Initial Environmental Examination

July 2019

KGZ: Multisector Activities Small Support Small Expenditure Financing Facility (SEFF)

Subgrant Activity 1: Proposed Osh-Plotina Water Treatment Plant Chlorine Neutralization Unit

Prepared by the State Agency for Architecture, Construction, Housing and Public Utilities - Department of Drinking Water Supply and Sewerage Development for the Asian Development Bank.

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Abbreviations

ADB	Asian Development Bank
ADB SPS	ADB Safeguard Policy Statement
AQI	Air quality index
BOC	Bill of quantities
DCA	Deputy Chief Architect
DDWSSD	Department of Drinking Water Supply and Sewerage Development
DSC	Design and supervision consultant
EARF	Environmental assessment and review framework
EA	Executing agency
EIA	Environmental impact assessment
EMoP	Environmental monitoring plan
EMP	Environmental management plan
HSE	Health, safety and environment
IA	Implementing agency
IEE	Initial environmental examination
MoF	Ministry of Finance
MPC	Maximum Permissible Concentrations
NES	National environmental specialist
OSHA	Occupational Safety and Health Administration
OVK	Oshgorvodokanal
PER	Public Environmental Review
PMO	Project Management Office
REA	Rapid Environmental Assessment
SAACHPU	State Agency for Architecture, Construction, Housing and Public Utilities
SAEPF	State Agency for Environmental Protection and Forestry
SEFF	Small Expenditure Financing Facility
SEMP	Site-specific environmental management plan
SER	State Environmental Review
US EPA	United States Environmental Protection Agency
WHO	World Health Organization
WTP	Water Treatment Plant

Executive Summary

1. The Multisector Activities Small Support Small Expenditure Financing Facility (SEFF) is being proposed to ensure that (i) ADB-financed projects in the Kyrgyz Republic have a high level of project implementation readiness, (ii) the lack of access to small expenditures financing needs does not result in a major performance hindrance in larger ADB-financed projects, and (iii) following the completion of ADB-financed projects, adequate financing for operations and maintenance program is available to ensure project sustainability.

2. The facility will provide support through provision of ten activity subgrants for project implementation readiness, ensure sustainability of ADB-financed projects, enable rapid response in the event of a natural disaster, and pilot new technologies and innovations. Only the first activity has been identified at this stage. As the other activities will be identified during project implementation, an environmental assessment and review framework (EARF) has been prepared for the SEFF to provide guidance on the safeguards screening process for future activities.

3. This Initial Environmental Examination (IEE) is prepared for the "Proposed Chlorine Neutralization Unit", Subgrant Activity 1 of the SEFF. The purpose of the Project is to ensure sustainability of the existing Ozgor Drinking Water Treatment Plant in Osh City, located in Osh Oblast in the Kyrgyz Republic. In accordance with the SEFF EARF, the proposed first activity has been classified as Environment Category B, requiring the preparation of the IEE. The IEE has been prepared in accordance with requirements of the Natural Environment Conservation law of the Kyrgyz Republic, the EARF, and ADB's Safeguard Policy Statement (SPS).

4. The report includes general information about the Kyrgyz Republic, relevant legislation and the project area. The report includes a detailed description of the proposed project and describes the current condition of the environment in the project area. Different environmentally sensitive receptors were identified and the impacts of the project have been analyzed from the perspective of the receptors, suitable mitigation measures have been identified to reduce the anticipated impacts to as low as reasonably possible and an Environmental Management Plan (EMP) has been prepared accordingly.

5. Impacts from the project are anticipated to be limited and site-specific. Despite the fact that most of the impacts are limited to the construction period of the project, some impacts also occur during the operation period. This impact is primarily due to the risks associated with potential spills or leakage of harmful substances required during operation of the project. The following impacts have been identified: (i) air pollution and noise impacts, which is particularly important within the settlements close to the project; (ii) land and water contamination due to improper waste disposal; (iv) minor disturbance to traffic during delivery of construction materials and/or equipment; and (v) impacts on health and safety due to handling of hazardous substances. Impacts are further discussed in this report according to project implementation phases: design, construction, and operation period.

6. Corresponding mitigation measures and monitoring requirements have been developed and incorporated into the EMP.

I. INTRODUCTION

A. Overview

7. This Initial Environmental Examination (IEE) for the Subgrant Activity 1: Proposed Chlorine Neutralization Unit, hereafter referred to as the "Project", is prepared as part of the requirements of the Asian Development Bank Safeguards Policy Statement (ADB SPS 2009) in relation to the Multisector Activities Small Support Small Expenditure Financing Facility (SEFF), or the "Facility".

