74	7,49	2,49	3,49	1,75	1,99	2,25	2,99	2,74	7,74	4,99	350
Sulphates	19,3	27,2	99,5	16,3	12,2	13,7	11,8	8,7	14,4	15,3	19,9	30,1	500
COD	6,98	6,12	4,24	4,32	2,29	5,07	5,36	2,96	1,45	2,13	4,48	6,41	15
BOD_5	1,73	1,95	1,34	1,85	2,06	2	1,71	1,76	1,38	1,67	1,85	1,95	3
Ammonia	0	0,02	0	0,02	0	0	0,01	0	0	0	0,04	0,03	0.5
Nitrates	0,84	0,72	0,67	0,38	0,42	0,42	0,55	0,58	0,33	0,34	0,22	0,24	40
Phosphates	0	0,002	0,151	0,009	0,019	0,008	0,009	0,019	0,007	0,007	0,009	0,013	0.3

Source: Uzhydromet, 2019

Underground water resources

204. Ferghana Valley is rich in underground water stocks and has about 38.6 % of the underground water resources of Uzbekistan. The total stock of underground water in Ferghana Valley is estimated at about 6,500 m^3 a day, of which about 1,900 m^3 and 1,700 m^3 a day are in **Andijan** and **Namangan** provinces, respectively. Formation of underground water reserves takes place through infiltration from rivers, canals, streams, and irrigated fields.

205. In the Ferghana Valley territory, a trend has been set in recent years of a growth in mineralization and total hardness of underground water with respect to their background content that often result from irrigation of lands. These studies of the state of underground water show that there were no changes recorded in the regional plan, but there are qualitative changes in the dry residue and the total hardness.

206. **Tashkent province, Akhangaran river.** By origin and age of the rocks, their degree of openness, established hydrochemical zonality and direction of the hydrogeological process in the general history of the geological process are distinguished by hydrogeological complexes.

207. The aquifer in the proluvial-alluvial sediments of the Sokh complex of the Quaternary system has a limited distribution. The main development was below Kerauchi village within the Akhangaran branch proper, Akhangaran river valley. It is confined to proluvial pebbles with sandy-loamy aggregate. The sediment thickness is over 100m. Aquifer power 25-30m.

208. An aquifer in the proluvial-alluvial sediments of the Golodnostep complex of the Quaternary system. Developed both on the right and on the left side of the valley of the Akhangaran River. They are characterized by low permeability and are practically non-aquiferous. The width of its development reaches 6-7km.

209. An aquifer in the alluvial sediments of the Golodnostep complex of the Quaternary system is characterized by the greatest development and power. Traced mainly under the younger sediments of the aquifer of the Syrdarya complex, in the axial part of the valley.

210. An aquifer in the alluvial sediments of the Syrdarya complex of the Quaternary system. It is developed in the alluvial sediments of the floodplain I, II above-flood terraces of the Akhangaran and its lateral tributaries Dukant, Karabau, Akcha, Gushsay, Shaugaz, Urgaz, and others.

211. Primary data on ambient air, water quality and noise level in the settlements located next to construction sites of Asaka and Kokand TSSs have not been collected due to limited access to the sites. The limitation was cased by to COVID-19 situation.

212. Ambient air quality monitoring will be carried out before commencement of construction activities to establish the baseline values.

4.3. Biological resources

213. **Andijan province.** The main crop in the province is cotton. Apart from cotton, the province grows cereals, grapes, pomegranates, figs, persimmons, peaches, apricots, melons and gourds, and other species.

214. The flora is rich and diverse, a great number of different plant species grow in the floodplain, such as: Asiatic poplar, tamarisk, 'changyl', 'trostlik', licorice, camel's thorn, 'shurazhnik', etc.

215. Two rare red-listed species of Uzbekistan's flora grow in the province: Tulipa ferganica and Allochrusa gypsophiloides (bekh, yetmak, in Uzbek).

216. Species composition of the fauna inhabiting the province is diverse. It is a habitat for animal species listed in the Red Book of the Republic of Uzbekistan, such as: luciobarbus capito and other representatives of fish fauna, pygmy cormorant, white stork, white-eyed pochard, and many others.

217. **Namangan province.** The climatic conditions are quite favorable for the cultivation of cotton and other warm-weather crops. Apricots, pomegranates, figs, grapes, persimmons, apples, pears, etc. ripen here.

218. The vegetation in the plains and in the adyr belt is ephemeroid-type, and, above this point, it is replaced by sagebrush, then saltwort-sagebrush, graminaceous-sagebrush, and forb-fescue steppe. There are forest communities with walnut, alycha, apple, etc., while at an altitude of about 3,000 m archa [juniper] communities occur. Upwards, there are subalpine meadows – a belt of summer pastures.

219. In the project area along with the railway the following trees grow: poplar, mulberry, jida (*Elaeágnus*), sycamore, elm, walnut, almond, peach, apricot, plum, apple, pear, quince, figs, pomegranates. The railway also crosses agricultural lands where cotton, wheat and vegetables, forage crops are grown.

220. In the **Tashkent province** at an altitude of 300-500 m, where light and typical gray soils are developed, ephemera and ephemeroids grow mainly: tulips, field poppy, sedge, bluegrass, white ferula.

221. Bulbous bluegrass, creeping wheatgrass, mustard cornflower, flattened cornflower (butakuz), yellow tea (sarikcha), from shrubbery - hawthorn, mountain cherry plum, bitter almond grow on the attitude ranges from 500 up to 1200 m.

222. At altitude of 1200-2500 m in the Chirchik-Akhangaran Valley, the vegetation consists of various herbs: feathery hairy, fescue, eremurus, mallow; shrubs and trees: almonds, hawthorn, barberry, juniper, maple, wild cherry, nuts, wild apple trees, cherry plum, poplar, willow, birch, spruce, etc.

223. In the mountains at an altitude of over 2500 m, the climate is more humid and cool. Subalpine and alpine meadows are common here. Thin-eyed kermek, kuyruk, geranium, ram, alpine tulip, wild onions grow here.

224. The vegetation inside of the urban area is represented by the artificial planting of trees, bushes and fruit trees. Non-fruit trees such us poplars, mulberry and willow grow usually along roads.

225. In whole it could be stated, that the reviewed districts are characterized as an area with those fauna species found their niche and adapted to the environment, where dominate place is occupied by human and one's business activity.

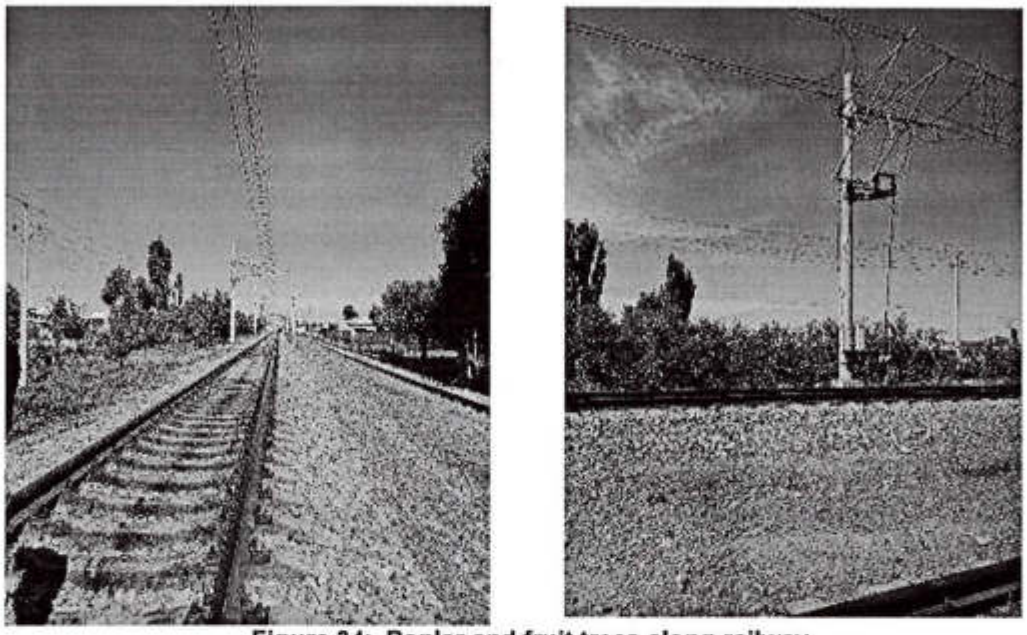


Figure 34: Poplar and fruit trees along railway

Natural protected areas

226. The territory of the Ferghana Valley has a large human impact. Among protected areas there are objects belonging to the III, IV, V categories of International Union for Conversation of Nature (IUCN). Data on the protected natural areas is presented in **Table 22.**

Table 22: Natural monuments (acc. to IUCN – III category)

№	Description and year of establishment	Location and protected object	Area km²
1	"Yozyavon" (1991)	Ferghana province. Desert ecosystems. Endemic species of reptiles.	18.4
2	Central Ferghana (1995)	Ferghana province. Desert and tugai ecosystems.	1.425
3	Mingbulak natural monument (1991)	Namangan province. Desert ecosystems of Ferghana Valley. Skink. Gecko Rustamova.	10
4	Chust (1990)	Namangan province. Reserve of useful insects – entomophages.	0,96

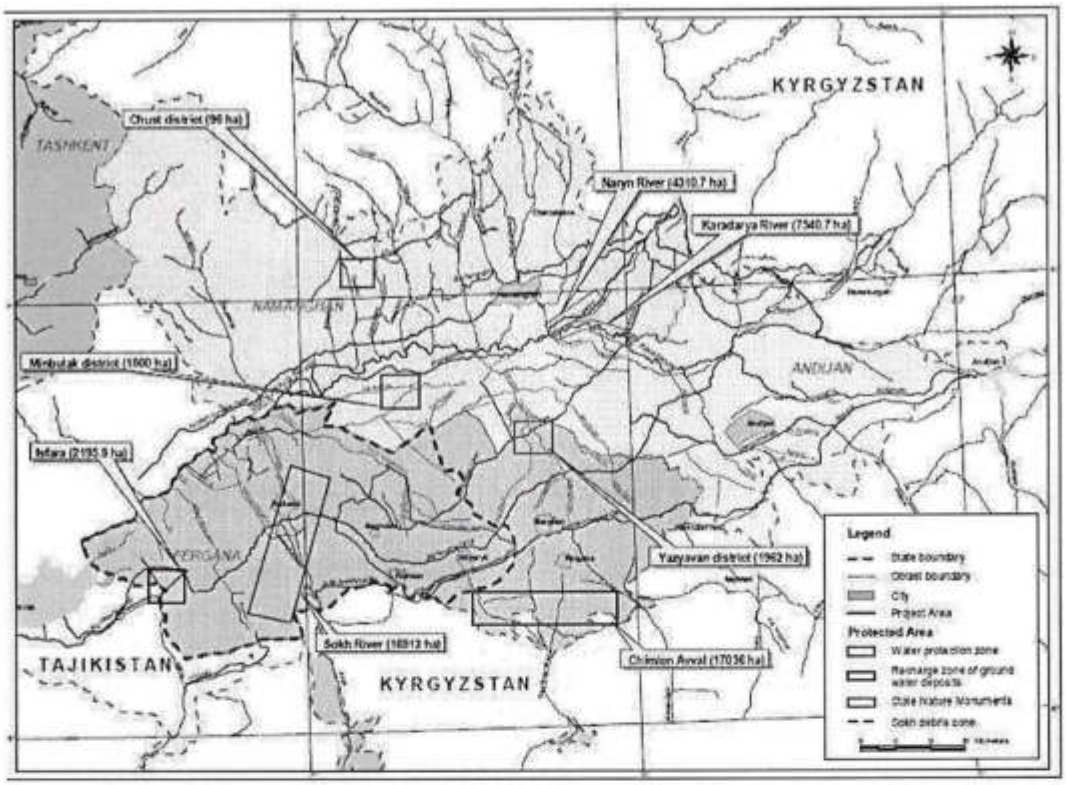


Figure 35: Location map of natural areas of protection in Ferghana Valley

227. The nearest natural area of protection in Namangan province is the Karaultepa IBA located at a distance of more than 2.4 km from the project area. The remaining natural areas of protection are on the territory of other districts of Namangan, Andijan and Ferghana provinces. There are not any bird areas or transect within the project territory. Therefore, the project will not impact on the biological resources.

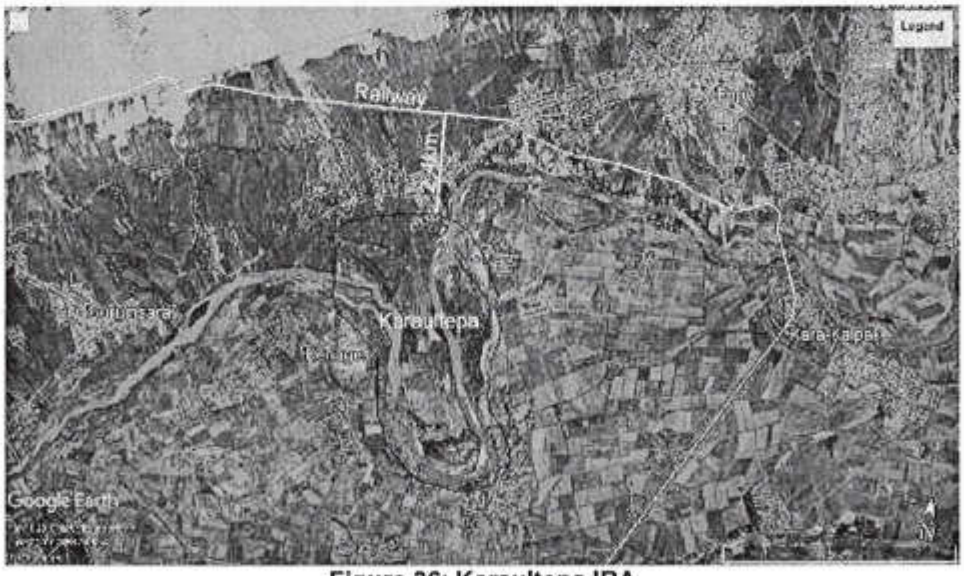


Figure 36: Karaultepa IBA

228. There is one protected area located in Tashkent province - Ugam-Chatkal Biosphere Reserve (BF). The BF was established as a national park in 1970 (re-organized in 1990 after preliminary surveys) and it occupies area of 574,000 hectares. The part covers almost all the south-western spurs of the Western Tien Shan: Koksu, Ugam, Maidantal, Pskem and Chatkal

ridges. The range of heights varies from 900m to 4000 m above sea level, which includes the midland, forest and alpine zones.

229. In 2018, the GoU adopted the Resolution of Cabinet Ministries # 1062 "On Regulation on Ugam Chatkal Biosphere Reserve" (2018) which states that territory of the BR consists of three zones:

(i) Reserve zone - 11,018 ha;
(ii) Buffer zone (1000 meters around the perimeter of the conservation area) 5,197.6 ha[22];
(iii) Transition zone – 27,920.8 ha.

230. The total area of the BR is 42,952 ha, and it is a highly restricted protected zone. Although economic activities are prohibited, some activities relating to recreation, tourism, the harvesting medicinal plants and other restricted activities however are allowed in the buffer zone. Economic activities without harmful impact on the protected assets are also allowed in the transition zone.

231. The location of the project sites related to the protected areas is presented in **Figure 37**. The distance between the railway alignment and the buffer zone is more than 30 km, and the distance between the closest point and transition zone is more than 25 km.

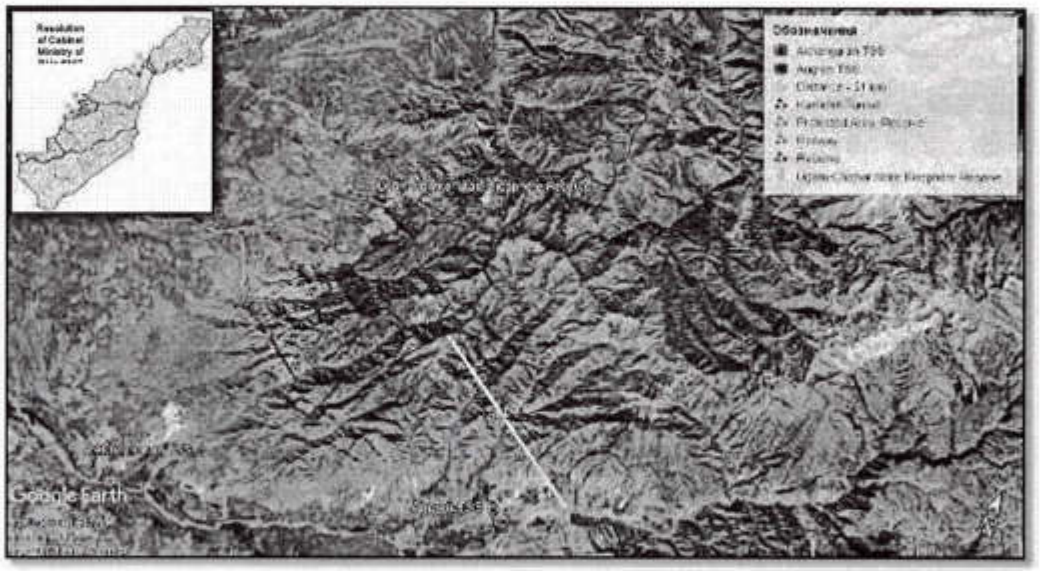


Figure 37: Location of the Ugam-Chatkal Biosphere Reserve. In purple – territory of reserve zone, in red – transitions zone

4.4. Socio-economic conditions

General information on the Ferghana Valley

232. **Demography.** Total population of the three provinces in the Ferghana Valley account for 28.5% of the total population of Uzbekistan, while occupying only 4.1% of the total area of Uzbekistan. The Ferghana Valley has the highest population density of all the provinces in Uzbekistan. The share of the urban population is slightly higher than the average for the Republic and amounts to 57.8%. Details of the demographic indicators are presented in Table 23.

[22] 1183.6 ha – territory of Akhangaran, Bostanlic and Parkent districts which are not included in the biosphere reserve

Table 23: Demographic indicators in project area

Province	Population (in '000)	Population density per km²	Gender (Share in %)		Population growth, promille	The average age of the population, years
			Male	Female		
Andijan	3,066.9	713.2	50.6%	49.4%	18.7	28.9
Ferghana	3,683.3	544.9	50.4%	49.6%	17.7	29.4
Namangan	2,752.9	370.0	50.8%	49.2%	19.9	28.5
Total in FV	**9,503.1**	**542.7**	**50.6%**	**49.4%**	**18.8**	**28.9**
Uzbekistan	**33,255.5**	**74.1**	**50.2%**	**49.8%**	**18.6**	**28.8**

Source: TRTA, PSA report 2020

233. About 60% of the total population of the three provinces of the Fergana Valley are of working age, 30% are under 16 years of age, and the remaining 10% are residents of retirement age. The proportion of men and women is approximately the same: 50.6% men and 49.4% women. The average household size is 5 persons. About 87% of the population living in the Ferghana Valley are ethnic Uzbeks, the rest are Tadjiks (5%), Russians (3%), Tatars (0.5%), Kyrgyz (0.5%) and other minorities. The primary spoken language is Uzbek, however some people speak Russian and Tadjik.

234. Agriculture is the leading sector in forming of GDP in the Ferghana Valley, it's share amounts to 44%, followed by industry (18%), and transportation and communication services make (6%). As shown in **Figure 38.** The provinces total contribute 17.4% to national GDP, equivalent to US$ 8,461.77 million (2018). Details of the GDP structure in the provinces are provided in **Table 24.**

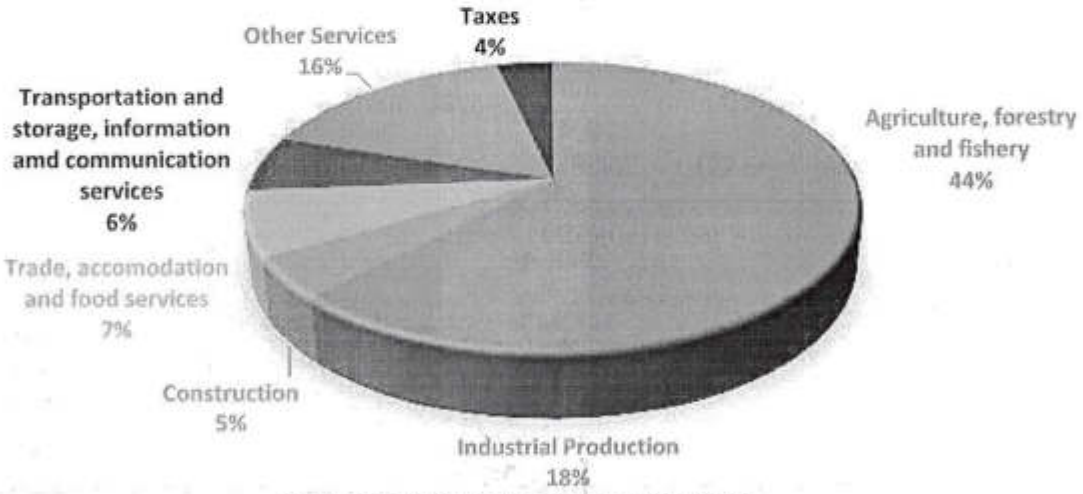


Figure 38: GDP by Sectors in FV in 2018

Table 24: GDP of Ferghana Valley provinces in 2018[23]

	Andijan		Ferghana		Namangan	
	(bln. UZS)	(mln.USD)	(bln. UZS)	(mln.USD)	(bln. UZS)	(mln.USD)
Agriculture, forestry and fishery	13,050.0	1,567.57	9,345.30	1,122.56	8,870.7	1,065.55
Industrial Production	5,515.0	662.46	4,907.40	589.48	2,124.4	255.18

[23] The Central Bank of Uzbekistan rate of currency as of December 2018 - $1 = 8,325 UZS

	Andijan		Ferghana		Namangan	
	(bln. UZS)	(mln.USD)	(bln. UZS)	(mln.USD)	(bln. UZS)	(mln.USD)
Construction	1,115.5	133.99	1,214.80	145.92	874.1	105.00
Trade, accommodation and food services	1,729.3	207.72	1,971.80	236.85	1 376.7	165.37
Transportation and storage, information and communication services	1,515.9	182.09	1,718.60	206.44	1 055.4	126.77
Other Services	3,561.4	427.80	4,654.40	559.09	3 357.1	403.26
Taxes	634.5	76.22	1,368.90	164.43	483.0	58.02
TOTAL	**27,121.6**	**3,257.85**	**25,181.20**	**3,024.77**	**18,141.4**	**2,179.15**
Share in total Country GDP	**6.7%**		**6.2%**		**4.5%**	

Source: TRTA, PSA report 2020

235. **Labor and Employment**. The total number of labor force in Uzbekistan as of January 1, 2019 was 18.830 million people, or 56.6% of the total population. These are people at the age from 16 to 60 years old (55 for women).

236. The economically active population, which is the sum of employed and unemployed people seeking jobs, was 14,641.7 thousand people (77.7% of the total labor force). The economically active population of the regions of the Fergana Valley was 4,170.8 thousand people, or 28% of the total economically active population of the entire republic.

237. The number of unemployed, determined by the method of calculating the unemployed population in need of employment, approved by government decree of May 24, 2007 No. 106, averaged 9.3% of the economically active population. And in the Ferghana Valley, the unemployment rate is the highest among other regions of the country reaching 9.6%. The average age of the working population is 36.4 for women and 37.9 for men, which indicates a higher rate of unemployment among young people in the project area.

238. Most of the employed people in the Ferghana Valley are engaged in the agricultural sector, for example about 28% of employed people in Ferghana province work in this sector. Industry, trade, education and construction sectors are the next highest employment sources for the residents of the Ferghana Valley.

239. At the beginning of the 2018/2019 school year, the total number of general education institutions was 9,774, including 9,648 general secondary schools, 37 primary, 89 other institutions. This includes 6,044 schools (62%) located in rural areas, and 3,730 schools (38%) in urban areas. The number of schools in the Ferghana Valley provinces and the number of students enrolled in the year 2018/2019 are presented in **Table 25**.

Table 25: Secondary schools in Ferghana Valley in 2018

Province	Number of schools	Number of students enrolled at schools (in thousands)	Number of teachers working at schools (in thousands)	Average number of students per teacher
Andijan	746	532.8	36.8	14.5

Ferghana	926	627.7	47.2	13.3
Namangan	695	474.3	33.9	14.0
Uzbekistan	**9,774**	**5,850.9**	**457.8**	**12.8**

Source: TRTA, PSA report 2020

240. According to the State Statistics Committee, in total, 18 lyceums and 376 professional colleges are functioning in the Ferghana Valley currently, where 197,200 students are studying. Since the beginning of the 2018/2019 school year, 360,200 students are receiving education in higher educational institutions, of which 159,400 are girls, 22.1% students are studying on a state grant basis, and 77.9% on a paid contract basis in Uzbekistan. In the provinces, a total of 14 higher educational institutions exist now, where 65,600 students are studying. It should be noted that about nearly half of the higher educational institutions are located in Tashkent City (42 out of 98) and there are many students from the Ferghana Valley provinces studying in universities and institutes in Tashkent.

241. **Tashkent province,** Angren city. The city is located on the Angren River, 110 km to the east of Tashkent. The city was founded in 1946. The territory of the city is 150 km^2. The population of Angren is approximately 175,400. The city population mainly consists of representatives of Central Asian peoples: according to official data, 73% are Uzbeks, 17% are Tajiks, and 5% are Koreans, 3% are Russians and less than 1% are Tatars.

242. Angren is the center of the coal industry of Uzbekistan. Brown coal is mined by OJSC "Uzbekkumir". Angren has the only gas producing station in the country using the underground coal pyrolysis (underground gas) method of OJSC "Yerostigaz". There are two power plants: "Angren" Hydroelectric power station and "Novoangren" Hydroelectric power station. In addition, in the city there are such enterprises as: machine-building plants, a kaolin ceramic porcelain factory, the Angren Pipe Plant, industries for reinforced concrete structures, cement, asphalt-concrete, paper and cardboard products plants.

243. There are also 17 preschools, 53 primary schools, 7 professional colleges, 3 academic lyceums, 3 children's art schools, 1 sport school, and 55 state clinics. In aggregate, in this region, socio-economic conditions are favorable for the population to live.

244. There are two settlements located next to the construction sites of the Asaka and Kokand TSSs. The name of the settlement located nearby Asaka is Kumgon mahalla, and nearby Kokand is the Ashurali Zokiroy mahalla.

245. The total population of Kumgon mahalla is 10,985 people. There is only one secondary school and one medical center in the mahalla. The majority of the working age population works at the SJC "GM Motors" – manufacture of automobiles. Agricultureal production and livestock are also additional incomes in the Kumgon mahalla. There are no historical heritages on the territory of this settlement.

246. Between 400 to 500 people live in the Ashurali Zokiroy makhalla, where there is one secondary school, one polyclinic and two private kindergartens. The population is involved in agriculture production and livestock. There are eight textile productions on the territory of the mahalla, several shops and one cafeteria. There are no historical heritages on the territory of this settlement.

4.5. Cultural heritage

247. **Andijan province.** Among the historical sightseeing places of Andijan province are: the Jome architectural complex (mosque and madrasa) located in a district of Andijan called Eski Shahar (Old Town); Babur's house museum situated on Boghi Shamol hill likewise in

Andijan Old Town; the tomb of the Arab commander, Qutayba ibn Muslim, which is located in Pakhtakor village, Jalol Quduq district, 28 km from Andijan city; Khonobod park city, Ming Tepa archaeological monument located in the eastern part of Marhamat city, 38 km from Andijan city centre; Fozilmon Ota temple located in Fozilmon Ota village near Khonobod city, 70 km from Andijan's centre; and the Bibi Seshanba temple located in Sultonobod village of Kourgan Tepa district, 60 km from Andijan's centre. It is a sacred place where the healing springs of Kouk Buloq and Qiz Buloq are situated.

248. The project area does not have historical monuments, and the above listed sights are located over a distance of 50 km from the project sites.

249. **Namangan province.** Among the main sights are the Hoji Omin mausoleum located in Namangan city on Kouzagarlik street; and the Mullah Kyrgyz madrasa in Namangan city. The sights are located over 10 km and 12 km from the railway track, and therefore it is anticipated that no impact on them is expected from the project work.

250. **Tashkent province.** Angren city. The city has a local history museum, a prayer house in honor of the icon of the Mother of God, and the mausoleum of Gumbez-bobo. These historical places are located a distance more than 15 km from the new Angren railway station where project works will be implemented. Besides these monuments, there are no other cultural heritages in the territory close to the project area.

5. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

251. Anticipated the project's environmental impacts were reviewed at the three stages – the pre-construction, construction and operation stages. A summary of potential impacts is presented in **Table 26**.

Table 26: Summary of project activities for the project

Project Activities	
Construction phase	**Operations phase**
Construction of new TSS	
• Construction and workers camp operation • Land leveling • Land and vegetation clearing • Fencing • Earthworks, digging basements • Construction of buildings • Installation of equipment • Connection of TSS to the external power supply • Landscaping • Maintenance of construction camps • Waste generation and its disposal • Water use	• Train movement • Train Maintenance
Installation of telecom, signaling and SCADA systems	
• Digging tranches • Cable lying • Filling cables	• System operation • Cable maintenance
Replacement of transformers on existing TSSs	
• Demolishing of operating transformers • Drain oil into special container • Installation of new transformers • Commissioning	• Transformers operation • Maintenance

252. The baseline lists in a tabular format the environmental factors likely to be affected by the project activities. The table was created by breaking down the environmental subsystems into the lowest level of environmental subfactors.

Table 27: Environmental factors hierarchy for the project

Subsystem	Environment	Factor	Subfactor
Natural physical Subsystem	Physical Environment	Atmosphere	Climate
			Noise
			Vibration
			Air Quality
		Soil	Soil and Subsoil Quality
			Structure
		Hydrology	Water quality
			Groundwater quality
			Water quantity
	Biotic Environment	Fauna	Fauna habitats
			Behavior patterns
		Flora	Natural vegetation
			Anthropic vegetation
Population and Activities Subsystem	Land use	Rural	Agriculture and livestock use
		Productive	Industrial use
		Nature conservation	Protected land
	Cultural heritage	Resources	Archeological
			Indigenous people
	Population	Occupation	Employment
			Health and safety
		Welfare	Population welfare
			Development of local economy
	Communication and infrastructures	Infrastructure	Railway infrastructure
			Non-railway infrastructure

253. Finally, the cross-reference between project actions and environmental factors was generated, as the main item of the impact identification process. The matrix of identification is shown next, in which are included the potential interactions between the project actions and the environmental factors (potential impacts).

254. The cells with grey color indicate negative impact and cells with green – positive impacts.

Table 28: Impact identification matrix – Construction phase

IMPACT IDENTIFICATION MATRIX - OPERATION PHASE																								
ENVIRONMENTAL FACTORS																								
PROJECT ACTIVITIES	NATURAL PHYSICAL SUBSYSTEM														POPULATION AND ACTIVITIES SUBSYSTEM									
	PHYSICAL ENVIRONMENT								BIOTIC ENVIRONMENT				PERCEPTUAL ENVIRONMENT		LAND USE			POPULATION				COMM. / INFRASTR.		
	Atmosphere				Soil	Water			Flora		Fauna		Landscape		Rural	Product.	Nature Cons.	Occupational		Welfare		Infrast.		
	Climate	Noise comfort	Vibration	Air quality	Soil and subsoil quality	Resource quantity	Water quality	Groundwater quality	Natural Vegetation	Anthropic Vegetation	Fauna habitats	Behavior patterns	Landscape quality	Visual intrusion	Agriculture and livestock use	Industrial Use	Protected land	Employment	Health & Safety	Population welfare	Development of local economy	Railway infrastructure		
Pre-construction phase																								
Selection sites for construction camps and their set up					■	■				■					■					■	■		
Opening new borrow pits or receiving permission on usage existing					■	■								■										
Arrangements of energy and water supply, domestic and construction wastes disposal					■	■	■																	
Construction of TSSs																								
•Land leveling		■	■	■	■					■	■			■	■			■	■					
•Construction and workers camp operation					■		■	■										■	■	■	■			
•Land and vegetation clearing																		■						
•Fencing		■		■										■	■			■	■					
•Earthworks, digging basements		■	■	■	■													■						
•Construction of buildings		■	■	■																				
•Installation of equipment																			■					
•Connection of TSS to the external power supply																			■					
•Landscaping									■									■						
•Waste generation and its disposal					■									■					■					
Installation of telecom, signaling and SCADA systems																								
•Digging tranches		■	■		■													■	■					
•Cable lying				■														■	■					
•Filling tranches		■			■													■	■					
Replacement of transformers on existing TSSs																								
•Demolishing of operating transformers		■																	■					

IMPACT IDENTIFICATION MATRIX - OPERATION PHASE																										
ENVIRONMENTAL FACTORS																										
PROJECT ACTIVITIES	NATURAL PHYSICAL SUBSYSTEM														POPULATION AND ACTIVITIES SUBSYSTEM											
	PHYSICAL ENVIRONMENT								BIOTIC ENVIRONMENT				PERCEPTUAL ENVIRONMENT		LAND USE			POPULATION				COMM. / INFRASTR.				
	Atmosphere				Soil	Water			Flora		Fauna		Landscape		Rural	Product.	Nature Cons.	Occupational		Welfare		Infrast.				
	Climate	Noise comfort	Vibration	Air quality	Soil and subsoil quality	Resource quantity	Water quality	Groundwater quality	Natural Vegetation	Anthropic Vegetation	Fauna habitats	Behavior patterns	Landscape quality	Visual intrusion	Agriculture and livestock use	Industrial Use	Protected land	Employment	Health & Safety	Population welfare	Development of local economy	Railway infrastructure				
•Drain oil into special container																										
•Installation of new transformers																										

Table 29: Impact identification matrix – Operation phase

IMPACT IDENTIFICATION MATRIX - OPERATION PHASE																										
ENVIRONMENTAL FACTORS																										
PROJECT ACTIVITIES	NATURAL PHYSICAL SUBSYSTEM														POPULATION AND ACTIVITIES SUBSYSTEM											
	PHYSICAL ENVIRONMENT								BIOTIC ENVIRONMENT				PERCEPTUAL ENVIRONMENT		LAND USE			POPULATION				COMM. / INFRASTR.				
	Atmosphere				Soil	Water			Flora		Fauna		Landscape		Rural	Product.	Nature Cons.	Occupational		Welfare		Infrast.				
	Climate	Noise comfort	Vibration	Air quality	Soil and subsoil quality	Resource quantity	Water quality	Groundwater quality	Natural Vegetation	Anthropic Vegetation	Fauna habitats	Behavior patterns	Landscape quality	Visual intrusion	Agriculture and livestock use	Industrial Use	Protected land	Employment	Health & Safety	Population welfare	Development of local economy	Railway infrastructure				
TSS operation																										
•Train movement																										
•Train Maintenance																										
Signaling, telecom, SCADA system operation																										
•System operation																										
•Maintenance																										

1.1. Pre-construction stage

Impact

255. During the pre-construction stage, the following aspects will impact on the effectiveness of implementation of environmental safeguards during the entire project cycle and may lead to non-compliance with requirements: (i) non-inclusion of environmental requirements into the bidding documents and contracts, (ii) non-compliance on receiving all required permissions, and (iii) purchase of goods, techniques and machinery which do not comply with ADB Prohibited Investment Activities List set forth in Appendix 5 of the Safeguard Policy Statement (2009) and national standards on exhausted gases.

256. Different types of inert materials (rubble, gravel etc.) will be used for construction. Opening of new borrow pits without getting permission from respective national agencies, or usage of unauthorized borrow pits is prohibited by law. Therefore, contractors will be required to obtain such permission prior to commencement of construction works.

257. At this stage, selected contractors will set up construction and temporary camps for workers or will organize accommodation of workers in nearby settlements. The contractors will therefore have to arrange energy and water supplies, and provide for domestic and construction waste treatment and disposal. Further details will be covered in the Site-Specific Environmental Management Plan (SSEMP) to be prepared prior to the commencement of construction activities.

258. Environmental specifications have to be included in bidding packages for the procurement of machinery within the project. Particularly, the toxic emission levels of machinery must meet "Euro 3" environmental requirements as defined by national regulations[24]. The noise levels of machinery should not exceed 87 dB[25].

259. Goods procured for project implementation will comply with the ADB Prohibited Investment Activities List set forth in Appendix 5 of the Safeguard Policy Statement (2009). It is also necessary to ensure that transformers procured within National Contract Bidding (NCB) processes does not contain oil with polychlorinated biphenyl (PCB).

Mitigation measures

- Ensure that environmental provisions along with EMP are included in the bidding documents and in contracts for Contractors;
- Bids evaluation needs to be done with consideration of: the capacity of bidders to meet EMPs requirements, proposing adequate budgets for efficient implementation of EMPs, and the existence of good practices in environmental performance within other similar projects;
- Within 30 days after contract award and prior to commencing any physical works, Site-specific Environmental Management plans (SSEMPs) will be developed by the contractors under the guidance of the PMC, and be endorsed by the PMC before submission to the PIU-ET for approval;
- Selected contractors need to identify locations of closest authorized borrow pits and conclude agreements on inert material supply with relevant agencies (State Committee on geology and mineral resources, Sanitarian Epidemiological Station);
- Goods procured for project implementation will be done in compliance with the ADB Prohibited Investment Activities List as set forth in Appendix 5 of the Safeguard Policy Statement (2009).

[24] Resolution of President of RUz "On measures for further development of production at the Samarkand automobile plant and renewal automobile park", dated from December 14, 2006

[25] Attachment # 6 to Cabinet Ministries Resolution # 192 dated from July 4, 2012 "On approval of general technical regulations "On safety during operation of railway transport""

1.2. Construction stage

1.1.1. Physical resources

Impact on air quality

Construction of traction substations

260. The construction of the TSSs will be similar to the construction of small buildings except that there will be extensive networks of conduits to accommodate the wires and communication cables. The yard of each will be leveled and topsoil and any unsuitable soil will be removed. The location of heavy equipment such as the transformers, towers, water tanks and oil storage tanks will be identified and the foundations excavated.

261. As a rule, for TSS leveling, excavation works and the placement of concrete as a basement, the UTY hires subcontractors to complete these works. After completion of this phase, the UTY will continue with the construction works, and the installation of transformers and other equipment.

262. Although a significant proportion of civil works (around 80%) has already been completed at the Kokand TSS, other works, including the completion of buildings and installation of equipment, are still to be implemented. This may include the utilization of heavy equipment that could generate air pollutants. For the Kokand TSS, an approximate distance between the track substation and the closest house is 20 meters and 120 meters respectively. Although the main construction works and installation of equipment will be undertaken on an area that is remote from settlements, dust and pollutants from machineries during windy weather may impact on the population within the settlements located around TSSs.

Figure 39: Location of Kokand traction substation and the closest sensitive receptors (102 m and 90 m)

263. For the Asaka TSS, the nearest village is located a distance of 62-65 meters and 205 meters respectively (**Figure 40**).

Figure 40: Location of Asaka traction substation and the closest sensitive receptors (62 and 205 meters)

264. During the construction phase, the impact on air quality could be caused by emissions from machinery and dust.

Installation of signaling, telecom and SCADA system

265. For the installation of signaling and telecom systems, the renovation of some of the buildings/facilities at the stations could be required. The necessity of such renovation works will be defined by an EPC contractor at the detailed design stage. During the renovation works, dust and exhaust gases from vehicles and equipment could therefore pollute the air, especially from vehicles and equipment that is in poor condition or has improper technical characteristics.

266. Two approaches will be used for lying pipe for optic fiber cable. Firstly, a cable trench digger will be used to excavate trenches in areas remote from settlements, and secondly, trenches for pipes located within settlements will be excavated manually.

267. Therefore, mitigation measures mainly have to be implemented mostly for activities related to the renovation of buildings and facilities.

Mitigation measures:

268. During the construction period the following mitigation measures shall be used in most cases:

- Apply watering of TSSs' and other construction sites located close to settlements during windy weather in the dry season;
- During the renovation of buildings/facilities for the installation of signaling and telecom systems, apply watering to construction sites during windy weather inside settlements during the dry season;
- Ensure that all used techniques and heavy equipment comply with national standards on gases emissions ("O'z DSt 1057:2004 Vehicles. Safety requirements for technical conditions" and "O'z DSt 1058:2004 Vehicles. Technical inspection. Method of control");
- All piles of soil, sand and gravel that will not be used within the next 24 hours will be covered to prevent dust generation;
- Transported bulk materials will be covered;

- Conduct dust pollution monitoring. In case of increasing maximum allowed concentration (0.5 mg/m^3), apply additional mitigation measures (more water, installation dust protection screen) as required.

Noise

269. Usually, during the construction phase, noise pollution and excess norms for vibration may occur due to the very nature of the work at the sites located close to settlement areas.

270. During this stage, various techniques and machinery could work at the same time. As per existing practice, the following machinery will be used during this stage: excavators, bulldozers (dozers), air compressors, truck cranes, assembly cranes, compactors, and vibrators for concrete compaction. The maximum noise levels for this equipment are presented in **Table 30.**

Table 30: Noise level form various techniques (at the distance 50 feet[26])[27]

Noise source	Equivalent noise level, dB
Excavator	81
Dozer (Bulldozer)	82
Compactor (ground)	83
Air Compressor	81
Truck (mobile) crane	83
Vibrator for concrete compaction	76
Backhoe	80
Truck	88

Source: WSDOT measured data in FHWA's Roadway Construction Noise Mode Database (2005)

271. Using Rules on Decibel Addition, it was calculated the that maximum noise level from construction equipment may reach 90 dB. Three noisier equipment were selected – trucks, mobile cranes and compactors. Noise propagation exercises show the anticipated noise levels during conduction the main works (**Table 31**). Noise levels will be reduced by fences which will be constructed around TSS (3 meters height) and surface factors. Fences will decrease noise levels by around 7 dB[28]. Surface factors (where areas between construction sites and living houses are mostly earth) will reduce noise levels from techniques by at least on 2.5 dB.

Table 31: Noise propagation with distances

Distance	Noise level (maximum), dB
17.4	90
50	80
62	78
90	74
100	74
102	69
120	67

272. As shown in Table 31, in the closest area adjusted to living houses (50 meters, Kokand TSS and 62 meters Asaka TSS) the maximum anticipated noise levels will be around 70 and 68.5 dB (80-7-2.5 = 70.5 and 68.5 dB accordingly). Considering the presence of trees on the site as well, it could be assumed that anticipated noise levels from construction techniques will exceed national and WHO norms (55 dB for day) by 15 dB. It is therefore recommended to conduct noise measurements in front of the nearby houses (2 meters from the window). In case of exceeding norms, sound absorbing barriers will then be installed.

[26] One feet is equivalent to 0.348 meters, 25 feet is 8.7 meters, 500 feet is 17.4 meters
[27] Part Two – Construction noise impact assessment, Table 7-4
[28] CRN 2.01.08 Noise protection, Table 29

Installation of signaling and SCADA system

273. Lying pipe for optic cable for signaling, telecom and SCADA systems will be done manually inside settlements and where houses are located close to the railway alignment, and by using machinery in unpopulated areas. Therefore, noise and vibration level impacts should be short term and low, which requires implementation of general mitigation measures indicated in the following mitigation measures.

274. The buildings where SCADA will be installed may require some rehabilitation works. The necessity of conduction works will be defined by the supervision consultant during the detailed design stage. In case of conduction rehabilitation works in buildings, noise could be generated from truck movements and crane operations (if any). In that case, noise levels should be similar to construction noise at the TSS. Therefore, it is recommended to conduct noise measurements in front of the closest houses (2 meters in front of windows) during the rehabilitation works, and in case noise levels are exceeded, to undertake mitigation measures.

Mitigation measures:

275. The following general measures need to be implemented to avoid noise and vibration impacts on the project sites located within settlements:

- During the construction period, establish speed limits for vehicles inside settlements (40 km/h)
- The operation of heavy equipment shall be conducted between 7 am and 10 pm only and be undertaken intermittently not continuously;
- Conduct noise level monitoring in places indicated in the environmental monitoring plan;
- In case of receiving any complaints from the population, additional noise measurements need to be conducted and in case of exceeding established standards[29], additional mitigation actions to decrease noise levels need to be undertaken (establishing temporary sound absorbing barriers and others);
- Schedule construction so as to minimize the multiple use of the noisier equipment near sensitive receivers;
- Use of Personal Protective Equipment (PPE) by workers involved in construction works in conditions of increased acceptable noise level (for situations when equivalent sound levels over 8 hours reach 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A), workers should use hearing protection equipment) is mandatory.

Vibration

276. Certain levels of vibration is anticipated during the operation of machinery on construction sites. During the construction of the TSSs, the following potential vibration-generating machines will work: excavators, bulldozers and cranes. Vibration impacts during the construction stage could be caused by the same machinery. Vibration levels from different techniques were calculated in accordance with the methodology provided in the Transportation and Construction Vibration Guidance Manual (2013).

[29] Admissible noise level into the living area, both inside and outside the buildings (SanR&N No.0267-09)

277. Values of vibration levels calculated in accordance with this formula are presented in **Table 32.**

Table 32: Calculation of vibration from equipment

Distance, m	Vibration from equipment,					
	Small bulldozer		Loaded trucks		Excavator	
	in PPV (in/sec)	dB	in PPV (in/sec)	dB	in PPV (in/sec)	dB
20	0.004	37	0.1	66	0.28	74
30	0.002	34	0.05	62	0.16	71
50	0.001	29	0.028	57	0.08	65

Source: PPTA's consultants, 2018

278. National standards for vibration levels in residential houses are provided in the Sanitarian Norms and Rules (SNR) № 0146-04 "Design of the living houses in climatic conditions of Uzbekistan". For living houses, the standard is 67 dB for night time and 72 dB for day time, with a frequency in 37 and 61 Hz and for night time is 67 dB.

Table 33: National standards for vibration

Period	Permanent vibration, dB
Day time	72
Night time	67

279. As shown in **Table 33**, vibration from construction activities will not impact on people living in surrounded areas and structures, since they are below standard (72 dB for day time).

280. In summary therefore, the above described impacts on air quality, noise and vibration will be temporary, and can be mitigated by implementation of recommended measures.

Impact on water resources

Construction of traction substations

281. There are no major surface water bodies within a radius of 1 km from the construction sites of the Asaka and Kokand TSSs. There is however a small drainage canal a distance of 110 m to the west of the project site in Kokand. The water in the canal flows during the irrigation season and during the rains. The drainage canal drains water during the irrigation season from agricultural lands surrounding the TSS. It is necessary therefore to ensure that the drainage canal works appropriately in order to avoid the waterlogging of the area.

282. During the construction phase, water will either be delivered by the railway to the construction sites or extracted from wells drilled within the construction sites. For drinking purposes, the TSSs will be connected to the centralized water supply system of Asaka and Kokand cities. Sewage water will be collected into septic tanks and disposed to the cities' wastewater treatment facilities.

Figure 41: Drainage canal to the west from TSS

Installation of signaling and SCADA system

283. The overall alignment crosses a number of canals and rivers, especially in the section of Angren-Pap. On these sections of the alignment, the railway goes through bridges specially constructed for the railway. Some parts of alignment also go next to water bodies.

284. At the distance of around 7.2-7.5 km from Angren city, and in front of Angren station for freight operations, the alignment goes close to the Akhangaran River - 55 meters away (**Figure 42**).

Figure 42: Railway alignment next to Akhangaran river

285. Further, the railway goes next to Akhangaran Reservoir: the nearest point of the river is located a distance 100 meters away (**Figure 43**).

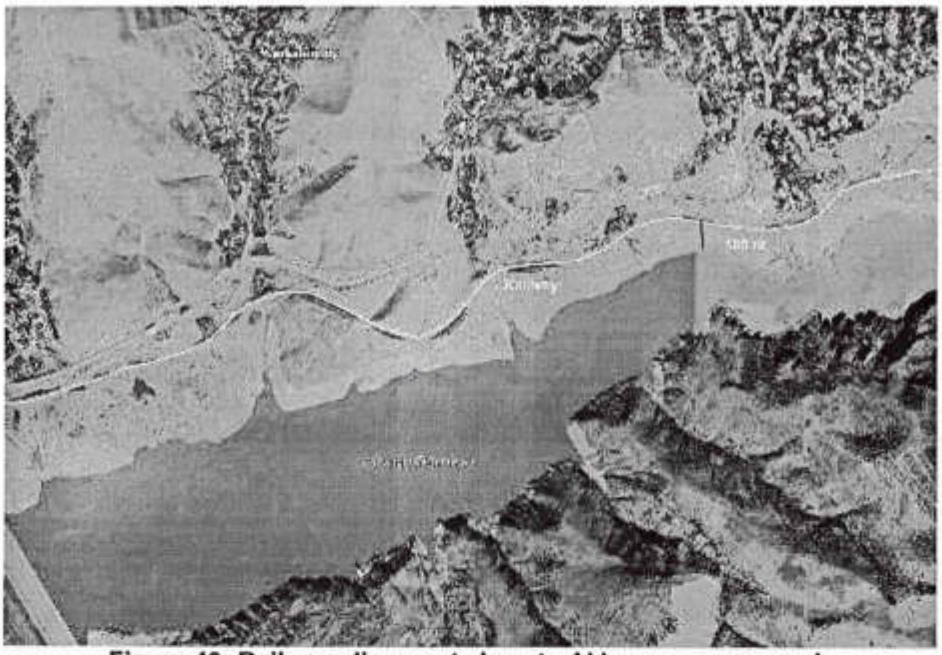


Figure 43: Railway alignment close to Akhangaran reservoir

286. The alignment also crosses up-stream of the Akhangaran River at several points on cement-concrete bridges. At certain points, the alignment is located a distance of 35-50 meters from the Akhangaran up-stream.

287. In Namangan province, after the Pap station, the railway crosses the Syrdarya River on a metal bridge.

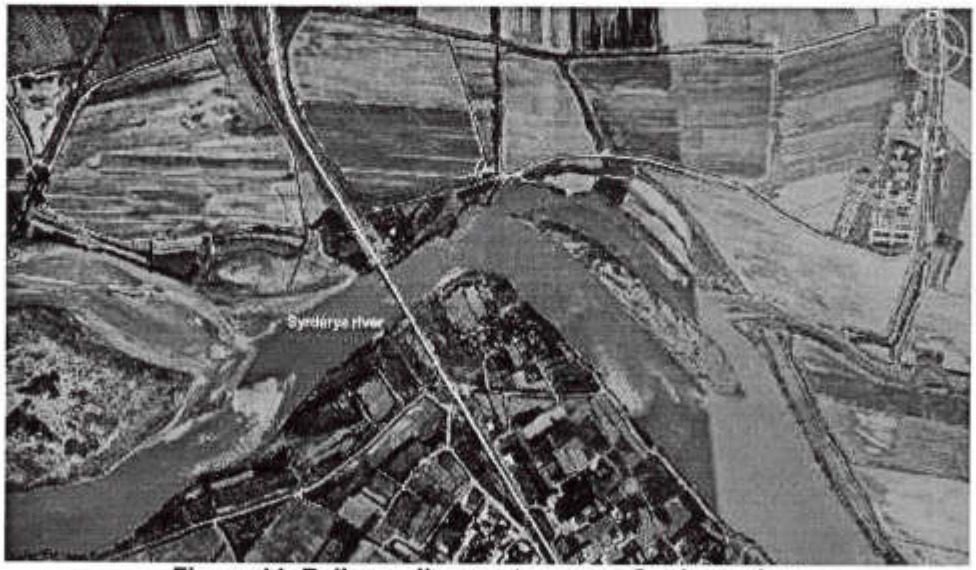


Figure 44: Railway alignment crosses Syrdarya river

288. Further, the railway crosses the Big Ferghana Canal (BFC) twice on reinforced concrete bridges.

Figure 45: Railway alignment crosses BFC river

289. The cable will be laid in the embankment of the railway within a distance of 3-5 meters from the railway axis. There is a special culvert installed in railway bridges where the cable will be installed. Mainly, a railway cable laying machine will be used for the installation of cable. In the area where this machine could not be used, the cable will be placed manually. It means that no works will be carried out within the river beds/water channels.

290. For these works, all workers will be accommodated on the territory of closest stations, and no construction camps will be located close to river and water subjects.

291. Civil works related to the installation of signaling and SCADA systems will be implemented in areas remote from water resources. Therefore, this activity will not impact on water resources.

Mitigation measures:

292. The following mitigation measures shall be implemented to minimize impacts on water sources:

- Construction and labor camps, including storage places for lubricant, fuel and other oil contented products, will be located at least 100 m away from water bodies;
- If equipment and vehicle washing is planning to be conducted in the labor/construction camp sites, appropriate wastewater treatment facilities have to be organized in the camps and within specially designated areas. The maintenance areas should be provided with oil and grease traps to prevent oil from being washed into offsite drainage canals.
- Refueling, oil replacement or repairing works will be prohibited within 100 m distance of water streams;
- Sanitary water and solid waste will not be released directly into surface water streams of other water bodies. Adequate on-site sanitation facilities with septic tanks to prevent untreated sewage from being channeled into the drainage canals, irrigation canals, and river will be provided.
- Topsoil stripped material shall not be stored where natural drainage or within 100m of water bodies will be disrupted;
- In the case of the necessity of the drilling of wells for technical or drinking water purposes, permission has to be received from relevant authorities - State Committee on Geology and Mineral Resources and State Committee on Ecology and Environment Protection.

293. The groundwater table level within the Project zone is reportedly deeper than 5 meters. Therefore, potential impact arising from the maintenance of transport, maintenance of vehicles and handling and storage of lubricants and fuel. The required provisions for maintenance of construction camps are described in the following chapters.

Impact on soil

Lying pipe for fiber optic cable

294. The disturbance or loss of topsoil may occur during the lying of pipes for optic fiber cable. Excavated soil will be temporary stored alongside trenches, and refilled after pipe lying. All works on cable laying will be implemented within the RoW.

295. Gravel will be used as a bed for the pipes. The usage of unofficial carriers without official permission may also lead to the loss of soil as well. Therefore, contractors will be required to use only official carriers for construction materials, or in the case of opening new ones, obtain official permission and ensure that after construction completion, all carriers are rehabilitated.

Construction of traction substations

296. Surplus excavated soil will be generated during the construction of TSSs. According to TSS design, three main buildings with dimensions 24.00mx7.20 m, 12.00mx21.60 m, and 18.00mx7.20 m will be constructed. The depth of basements will be around 3 meters, which means that around 907.5 m^3 of soil will be excavated for the construction of buildings. There are several options for the disposal of this soil. Excavated soil could be used for land leveling of the territory of the TSS to bring it up to the same level as the railway alignment. Another way for use of the topsoil is its usage for landscaping. After defining how much soil will be needed for TSS, the contractor will coordinate with local municipalities on how and where soil should be disposed. Usually such soil is used by khokimiyats for leveling other territories. A spoil management plan will also be prepared as part of the SSEMP and properly implemented.

297. Gravel and sand will be required for pipe lying and the rehabilitation of damaged roads. Unauthorized excavations of such construction materials and improper restoration works on closing used carriers could result in negative impacts. Contractors will therefore be required to use only authorized carriers or obtain all necessary permissions (from cadaster and nature protection committee - Goskomekologiya) for opening new ones. After completion of construction works, new carriers need to be closed in accordance with national standards.

298. There are existing access roads to the Asaka and Kokand TSSs. For both sites, land acquisition procedures have been implemented. A social due-diligence report was prepared by the social team of the TRTA.

Installation of signaling and SCADA system

299. Civil works related to the construction and rehabilitation of the signaling system will be implemented on the territory of the existing railway statossn. Insignificant amounts of surplus soil generated during excavation works will be used for landscaping of the territory of the stations or placed in the areas indicated by local hokimiyats. Therefore, the impact on soil from this activity should be minor.

Mitigation measures:

300. To minimize this impact on soil quality, the following measures shall be implemented:

- Remove the topsoil (about 30 cm depth), store separately during excavation works, and use subsequently for the filling of trenches and tower ditches;

- Use surplus soil generated during the construction of substations at the same substations for the creation of earth beds for equipment or landscaping adjusted communication blocks. The rest of soil can be disposed os at the sites indicated by khokimiyats;
- Use only authorized carriers and obtain all necessary permissions per respective national legislation;
- In case of the necessity to open new carriers for construction materials, obtain all necessary permissions and certificates on the proper closing after the completion of project works;
- Provide oil spill kits on each construction site where works related to oil handling and storage will be performed.

301. The pollution of soil during the construction phase could be caused by the improper handling of fuel and oil during refueling and poor waste management. This is reviewed in the next chapters.

Waste management

Non-hazardous wastes

Lying pipe for optic fiber cable

302. During the lying of pipes, packing materials will be generated as wastes, as well as the generation of domestic wastes from workers. During the implementation of all works related to fiber cable lying and the installation of equipment, the UTY will utilize its own facilities. The UTY will also use a special train equipped with all necessary facilities: kitchen, washrooms and rest rooms. Generated solid and liquid wastes will be kept in the train and disposed of at the closest station upon arrival.

Installation of signaling and SCADA system

303. Wastes will be generated during the replacement of the existing small transformers at the stations, and during installation of new equipment for the communications and signaling systems.

304. Used transformers will be transferred to the Electrical Department under the UTY which will assess their condition and decide whether to transfer them to other UTY divisions for further usage or to discard them. Oil from transformers could be used as lubricant. There are two types of transformers in the stations – dry (no contained oil) and with oil. All transformers with oil were produced after 2000, which means that they do not content PCBs contained oil. It is expected that used welding rods, packing materials, woods will be generated as well.

Construction of traction substations

305. Main wastes generated during the construction of the TSSs will be construction wastes similar from works on the rehabilitation of stations. More packing wastes could also be generated due to the amount of installed equipment.

306. Domestic wastewater and solid waste containing food and other organic wastes will be generated at construction sites and campsites. Improper waste management may cause environmental pollution and potentially the spread of infectious diseases through the proliferation of disease vectors (such as rodents and insects) in construction campsites. This has the potential to lead to conflict with the local population.

Replacement of transformers in TSSs

307. There is a risk that during the replacement of transformers, leakages of oil could pollute the soil. According to national legislation, the replacement of facilities shall be done by a specialized agency under the Ministry of Energy. All works on replacement transformers will also be performed in accordance with the manual "Safety rules for servicing electricity consumers, approved by the State Inspectorate for Uzenergonadzor, (2004), and Rules 34-301-941: "Norms for the use of fuel and lubricants for repair and maintenance of equipment of energy enterprises" (2007).

308. The transformer bases comprise of concrete with gravel beneath. There are specially designed basins/pans under the transformers which connect to oil tanks. These tanks have a capacity of 110% of the oil contained in all machinery and devices to ensure that they can capture any oil leakages and minimize soil pollution during transformer replacement and TSS operations.

Transformers in Angren TSS

Oil storage tank in Temiryolobod TSS

Figure 46: Transformers and oil tanks in TSSs

309. Nevertheless, the following general requirements and mitigation measures regarding oil handling have to be applied.

Mitigation measures:

310. The following shall be implemented for proper waste management:

- Dispose oil from dismountable transformers in accordance with established procedures ("RH 34-301-941: 2007 Individual consumption rates of transformer oil for the repair and maintenance needs for equipment of power facilities"), and avoid leakages and spills on soil;
- Provide oil spill kits on each construction site where works related to oil handling and storage will be performed;
- Segregate wastes into recyclable and non-recyclable components for proper handling, treatment and disposal;
- Conclude agreements with relevant agencies (hokimiyat, suvokova etc.) regarding solid and liquid wastes disposal;
- Provide hydro isolated septic tanks for the collection of wastewater at the campsites, bio toilets for workers at the construction sites, and the timely disposal of wastewater to local wastewater treatment plants.

- Sell recyclable wastes to relevant organizations and ensure the timely disposal (each 3 days) of non-recyclable wastes;
- Prohibit the burning of waste on all construction sites.

Hazardous wastes

Installation of signaling and SCADA system

311. During installation of new equipment for the signaling and SCADA systems, demolition and reconstruction works may take place in the rehabilitation of existing buildings. Therefore, there is a possibility of the presence of asbestos materials (in roofing slate) being encountered. The necessity of the implementation of appropriate works to evaluate and safely remove and dispose of these hazardous materials will be determined during the project's detailed design stage.

312. The improper storage and handling of oil materials may lead to land contamination, which through leaching and transport, may affect groundwater, surface waters, and adjacent sites.

Construction of traction substations

313. Used containers from paints, oils and chemicals will be generated on construction site as well. To avoid soil and groundwater pollution, mitigation measures should be applied.

Lying pipe for optic fiber cable

314. There is low possibility of the generation of hazardous wastes during pipe lying. However, if these works will require the usage of paints or other chemicals, mitigation measures recommended below have to also be applied.

Mitigation measures:

- Prior to the commencement of rehabilitation works on demolishing existing buildings, the ES, with civil construction and environmental specialists, will conduct observations of old existing buildings and facilities to determine the presence of asbestos materials;
- In case of the presence of such materials, a detailed "Waste Asbestos-Containing Material Management Plan" will be developed by contractors (an example of such a plan is presented in Attachment 2);
- Conduct the refueling of vehicles and the replacement oils in special designated and properly equipped places. Emergency facilities have to be provided at these locations to mitigate oil spill accidents on the construction sites;
- Ensure that oil which will be used for re-fueling does not contain PCBs.

1.1.2. Biological resources

Lying pipe for optic fiber cable

315. Project sites are a combination of populated areas, agricultural lands represented by typical urban and agro-biocenoses, and mountainous areas. There are no nature protected areas closer than 20 km. Since optic fiber will be placed within existing RoW and free from vegetation (12 meters from railway), it is not necessary to cut trees and bushes along the existing railway alignment. Therefore, the impact on biodiversity from these types of works will be negligible.

Construction of traction substations

316. The construction of TSSs will be implemented on the territory belonged to the UTY without trees and plants. As part of technical requirements, the landscaping of the territory of the Duty Point of Contact Network (DPCN) adjusted to track substations will be implemented.

Installation of signaling and SCADA systems

317. Installation works for the signaling and SCADA systems will be implemented within the territory of existing stations or inside existing buildings. It is not anticipated that tress will be cut.

318. There is a low possibility of the presence of mammals and reptiles on the sites, since cable lying will be implemented within the existing RoW of the operating railway. The new Asaka TSS will be constructed on recently cultivated agricultural lands. Large birds have not been identified which could be affected by electric shock within the territory of the project sites – Asaka and Kokand TSS, and Angren, Namangan, Pap, Kokand and Andijan railway stations.

Mitigation measures:

- Landscaping and vegetation of the territories of the TSSs should be implemented in full compliance with the project's technical specifications;
- Ensure that all construction works are being implemented within the territory of stations and allocated TSSs;
- Conduct awareness programs for workers to to promote the protection of mammals and reptiles during construction works.

Impacts on land use

319. The signaling and SCADA systems, as well as the optic cable pipes, will be installed within the territory of stations and existing RoW of the railway alignment. The construction of TSSs will also be implemented within lands that were allocated to the UTY in 2018. Works conducted outside of allocated lands and the RoW may impact on land use.

320. Moreover, the opening of unauthorized quarriers for construction materials without permission may also impact on land use.

Mitigation measures

- All construction works should be implemented within allocated lands;
- Prohibit the use pf unauthorized carriers for construction materials.

1.1.3. Socio-economic resources

321. During the construction phase, the project will have a positive effect and may have some negative impacts on socio-economic resources. Negative impacts may occur due to inconveniences caused by increases of traffic inside settlements located close to TSS construction sites. However, this impact will be temporary (2-3 months) and could be mitigated through communications with affected populations.

322. For most of the project works, personnel with special qualifications will be required. However, for the construction of TSSs, local contractors will be hired, which could create job opportunities for local communities.

323. Moreover, indirect services will also be required to provide needs for housing, catering, petrol stations, etc. This temporary positive impact will also contribute to the project's overall positive impact.

Mitigation measures

324. The following measures need to be undertaken to minimize or mitigate the above-mentioned impacts:

- Increase public awareness among affected populations in the project area through communications, and inform the public in advance about project works;
- Involve local workers in project works where specific qualifications are not required.

1.1.4. Health and safety issues

325. Besides impacts on air, water and soil quality, as described in previous chapters, certain risks relate to community health and safety for workers.

Community Health and Safety

Construction of traction substations

326. During the construction phase, inadequate lighting and fencing at construction sites and inside settlement areas can be dangerous for the population and workers during the nighttime. All construction sites, including pits and trenches, shall therefore be fenced and adequately lit, and warning signs prominently displayed on fences and in and around hazardous areas.

327. Increased truck and other vehicle movements are expected inside the settlements located close to the project sites: the Kumgan mahalla in the Asaka district (Asaka substation) and the Ashurali Zokiriy mahalla in the Kokand district. Despite the temporary character of this inconvenience, which will occur particularly during the leveling and basement laying of track substations, contractors will be required to strictly adhere to speed limits inside settlements (30 km/h).

328. Some construction works may require the removal and reconstruction of engineering networks/infrastructure. In this case, the works have to be carried out in the presence of representatives of relevant organizations.

329. Untimely and inefficient disposal of solid waste and improper sanitary conditions generated by the construction workers at construction sites and labor camps may cause pollution of the surrounding environment and affect the health of local people. There could also be social problems due to the potentially irresponsible behavior of the outside workforce, such as gambling, alcoholism, and the disrespect of local people and their culture.

330. Cultural interference workers with local communities may cause HIV and sexually communicable diseases (STD) spreading in case of low awareness about these diseases among workers and the community.

331. The existing health services in the vicinity are located in the commune areas. The commune health services may not be able to accommodate any additional patients from the construction workforce. Therefore, during the construction phase, the contractor will be required to provide first-aid facilities for the workers, and at least one trained first-aider should be available at the each construction camps.

332. Construction sites and areas used for construction camps without proper cleaning and reinstatement works will cause damage and inconvenience to local communities due to debris, spoils, and excess construction materials.

Lying pipe for optic fiber cable

333. During works on lying pipes, trenches left open, even for several days, may create a risk for the population walking close to the railway alignment or crossing it. The risk increases significantly inside settlements.

334. Poor waste management practices may create inconveniences for populations living next to the railway.

335. There is a risk of infection of the population with COVID-19 during the construction period due to interactions of the local population with workers. In this condition of pandemic, the GOU through the special Commissions on pandemic has introduced rules for different "zones". The entire territory of Uzbekistan is divided into three zones: red, yellow, and green. Depending on the zone, different types of activities are allowed. Most activity and movement restrictions are defined for red zones, and the least for green zones. The zones are revised by the Commission weekly, based primarily on the number of people infected in a zone.

336. At the time of IEE preparation, both the Asaka and Kokand districts belong to green zones. Nevertheless, the basic requirements for wearing a mask, maintaining social distance, and avoiding groups of people have to be followed by the population. The local municipalities, together with health care organizations, conduct regular awareness programs through media, leaflets and etc.

337. Prior to construction commencement, populations living nearby construction sites will be informed about the project one more time and the necessity of confirming with preventive measures for COVID-19 will also be discussed one more time. Along with this, contractors will be required to organize their work, construction and workers camps in accordance with the regulations on working on conditions of pandemic adopted by the GOU in May 2020. More detail information regarding regulations and their requirements is provided in the following chapter.

Installation of signaling and SCADA system

338. Impacts will occur during the installation of signaling and SCADA systems. These relate to traffic management, waste collection and disposal, and the potential cultural interference of workers with local communities.

Mitigation measures

339. All relevant national regulations indicated in chapter 2.1, and IFC EHS General Guideline (2007), have to be complied with. The following measures need to be undertaken to minimize and mitigate the above impacts:

- Contractors and the Construction Supervision Consultant (CSC) will inform populations in advance about anticipated works in settlements;
- Contractors will be required to develop traffic management plans with clear indication of the routes of vehicle movements, placement of special signs, speed restrictions inside settlements (30 km/h), and the schedule of transportation activities to avoid peak traffic periods;
- Clearly visible signs will be placed in construction sites in clear view of the public, warning people of potential dangers such as moving vehicles, excavations etc. and raising awareness on safety issues.
- All construction sites, trenches and ditches will be properly lit and fenced;
- Site specific plans for campsites will be developed by contractors;
- Carry out regular awareness campaigns among work staff, including specific hazards associated with the spread of HIV/AIDS, COVID-19.

- After completion of construction, contractors shall fully reinstate construction sites and campsites to their primary condition;
- Rubbish and temporary structures (such as buildings, shelters, and latrines) which are no longer required will be removed;
- All hardened surfaces within construction sites and campsites shall be ripped, and all imported materials removed;
- The CSC will conduct a post-construction audit during the defect liability period to ensure that construction sites and campsites are properly cleaned and restored to pre-project conditions before the acceptance of works and the hand-over to the Kokand Regional Departments of UTY, which will be responsible for the operation and maintenance of the electrified railway.
- After the completion of works, all roads shall be rehabilitated at least up to their condition of the pre-construction stage.

Occupational Health and Safety

340. Safe working conditions, and compliance with sanitary, fire protection, and other norms related to construction need to be provided to prevent accidents, including electric shock during the construction stage. Contractors will be required to develop an Occupation Health and Safety Plan, which will cover such topics as the usage of PPE, usage of fire protection equipment, and training programs implemented based on all relevant national regulations (KMKs, SanPiNs) and IFC EHS General Guideline (2007), IFC EHS Railway (2007).

341. As previously discussed, improper house-keeping practices in construction camps may lead to the spread of infectious diseases among workers and the population. Depending on specific civil works, labor camps may locate on the territory of existing stations, mobile living wagons, or on construction sites. Another option is renting houses for workers in the nearest settlements. For labor camps at the construction sites, a Site-Specific EMP for labor/construction camps will be developed by contractors, endorsed by CSC, and approved by the Environmental/Social Specialist of the PIU-ET prior to commencement of the works. The SSEMP for labor/construction camps will describe waste collection and disposal procedures, and requirements for the establishment of camp facilities (such as construction material storage places and techniques, laundries, toilet, access roads and so on). The contractors shall instruct all workers to act in a responsibly manner.

342. Particular attention should be paid to OHS during fiber cable installation works. When working with fiber optics, human eyes can be damaged by the transmission of light. Anyone looking directly at the transmission of such frequencies can suffer a loss of visual acuity or blind spots, because the beam is focused on the retina.

343. The fibers themselves are also a potentially severe hazard since they contain small pieces of glass. If possible, a dark mat that is chemically-resistant and resilient as a work surface should be utilized, so when small fragments fall, they can be seen quickly and picked up with tweezers.

344. When a worker is trimming, stripping, or cutting fibers, tiny fragments can also penetrate the skin and become embedded, causing severe irritation. Ingested fibers can also cause internal damage since they are light enough to float in the air. Because of this, workers should not eat or drink in a fiber optic work area, since a fiber scrap could fall onto their food or in their drink.

345. There are no separate national procedures on working with fiber cable, so recommendations based on international safety procedures have been used.[30].

[30] International Telecommunication Union, Telecommunication Standardization Sector of ITU, G.664, Optical Safety Procedures and Requirements for optical transport system.

Mitigation measures

General

- Contractors have to develop Occupational Health and Safety Plans (OHSPs) based on IFC General EHS Guideline (2007);
- Contractors have to conduct training for workers on EHS and SSEMP implementation;
- Contractors have to ensure proper implementation of OHSP and SSEMP by all workers.

For fiber cable laying works

- All employees performing any splicing or termination activities should always wear safety glasses with side shields. Any other employees or site managers entering the work area should wear safety glasses with side shields also;
- Unless an employee is absolutely sure there is not a light source at the other end, they should never look directly into the end of the cable. A power meter can be used to make certain the fiber is dark;
- While working with fiber optics, ensure that workers have well-ventilated and well-lit work areas;
- All food and beverages should be kept out of the work area. Workers should wear disposable aprons to keep fiber particles off their clothing. Before leaving a work area, an employee should always check their clothing for pieces of stray fiber, and if any are found, they should remove it with double-sided tape;
- All workers should wash their hands thoroughly before touching their eyes, and contact lens wearers should wash their hands before touching their lenses. Workers should also read all instructional materials before handling chemicals;
- A disposable container that can be tightly closed must be used for fiber scraps. When finished with a fiber optic job, all cut fiber pieces should be disposed of properly along with any used chemicals and containers. The work area should be thoroughly cleaned when job is completed.

346. There is a possibility that workers could be infected with COVID-19 during project implementation. Therefore, if during project implementation the risk of infection is elevated, additional measures on prevention, early identification and treatment must be fully adopted, in accordance with GOU relevant protocols and procedures.

347. The GOU has adopted special procedures on acting in conditions of pandemic - the Temporary Sanitarian Norms and Rules (SanN&R) # 0372-20 "On organization of performance of state agencies and other organizations, commercial entities in limited measures condition due to pandemic COVID-19". The document was approved by the Agency on Sanitarian Epidemiological Well-Being (3rd edition), May 11, 2020. The SanN&R provides general requirements and specific requirements for different sectors: pharmacy, public transport, markets, construction sites, etc.

348. According to SanN&R, the managers of organizations are personally responsible for compliance with the SanN&R. All works have to be organized in order to ensure:

- Prevention of the introduction of infections into an organization;
- Taking measures to prevent the spread of coronavirus infection (COVID-19) in teams in organizations;
- Implementation of organizational and technical measures to prevent infection of workers;
- Other organizational measures to prevent infection of workers.

349. The rules present requirements for the safe transportation of workers, organizing medical examinations at entrance points, the provision of disinfection equipment and disinfectants, catering facilities, construction camps, etc. Also, SanN&R describes the requirements for the isolation in medical centers (if any) of any patient identified with a high fever or with individual symptoms of an acute respiratory viral infection (lack of smell, dry cough, malaise, etc.).

350. All managers have to conduct introductory training for new workers and routine training for working staff. The rules provide an action plan for cases of workers with COVID-19 symptoms.

351. Section 5.1.4 of SanN&R provides specific norms for construction sites. The section pays special attention to dust, and provides recommendations for dust generation mitigation and protection. The rules also provide a list of Personal Protection Equipment for COVID-19.
352. The document also provides instructions regarding communications with local health care institutions, and for the organization of regular medical examinations of workers and mobilization in case of identification infections.

Mitigation measures

- In conditions of pandemic risk, organize works in accordance with the Temporary Sanitarian Norms and Rules (SanN&R) # 0372-20;
- Ensure proper recording and reporting of any cases of infection and undertaken actions.

1.1.5. Cultural heritage

353. The project area is represented by settlements and agricultural land, and excavations conducted during the project are very small in area and limited primarily to the tower foundations. However, there is still a possibility of locating archeological findings that might have significant value. Therefore, mitigation measures will be undertaken in accordance with the procedures indicated in the Law of RUz "On Protection and Use of Objectives of the Archeological Heritages" (2009).

Mitigation measures

354. The following actions need to be undertaken in case of finding potential heritage:

- Excavations and other works need to be suspended immediately;
- Areas with possible heritage shall be fenced with fencing tape;
- A designated focal point from a local administration (khokimiyat) needs to be informed and invited for assessment of potential heritage and undertaken necessary actions;
- Civil works at the finding place could be recommenced after obtaining permission from the focal point (deputy governor of relevant district).

1.3. Operational stage

Noise

355. After project implementation, the number of train movements during the day will increase. To assess the anticipated changes in noise level generated by trains, noise modeling was undertaken for the current and expected number of trains. The certified noise company "Eco-Spectri" Ltd. (Georgia) was hired to identify the major sensitive receptors along the project corridor and to evaluate the noise impact levels caused by the railway transport on the receptors by using both instrumental measurements and 3D modeling. It was necessary to evaluate noise impact levels both before project implementation (baseline) and after project implementation. As necessary, the consultant had to develop mitigation measures. the project

runs across 56 settled areas. No other sensitive receptors except the settled areas are fixed adjacent to the project line. Consequently, within the scope of the project, modeling of the noise propagation caused by the railway traffic was done only for the said section.

356. Due to the large scale of the project, the project zone has been divided into five sections (**Figure 47**):

- 1st section: KP 0 - KP 44.5 (the calculation of kilometers starts at city Angren and ends at city Andijan). Noise along the given section was modeled for 5 sub-sections.
- 2nd section: KP 44.5 - KP 163.7 – for 9 sections.
- 3rd section: KP 163.7 - KP 235.6 - for 8 sections.
- 4th section: KP 235.6 - KP 278.4 - for 6 sections.
- 5th section: KP 278.4 - KP 306 - for 5 sections.

Figure 47: Five sections along within the project alignment

357. In total, noise modeling was provided for 33 sections within the scope of the project. As for other sections, no noise modeling was provided for them as there were no sensitive receptors adjacent to those sections.

Table 34: Traffic information for long-distance trains

Parameter	Passenger trains		Freight trains	
	Current	Design	Current	Design
Andijan-Kokand-Angren line				
Type of coach	First-class		Freight coaches	
Number of coaches per stock	14	14	35	35
Number of a couple of wheels	56	56	140	140
Per coach	4	4	4	4
Type of locomotive	2O'z-EL(R), 2O'zbekiston		3ВЛ80с, #ЭС5К, ИЛ80С	
Number of trains during the day	5	8	4	5
Number of trains at night	2	4	4	5

Source: UTY-ET, 2020

358. **Table 35** gives the information about the traffic of local trains. The same table gives full information about the current stocks and expected number of trains after the project implementation.

Table 35: Traffic information for local trains

Suburban trains, Andijan-Angren line				
Type of coach	First-class		Freight coaches	
Number of coaches per stock	6	6	25-30	30
Number of a couple of wheels	24	24	100-120	120
Type of locomotive	Electric train		Pick-up train	
Number of trains during the day	2	2	1	2

Source: UTY-ET, 2020

359. As **Tables 34 and 35** show, twice as many trains travel across the project zone during the night than during the day. During January 2020, 24-hour long instrumental measurements of baseline noise levels were taken in the territory of the village Karanchitugay in the project zone, at two points simultaneously **(Figures 48 and 49)**. A total of 43,000-44,000 measurements were obtained from every point defined as a sensitive. The tabulated results of the 24-hour-long measurements are provided in Annex 2 of the noise modelling report.

360. The points were selected in line with the requirements of the **IFC Environmental, Health, and Safety (EHS) Guidelines 1.7 - "Noise Management".** Noise meters were installed at 1.5 m height from the ground, and the distance from the noise reflecting plane was a minimum 3 meters. The microphone of the noise meter was directed towards the noise source.

Figure 48: Measuring baseline noise level 10 m from the railway (42612184.00 E, 4551139.00 N)

Figure 49: Measuring baseline noise level 50 m from the railway (42612156.00 E, 4551163.00 N)

361. Sampling was conducted with an American noise meter "REED 8080". The given equipment is a II-class noise meter31. The equipment was calibrated before commencement of the measurements. Calibration was done with the calibrator of the same brand (REED R8090) (IEC 60942 Class 2). The calibrator checks the noise efficiency at two frequencies: 94 dB and 114 dB.

362. For the baseline, 24-hour-long instrumental measurements of baseline noise levels in the territory of the village Karanchitugay in the project zone were conducted at two points simultaneously. As the results show, the difference between the day and nighttime noise levels

[31] "Noise monitoring should be carried out using a Type 1 or 2 sound level meter meeting all appropriate IEC standards" – IFC Environmental, Health, and Safety (EHS) Guidelines 1.7 "Noise Management".

is only 0.5 -1 dB indicating that no additional anthropogenic noise level is fixed in the given village during the day.

363. Before the noise meters were installed, the given locations were assessed in order to identify other sources of noise which could affect the results. No other important permanent and/or impulse sources of noise were identified at the locations where the noise meters were installed. As **Figure 50 - 51** shows, there is an open housing for goats located adjacent to the second installation point of the noise meter. This may be considered as an impulse noise source. However, the given kind of source is not an important impulse source and it cannot affect the general situation.

Figure 50: Housing for goats

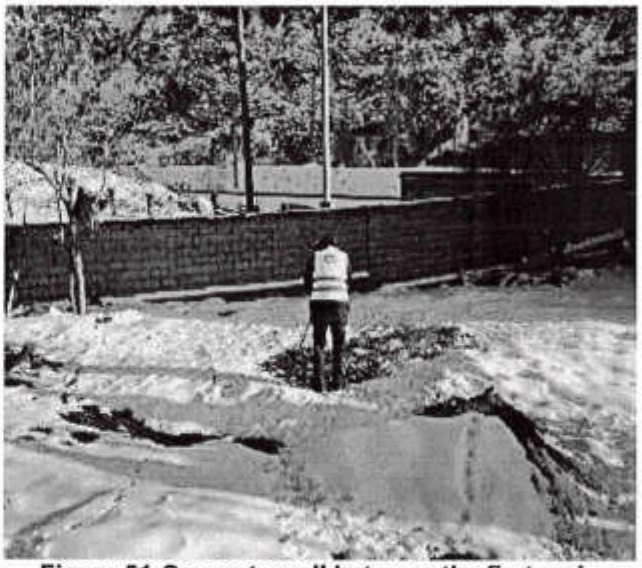


Figure 51:Concrete wall between the first and second noise meters

364. **Tables 36 and 37** give average hourly data of 24-hour-long measurements. As the gained results show, the difference between the daytime and nighttime noise levels is only 0.5 -1 dB indicating that no additional anthropogenic noise level is fixed in the given village during the day.

Table 36: Results of instrumental measurement (the first point)

N1 measurement		
Date	Location	Distance from the source
17.01.2020 - 18.01.2020	Adjacent to the railway track	10 m
Results of measurement N1		
Average	Day (07:00-23:00)	Night (23:00-07:00)
	41.6	40.1
Hourly		
1	17/01/2020 - 15:00-16:00	43.6
2	17/01/2020 - 16:00-17:00	42.3
3	17/01/2020 - 17:00-18:00	41.6
4	17/01/2020 - 18:00-19:00	41.4
5	17/01/2020 - 19:00-20:00	41.3

6	17/01/2020 - 20:00-21:00	39.6
7	17/01/2020 - 21:00-22:00	39.7
8	17/01/2020 - 22:00-23:00	40.8
9	17/01/2020 - 23:00-24:00	39.7
10	18/01/2020 - 00:00-01:00	38.1
11	18/01/2020 - 01:00-02:00	39.5
12	18/01/2020 - 02:00-03:00	40
13	18/01/2020 - 03:00-04:00	40.5
14	18/01/2020 - 04:00-05:00	39.3
15	18/01/2020 - 05:00-06:00	40.1
16	18/01/2020 - 06:00-07:00	42.5
17	18/01/2020 - 07:00-08:00	41.9
18	18/01/2020 - 08:00-09:00	42.9
19	18/01/2020 - 09:00-10:00	42.3
20	18/01/2020 - 10:00-11:00	41
21	18/01/2020 - 11:00-12:00	39.7
22	18/01/2020 - 12:00-13:00	40.9
23	18/01/2020 - 13:00-14:00	44.9
24	18/01/2020 - 14:00-15:00	40.9

Table 37: Results of instrumental measurement (the second point)

N2 measurement		
Date	Location	Distance from the source
17.01.2020 - 18.01.2020	At the fence of a residential house	50 ∂
Results of measurement N2		
Average	Day (07:00-22:00)	Night (22:00-07:00)
	41	40
Hourly		
1	17/01/2020 - 15:00-16:00	44.5
2	17/01/2020 - 16:00-17:00	41.6
3	17/01/2020 - 17:00-18:00	41.4
4	17/01/2020 - 18:00-19:00	41.2
5	17/01/2020 - 19:00-20:00	41.1
6	17/01/2020 - 20:00-21:00	40
7	17/01/2020 - 21:00-22:00	40.3
8	17/01/2020 - 22:00-23:00	40.8
9	17/01/2020 - 23:00-24:00	40.1
10	18/01/2020 - 00:00-01:00	38.4
11	18/01/2020 - 01:00-02:00	39.2
12	18/01/2020 - 02:00-03:00	39.9
13	18/01/2020 - 03:00-04:00	40.5
14	18/01/2020 - 04:00-05:00	39.2
15	18/01/2020 - 05:00-06:00	40.1

16	18/01/2020 - 06:00-07:00	41.9
17	18/01/2020 - 07:00-08:00	41.7
18	18/01/2020 - 08:00-09:00	42
19	18/01/2020 - 09:00-10:00	39.8
20	18/01/2020 - 10:00-11:00	39.4
21	18/01/2020 - 11:00-12:00	38.4
22	18/01/2020 - 12:00-13:00	39.5
23	18/01/2020 - 13:00-14:00	43.4
24	18/01/2020 - 14:00-15:00	40

Note:

	Night hours: 10 pm -7 am
	Day hours: 7 am-10 pm

365. In addition, as the given results show, it is clear that the noise caused by the railway traffic does not have a great impact on the hourly noise level. As the tables show **(Table 36 and 37)**, at the same time interval, the difference between the average noise values of the noise meters installed at the first and second points varies from 0.5 to 1 dB. If considering that the distance between the two points is 40 m, the difference between the noise levels must be much more.

366. For comparison, noise level values in the short time interval when the train travels adjacent to the noise meter locations were considered. **Figure 52 and 53** show the results produced by the noise meter in a 2-minute interval when the train traveled there.

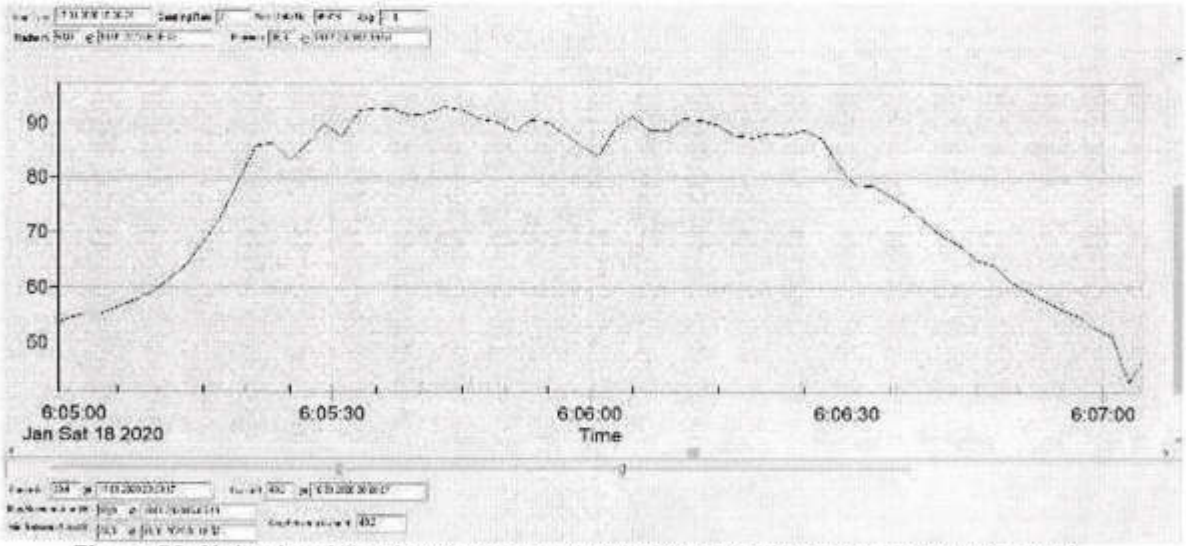


Figure 52: Noise level fixed at the moment of the train traveling through (first point)

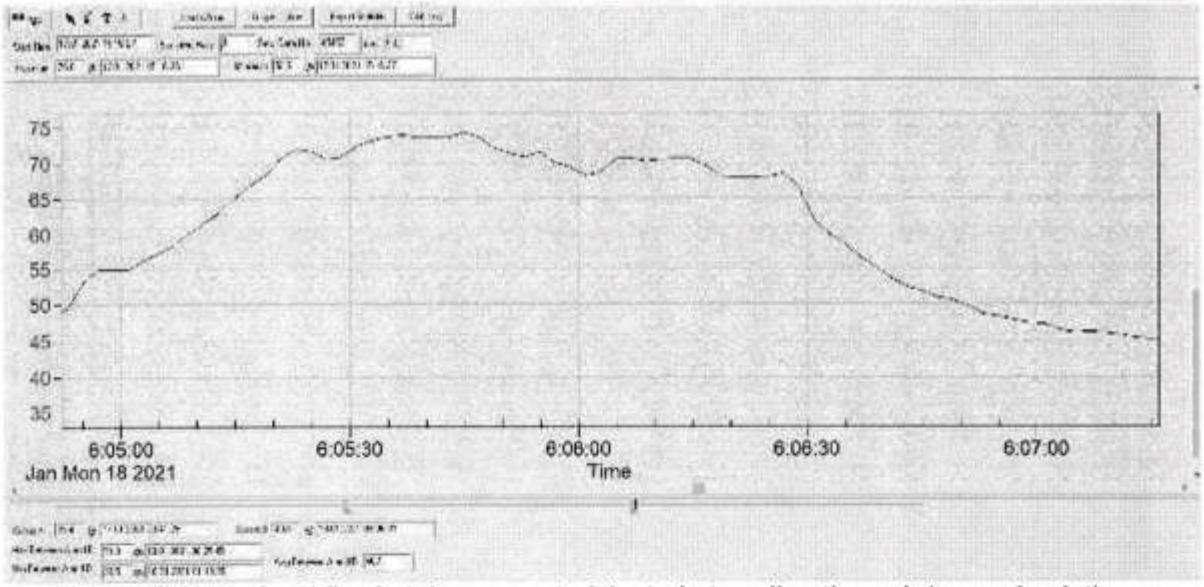


Figure 53: Noise level fixed at the moment of the train traveling through (second point)

367. As the figures show, at the moment of train traveling through, the maximum noise level at the first noise meter, which is installed 10 meters from the noise source, was fixed at 6:06:45 sec. and it made 93 dB. At the same time, at the noise meter installed at the second point, which is distanced from the noise source by 50 m, the value was fixed at 73 dB. The noise level difference between the first and second points, when the train traveled adjacent to the instrumental measurement point, is therefore 20 dB.

368. A reduction of the noise level by 20 dB at the distance of 40 m is however too much. This fact can be explained only as follows: as **Figure 51** shows, there is a block wall built between the noise meter installed at the second point and the source of noise (railway). This wall played a noise attenuating role in the given case. Building a concrete or block wall around the residential house is an architectural peculiarity in Uzbekistan. All over the country, similar fences are constructed around private houses. As Table 36 and 37 show, average noise levels were 41.1 and 40.1 dB for first and second points accordingly.

369. In order to obtain real results at the stage of modeling, it was desirable to enter all block, brick and concrete walls made around all buildings in the software program. However, as the group of specialists could not take time to visualize all buildings found in the project zone due to the lack of time (there are approximately 10 000 buildings and premises found in the project zone, in 300 m radius of the railway), it was decided not to fix the fences in the modeling program due to the lack of accurate information. With great probability, if the fences are shown in the program, the existing noise level would be much less on the existing buildings and premises.

370. For modelling CadnaA (Computer Aided Noise Abatement) computer software were used. As already mentioned, following the scale of the project zone, the project area was divided into 33 sections. The sections were identified for the areas of the project zone with sensitive receptors on them. Only settlements adjacent to the project area are considered to be sensitive receptors for this project.

371. 20,207 buildings are found within a 300-m radius area from the project zone. Noise level for all houses located within indicated area have been done. Each house was numbered and noise level for each house was calculated. Example numbering houses is presented in Figure below.

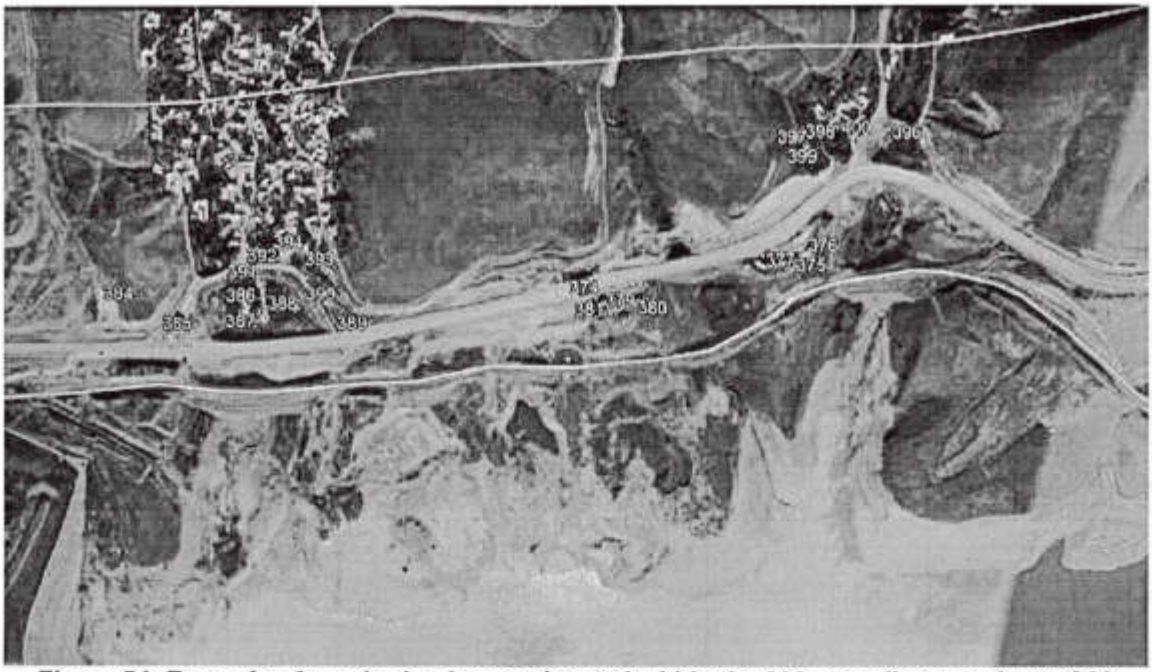


Figure 54: Example of numbering houses located within the 300- m radius area (one of 33 modelled section)

372. Noise levels have been calculated for current conditions, during the construction period, and during operations. For each section, a separate table with noise levels for various phases was prepared. Examples of table for sections presented on **Figure 54** is provided in the table below.

Table 38: Example of calculated noise level for various situations

1/2					
Building N	Current		Construction	Project Implementation	
	Day	Night	Day	Day	Night
374	41,2	43,4	32	39,7	41,9
375	47,3	49,5	36,7	45,9	48,1
376	43,1	45,2	35,2	41,6	43,8
377	47,1	49,3	37	45,6	47,8
378	54	56,2	42,7	52,9	55
379	38,5	40,7	31,8	36,9	39,1
380	44,4	46,6	34,5	43	45,1
381	37,2	39,5	31	35,7	37,9
382	55,9	58,1	43,8	54,7	56,9
383	55,9	58,1	43,5	54,7	56,8
384	41,2	43,4	32,4	39,9	42
385	38,8	41	31	37,2	39,4
386	38,1	40,4	28,1	36,7	38,9
387	38	40,2	29,4	36,5	38,6
388	37,6	39,8	29,3	36	38,2
389	41,6	43,8	31,4	40,1	42,3
390	38,9	41,2	29	37,4	39,6
391	36,9	39,2	26,8	35,6	37,8
392	36,6	38,9	26,6	35,2	37,4

393	36,6	38,8	26,9	35,2	37,3
394	35,5	37,7	26,2	34	36,1
395	35,9	38,2	26,4	34,5	36,7
396	35	37,2	25,5	33,6	35,7
397	27,8	30,1	26,3	26,1	28,3
398	27,4	29,7	26,3	25,7	27,9
399	27,4	29,7	26,9	25,6	27,8
400	32,8	35	28,1	31,3	33,5
401	37	39,1	30,9	35,7	37,8
402	36,9	39	30,5	35,6	37,7
403	45,8	48	36,2	44,3	46,5
404	39,5	41,7	29	38,2	40,4
405	35	37,3	26,5	33,7	35,8
406	47,9	50	37,6	46,7	48,8
407	28,1	30,6	25,2	26,4	28,7
408	24,8	27,3	23,5	22,8	25,1
409	32	34,2	25,5	30,5	32,6
410	35,2	37,4	28,8	33,9	36
411	32,7	34,9	27,5	31,3	33,4
412	30,7	32,9	26,3	29,1	31,3
413	32,3	34,5	27	30,9	33
414	38,1	40,3	30,8	36,8	38,9
415	32,5	34,8	24,6	31	33,2

373. As the modeling results suggest, the noise level on 4,808 (23.8%) buildings during the day and at night exceeds the admissible level. In particular, the noise level exceeds the admissible level only at 468 (2.3 %) buildings. As **Tables 36 and 37** show, more trains travel at nighttime across the project zone than during the day. At the same time, the maximum admissible noise level is much less at night than during the day. As per the modeling results of the existing situation, the excess noise occurs at more buildings at night than during the day. **Annex 4** to Noise Modelling Report (**Attachment 4, IEE**) gives noise modeling results for all 33 sections.

374. The modeling results are given for night hours when the noise level caused by the railway traffic is maximum. The figures show the buildings near which the noise level exceeds the admissible level at night in red. At the same time, it should be noted that not all buildings at which noise levels exceed the admissible level are residential buildings. Most of these buildings are auxiliary infrastructural facilities of the railway.

375. Noise modeling was provided both for the current phase and for the post-project phase. As the modeling results suggest, noise levels after the project implementation will be by 2-3 dB less on average than before project implementation. Electric locomotives tend to be quieter than diesels. The diesel engine sounds carry further than the sound of the blowers and electrical gear on electric locomotives. However, the locomotive is only part of the sound and the overall noise level decreases only slightly.

376. The figures show the results of 3D modeling on three sites before and after the project (the buildings where noise level exceeds the admissible level are marked red).

Figure 55: First site - current situation

Figure 56: First site - after the project implementation

Figure 57: Second site - current situation

Figure 58: Second site - after the project implementation

Figure 59: Third site - current situation

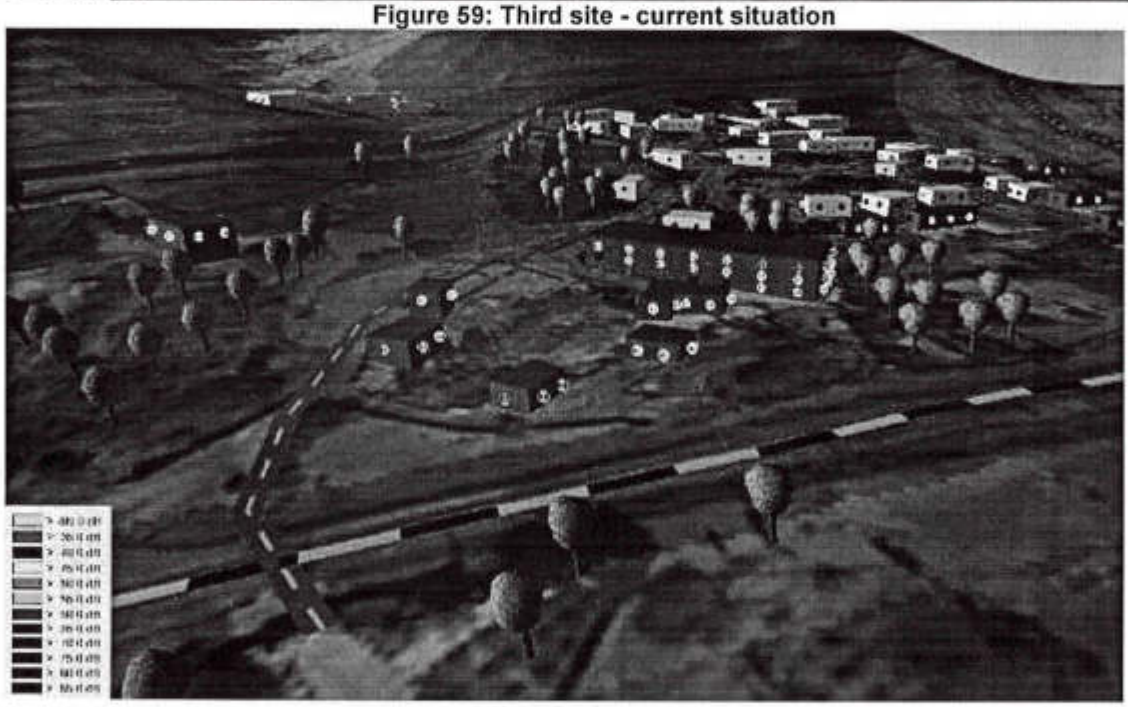


Figure 60: Third site - after the project implementation

377. As the figures show, after the project implementation, the noise level at all sites is 1-4 dB ***less than*** before the project implementation. Consequently, in line with the requirements of IFC instructions, with the aim to reduce noise level within the scope of the project, no additional mitigation measures are necessary.

378. Based on conducted noise modelling, the following **conclusions of noise impact during the operation phase** are provided:

- As per the schedule, more trains travel across the project zone at night than during the day. As the maximum admissible noise level is much less at night than during the day, the noise levels exceed the maximum admissible level at

a number of buildings located adjacent to the project zone at both the pre-project and post-project stages.

- As the number of trains traveling across the project section is not great (55 trains per day) and no great increase of their number is planned after the project implementation, the noise caused by this source does not affect the average noise level;
- As per the existing situation, 20,207 buildings are found within a 300-m radius area from the project zone. As the modeling results suggest, the noise levels at 4,808 (23.8%) buildings during the day and at night exceed the admissible level. In particular, the noise levels exceed the admissible level only at 468 (2.3 %) buildings.
- Annex 4 (Attachment 1. Noise modeling report) gives the locations of all buildings along the project zone and building numbers assigned. In addition, baseline noise levels are given for each building both during the day and at night. Annex 4 also provides the expected noise levels on all buildings and premises during the day and at night in the construction and operation phases.
- In the construction phase, the noise levels exceed the baseline level only at five buildings, as the noise of trains exceed the noise level originated during the use of heavy techniques for the rehabilitation works.
- As Annex 4 shows, the noise level in the operation phase will reduce as compared to the baseline level. Following the modeling results, the noise levels do not increase at any building as a result of project implementation. Consequently, no additional mitigation measures, including noise barriers, are necessary to abate the noise levels.
- Following the architectural peculiarities of Uzbekistan, all private houses have block or concrete walls around, which virtually represent noise-attenuating barriers. As due to the lack of accurate information, the existing walls were not indicated in the modeling software, the results of the accomplished modeling could be much less in reality.
- Noise levels in the project zone after the project implementation decreased by 1-2 dB as compared to the existing level (there are also the sections where the noise level decreased by 3-4 dB). Consequently, following IFC standards, after project implementation, the noise levels are within the norms in the project zone.

379. The following is proposed:

Mitigation measures

- As previously reported, as a result of project implementation, the noise levels on all buildings and premises adjacent to the project zone is within the norm. Consequently, there is no need for additional mitigation measures in the operation phase;
- In case of a significant increase of the number of trains in the project zone, additional instrumental measurements near sensitive receptors will be necessary, and if the noise level exceeds the current level by 3 dB, additional mitigation measures must be developed and implemented;
- If the number of trains traveling across the project zone increases, the train traffic schedule is desirable to develop in the way as to limit their traffic across the project zone to day time hours wherever possible.
- In the construction phase, the noise levels exceed the admissible norm at 5 buildings. It should be noted that the noise levels at the given buildings will exceed the admissible level only for some days, only when the rehabilitation activities are realized immediately adjacent to these buildings. Notwithstanding this fact, in the construction phase, the following mitigation measures are recommended adjacent to these buildings.

Mitigation at the Source

- Source control is, in general, the most effective form of noise mitigation and involves controlling a noise source before it is able to emit potentially offensive noise levels. Construction noise (exclusive of blasting) is typically generated by two source types: (i) Stationary equipment; and (ii) Mobile equipment.
- **Less noisy equipment:** One of the most effective methods of diminishing the noise impacts caused by individual equipment is to use less noisy machinery. By specifying and/or using less noisy equipment, the impacts produced can be reduced or, in some cases, eliminated. Source control requirements may have the added benefits of promoting technological advances in the development of quieter equipment.
- **Mufflers:** Most construction noise originates from internal combustion engines. A large part of the noise emitted is due to the air intake and exhaust cycle. Specifying the use of adequate muffler systems can control much of this engine noise
- **Shields:** Employing shields that are physically attached to the particular piece of equipment is effective, particularly for stationary equipment and where considerable noise reduction is required.
- **Aprons:** Sound aprons generally take the form of sound absorptive mats hung from the equipment or on frames attached to the equipment. The aprons can be constructed of rubber, lead-filled fabric, or PVC layers with possibly sound absorptive material covering the side facing the machine. Sound aprons are useful when the shielding must be frequently removed or if only partial covering is possible.
- **Enclosures:** Enclosures for stationary work may be constructed of wood or any other suitable material and typically surround the specific operation area and equipment. The walls could be lined with sound absorptive material to prevent an increase of sound levels within the structure. They should be designed for ease of erection and dismantling.

Mitigation Along the Path

- In some situations, such as in urban areas or on isolated sections of a project (tunnel installation area), it may be beneficial and necessary to construct barriers adjacent to the work area or at the right-of-way (RoW). These can take the form of natural shielding, temporary shielding, and/or permanent shielding.
- Temporary abatement techniques include the use of temporary and/or movable shielding for both specific and nonspecific operations. Some mobile shielding is capable of being moved intact or being repeatedly erected and dismantled to shield a moving operation. An example of such a barrier utilizes noise curtains in conjunction with trailers to create an easily movable, temporary noise barrier system.

Mitigation at the Receiver

380. Mitigation at a receiver can vary in its complexity, ranging anywhere from relocating residents for a day to insulation of a building. Even after mitigation measures have been applied, the outcome may still be unpredictable with no guarantees that the implemented methods achieve expected results. Therefore, mitigation at the receiver should only be considered as a last alternative. However, there are cases where creative techniques have been successfully implemented.

Vibration

381. To assess the vibration on building integrity and human health, measurements of vibration levels from electrified alignment operations for Andijan-Margilan-Kokand were completed in order to evaluate anticipated impacts. The measurements were done by the

UTY's Sanitarian Epidemiological Station (Kokand department) in January 2018, and at different distances (8, 12 and 20 meters). The results are presented in the **Table 39.**

Table 39: Results of vibration level from trains on operating Andijan-Margilan-Kokand alignment

Distance	Duration of measurements	Type of train	Speed km/h	Number of wagons	V_{ecq} dB	V mm/s	Standard, (dB) for people's health (Table 3)	Standard(dB) for structure integrity (Table 4)
8 meters	1 min 10 sec	freight	65	40	78.2	0.4	80	100
12 meters	1 min 25 sec	freight	65	46	76.3	0.33	80	100
20 meters	1 min 20 sec	freight	60	44	68.2	0.13	80	100

Source: Measurement were conducted by Kokand branch of UTY's SES, 2018

382. The comparison of measurement results with international standards show that vibration levels during train movements will not exceed the limits for either people's health (Tables 3, Chapter 2) or construction integrity (Table 4, Chapter 2).

383. Nevertheless, the continuous monitoring of vibration for compliance with national standards on vibration levels in residential houses needs to be implemented during the operation phase.[32] It is also recommended to conduct baseline visual monitoring of the condition of structures/houses located along the railway in order to evaluate any impacts on the structural integrity of the buildings/houses. The frequency and location of monitoring points are included in the Environmental Monitoring Plan (**Table 43**).

384. In case of increasing standards (80 dB, Table 12b), additional mitigation measures will be implemented as requested. The following mitigation measures are recommended: special seals for rails, the improvement of embankments through using coarse fractions of crushed stone, rails and wheel turning.

Air pollution

385. The proposed railway operational efficiency improvements through the construction of TSSs, and the installation of signaling, SCADA and telecom systems, will allow an increasing number of trains and transported passengers. Increasing the number of trains moving during the operation phase will not lead to increasing air pollution on a local scale within the project area, since all trains will be run by electric locomotives. Therefore, it is not anticipated that local pollution of air will occur.

386. It should be noted that the railway is already electrified, and the majority of the freight and passenger trains are propelled by electric locomotives. Few switching trains moving within the stations use diesel as a fuel, although this amount of diesel is negligible.

387. The ongoing economic development of Uzbekistan will lead to increasing demands in the transportation of freight and passengers, including to and from the Ferghana Valley. Without this project, the railway will therefore not be able to transport more freight and passengers without the utilization of diesel locomotives.

388. Economical modeling developed for the project under the TRTA provides estimations of GHG emissions both with project implementation and without the project. Thus, for the scenario when additional traffic will be transported by diesel locomotive, GHGs emissions in the year 2025 (year of the project commissioning) will be 31,086 $teCO_2$/year.

389. If the same amount of traffic will be transported by railway with increased capacity (after project implementation) the GHGs emissions for the same year (2025) will be only

[32] Sanitarian norms and rules № 0146-04 Design of the living houses in climatic conditions of Uzbekistan

12,635 $teCO_2$/year. The annual saving of CO_2 emissions will therefore be around 18,451 $teCO_2$/year. This results in a positive impact on air quality and contribution to the mitigation of climate change impacts.

Impact on water

390. Due to the increasing number of operating trains following esrailway electrification, rail car maintenance and refurbishment will also increase. Usually, such activities involve high-pressure water washes, which may contain residues from transported materials, paint, oil and grease, and other contaminants. The discharge of such untreated wastewater in the water bodies or municipal sewage system may therefore pollute these water bodies and affect the normal functioning of wastewater treatment plants.

391. All rail car maintenance involving water are being implemented in the Kokand depot, which is equipped with wastewater treatment facilities (sedimentation tanks and an oil trap). After the depot's first treatment, wastewater is discharged into the municipal sewage system of Kokand city.

392. The discharge of wastewater from TSSs to water bodies without treatment will pollute them. Therefore, rail car washing will be prohibited on the territory of TSSs. Such kind of works will have to be conducted in the Kokand depot.

393. Due to the expected increase in the number of passengers and trains, the generation of domestic wastewater will also increase. Wastewater from the Asaka, Margilan, and Kokand stations will be discharged into municipal sewage networks. All other stations are equipped with septic tanks, sewage from which is discharged into the closest sewage networks (Asaka, Margilan and Kokand cities).

Mitigation measures

- Conclude an agreement with the local suvokova regarding the collection and disposal of domestic wastewater from stations, and monitor its timely, proper implementation;
- The UTY as maintenance company has to ensure that wastewater is not discharged into water bodies without treatment;
- Washing equipment will be prohibited on the territories of the TSSs;
- Rail car maintenance will be allowed only in the specially equipped depot (Kokand).

Impact on biological resources

394. The impact on biological resources during the operation phase will mostly be related to the maintenance of vegetation within the railway RoW. Such regular maintenance will involve the use of mechanical methods (e.g., mowing), manual methods (e.g. hand pruning), or herbicides. The size of the RoW for each section of the railway will be established by the Track Facilities Department under the UTY. Vegetation maintenance beyond that which is necessary for safety may remove unnecessary amounts of vegetation, resulting in the continual replacement of successional species and an increased likelihood of the establishment of invasive species.

395. Another potential impact that could occur during the operation phase is the collision of livestock with trains while they are crossing the railway track. Measures to avoid the potential collision of livestock with trains will be included in the safety program being implemented currently by the UTY.

Mitigation measures

- Implement integrated vegetation management (IVM). From the edge of the track area to the boundary of the RoW, vegetation should be structured with

smaller plants near the line and larger trees further away from the line to provide habitats for a wide variety of plants and animals;
- Native species should be planted and invasive plant species removed;
- Maintenance clearing in riparian areas should be avoided or minimized.

Waste management

Non hazardous materials

396. Due to the increasing number of cargo and passenger trains, it is expected that the amount of generated solid and liquid wastes will increase also. Among producing waste will be: solid communal waste, food waste, packaging materials from retail facilities, and paper, newspaper, and a variety of disposable food containers from trains and common passenger areas. The maintenance and upgrade of rail infrastructure may also result in the generation of non-hazardous and hazardous waste including lubricants from field maintenance equipment and steel and wood from rails and rail ties.

Mitigation measures

- It is recommended to use a waste recycling program, place waste in labeled containers in each station and train for easy segregation and further disposal;
- The UTY shall ensure that waste collection and its disposal from passenger trains are being appropriately implemented, and that liquid wastes are not discharged during train stops;
- Agreements on waste collection and its further disposal need to be concluded between local khokimiyats, waste management's entities, railway stations and track substations.

Hazardous materials

397. Oil is used in large transforms for cooling in TSSs and smaller transformers for SCADA. The quality of oil and its amount are checked regularly by the electrical department under the UTY. In case of non-compliance of oil quality with standards, oil will be drained and sent for regeneration to the UTY's or JSC "Uzbekenergo's" specialized departments. Depending on the quality of the treated oil after regeneration, it could be used for refilling transformers or as a secondary use in the UTY enterprises.

398. To prevent oil leakages from transformers, special collector basins are placed under each transformer. The volume of such basin is designed for 110 % of transformer oil.

Mitigation measures

- To avoid soil pollution, all works on oil replacement have to be conducted in full compliance with JSC "Uzbekenergo"'s instruction "RH 34-301-941: 2007 Individual consumption rates of transformer oil for the repair and maintenance needs for equipment of power facilities";
- Spare oil has to be storage in properly organized places with concreted floors and covers;
- Oil used for re-fueling transformers has to be free from PCBs[33].

Health and Safety

399. During railway operations, issues also relate to the health and safety of workers and the populations living near to the project sites.

Occupational Health and Safety

[33] Uzbekistan joined to Stockholm Convention on Stable Organic Pollutants in 2019

400. During railway operations the following issues may take place[34]: (i) train/worker accidents, (ii) noise and vibration, (iii) fatigue, (iv) electric hazards and (v) electric and magnetic fields.

401. Worker safety requirements during railway maintenance are described in detail in various UTY internal regulations, such as a "Rules of technical maintenance of railway", "Instruction on signaling on railway", "Work safety rules during maintenance of electrical devices", "Rules of organization and technical operation of the contact network of the electrified railways of SJSRC "Uzbekiston Temir Yullari" (UTY), Sanitarian Rules and Norms No 0023-94 "Hygienic requirements for working conditions and the sanitary security of workers of construction companies", and other national standards and norms and IFC EHS Guideline, Railway, 2007. The railway operating entity (Kokand railways authority) is responsible for conducting training for staff in accordance with State Standards GOST 23457-86.

402. All railway and electrical facilities need to be provided with an untouchable volume of water as per KMK 2.04.02-97. Electrical safety has to comply with requirements of GOST 12.1.130-81 "Electrical safety. Protective earth. The vanishing".

403. There is a possibility that some replacement or repair works could be required for fiber cable during operations. This may therefore create the same risks which may occur during cable installation. Therefore, the same mitigation measures indicated in section 6.2.4 apply during replacement cable or repairment.

404. If COVID-19 or other pandemics become active during the project's operation stage (2024 onwards), there is an increased risk of infection of passengers and railway personnel. Therefore, appropriate regulations regarding operations during such pandemic conditions have to be strictly followed, including regulations established by the Government of Uzbekistan, the World Health Organization (WHO), or other entities.

Mitigation measures

- The UTY should ensure compliance with all safety requirements indicated in all relevant documents indicated in previous paras;
- For works on replacement fiber cable or repairment the mitigation measures indicated in section 6.2.4. have to be followed;
- In conditions of pandemic (if any), Government and other regulations have to be strictly complied with.

Community Health and safety related to railway operation

Impact of electromagnetic fields

405. The main health and safety issues specific to railway operations are: (i) general rail operation safety, (ii) the transport of dangerous goods, (iii) level crossing safety and (iv) pedestrian safety[35].

406. Due to the proximity of residential houses to the electrified railway, there is a risk of impact of electromagnetic fields on the population after project commencement. National requirements on the level of electromagnetic field fully comply with international standards. The IFC EHS guideline refers to the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the Institute of Electrical and Electronics Engineers (IEEE), which establish an allowable level for electric field as 5 kV/m for area adjusted to living houses, and for magnetic fields as 100 mT

[34] IFC EHS Guideline, Railway, 2007, Occupation Safety
[35] IFC EHS Guideline, Railway, 2007

407. The national standards include SanPiN # 0236-07 dated from 2007 "Sanitarian Norms and Rules on safety ensure for population living areas close to high voltage lines". These standards indicate that the electromagnetic field for living areas has not to exceed 0.1 kV/m and for magnetic fields – 80 A/m, which is equivalent to 100 mT.

408. The SanPiN also provides the size of buffer zone for electric lines with various voltages. For electric lines with a voltage up to 30 kV, the buffer zone is 5 meters on both sides of an electric wire. Since the minimal RoW for electrified railway is established as 12 meters, no impact of electric and magnetic fields is expected from the electrified railway.

General rail operation safety

409. The most significant safety issue potentially affecting both crew and passengers is the threat of severe injury or the potential loss of life due to train collisions with other trains or with road vehicles, as well as the possibility of derailment due to these or other operational causes. To minimize this risk, the project includes the installation of SCADA and the signaling systems designated to avoid such accidents. Also, regular inspection and maintenance of the rail lines and facilities will be undertaken to ensure track stability and integrity in accordance with national and international (IFC) track safety standards.

410. **Dangerous goods may be transported** in bulk or packaged form by rail, representing a potential risk of release to the environment in the event of accidents on other causes. In intermodal containers, spills and leaks may result from improper packing and resultant load shifting during transport. Along with this preparation of spill prevention and control, emergency preparedness and response plans are also required based on an analysis of hazards, including the nature, consequence, and probability of accidents. It is important to disseminate this information to the potentially affected population.

411. In the case of the transportation of such goods, implementation of requirements indicated in the above mentioned national and international guidelines are required[36].

412. Special attention also needs to be paid to **pedestrian safety** because of some houses located a distance closer than 30 meters. There is a risk of accidents due to walking people close to the railway or crossing it.

413. Therefore, the improvement of safety for this railway is crucial. Currently, the UTY is working on a development campaign on increasing awareness among the population on safety issues. Moreover, at the stage of project implementation, the construction supervision consultant team will include a safety expert who will assess a safety situation along with the project area and will develop a mitigation program, which will be recommended to the UTY for implementation.

414. The overall installation of telecommunication, signaling, and SCADA systems will improve the efficiency of the railway operation and safety, which will have a ***positive impact*** on society.

[36] IFC EHS Guideline, Railway, 2007 and Resolution of Cabinet Ministry of RUz #192 dated from July 2012 "General Technological regulations of railway safety during operation".

Mitigation measures:

415. Details will be developed by the CSC railway safety specialist, to be implemented by the UTY as counterpart funding. An awareness program will be conducted by the UTY as part of the PIU-ET administration and capacity building activities. In addition to the awareness program, the following recommendations are proposed during the development and implementation of the program:

- Conduct awareness programs on a regular base, which will include among others such topics as: impact of electromagnetic fields, electrocution, and risk related to fast moving trains;
- Prepare spill prevention and control, and emergency preparedness and response plans, based on an analysis of hazards, including the nature, consequence, and probability of accidents;
- Install automatic gates at all level crossings, and regular inspection/maintenance to ensure proper operation;
- Fulfill occupational and community health and safety requirements as indicated in national and international standards documents;
- It is recommended to consider the relatively high density of the population in the project area during safety assessments and the definition and necessity of additional passages.

Impact on socio-economic resources

416. Project implementation will allow reliable, more frequent and higher-speed connections between the major cities and towns in the Fergana Valley. Moreover, the project supports the improvement of the Central Asia Regional Economic Cooperation (CAREC) Corridor 2, linking Uzbekistan to the People's Republic of China to the east, and Europe to the west. This impact is considered as cumulative because its severity increases when the action that generated it continues.

6. REVIEW OF ALTERNATIVES

417. The project will be implemented on the electrified railway. Telecom and signaling cables will be installed within the already allocated ROW. SCADA systems will be installed into the existing and operating buildings. The transformers on existing TSS will be installed instead of old ones on operating TSS. The location of the Asaka TSS has been selected in a way as to minimize the impact on houses, agriculture lands, in compliance with technical specifications of the railway, and for optimal connection to the external power supply lines.

418. Therefore, only one alternative was reviewed – the scenario without the project. In that case, the capacity of the existing railway will not be able to respond to the growing demand in transportation for the region. To satisfy this demand, the railway will have to combine electric locomotives and diesel. It will lead to a deterioration of air quality in the region due to emissions from diesel and discharging more GHGs.

419. Moreover, existing telecom and signaling systems will not be sufficient to ensure timely and safe communication between stations. It will create risks for effective railway operation and the risk of accidents on the alignment.

420. Climate change risk assessment shows the tendency of the increasing frequency of emergency situations in the mountainous areas, such as due to mudflows and avalanche gathering. Without the installation of warning systems included in the project, the movement of trains will be vulnerable to such events.