8. The Facility will provide support to ten activity subgrants for project implementation readiness, ensure sustainability of ADB-financed projects in the Kyrgyz Republic, enable rapid response in the event of a natural disaster and pilot new technologies and innovations.

9. The first activity, covered by this IEE, is aimed at enhancing project sustainability. In 2011, the ADB approved the Emergency Assistance Reconstruction and Recovery Project (EARR) to (i) restore the country's immediate fiscal capacity to meet the sharp rise in incremental costs arising from the April and June 2010 conflicts; and (ii) rebuild damaged houses and improve essential public infrastructure, as reflected in the report and recommendation of the President. One of the components of the Initial Project was to rehabilitate the Chlorination Station located at the Ozgor Water Treatment Plant (WTP). The Initial Project started on 14 February 2011 and was completed on 23 November 2016 (actual completion date). Although the project completion report concluded that the project was successful, it raised issues related to standards being employed in the water sector in the Kyrgyz Republic, in relation to current standards. ADB and the government agreed that upgrading the chlorine neutralization units at WTPs was a priority to meet the most recent international standards with the highest safety levels available in the market. Given its urgency, the government requested to upgrade the chlorine neutralization unit at the Osh-Plotina WTP as the first activity under the facility.

10. To ensure sustainability of the previous project, the project proposes the installation of a chlorine neutralization unit to ensure: (i) safety during operation stage, (ii) neutralization of any chlorine leakage, and (iii) safe and sustainable operations within the existing Ozgor WTP.

B. Existing Situation

11. The City of Osh is the second largest city of Kyrgyz Republic. The number of customers receiving water given by the Osh municipal enterprise or Oshgorvodokanal (around 72,000 (considering the figure of 5 members per family). Osh is mainly supplied with surface water from the Ak-Bura River treated at the Ozgor WTP producing approximately 180,000 m^3/day equal to approximately 80 percent of the water supply. The remaining water supply is extracted from wells and drainage galleries in four main locations.

12. Ozgor WTP was constructed in 1978 with 6 rapid filters (line I) and extended in 1991 to 10 new filters (line II). The design capacity of the two treatment lines are 50,000 m^3/day and 80,000 m^3/day, respectively (Figure 1). However, the average daily production of the plant is 180,000 m^3/day as reported by OVK, indicating that the plant is currently overloaded.

13. During the ADB Mission to the Ozgor WTP in May 2018 to visit the newly rehabilitated Chlorination Plant, some safety and security issues have been identified. Currently, the chlorination facility within the Ozgor WTP stores up to eight containers of liquid chlorine with a capacity of 800 to 1,000 kg, located in one room. The only existing emergency solution in case of

a leakage is a sarcophagus that can isolate one drum of chlorine. A ventilation system is in place that can draw vaporized chlorine, but it will be dispersed directly to the environment via a stack, which has the potential to adversely affect the surrounding environment. The proposed neutralization facility will aid in absorbing and neutralizing leaked chlorine gas prior to emission, thereby ensuring safe operations of the chlorination facility of Ozgor WTP.

Treatment line for 50,000 m³/day | Treatment line for 80,000 m³/day

Figure 1 Ozgor WTP

C. Purpose and Structure of the Report

14. This IEE is part of the process of compliance with ADB's SPS 2009. The IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental impacts associated with the development of the project. The IEE also outlines the potential direct and indirect impacts associated with the project during key periods of work.

15. The IEE specifically provides the following:

- Describes the project design, construction activities and operational parameters;
- Describes the existing socio-environmental conditions within the project area;
- Describes the extent, duration and severity of potential impacts;
- Analyzes all significant impacts; and
- Formulates corresponding mitigation actions and monitoring requirements and presents it all in the form of an Environmental Management Plan (EMP).

16. The IEE report is organized as follows:

- Executive Summary. Summarizes critical facts, significant findings, and recommended actions.
- Introduction. Introduces the proposed subproject, report purpose, and IEE structure.
- Description of the Subproject. Provides a detailed description of the subproject scope, components, location, layout, budget and implementation schedule.
- Environmental Legal and Administrative Framework. Discusses Kyrgyz Republic (KR) and ADB environmental assessment legal and institutional frameworks.

- Environmental Baseline. Provides a description of the relevant physical, biological, socioeconomic conditions within the area potentially affected by the subproject. The description is based on reviews of available documentation, statistical data and field surveys and investigations.
- Analysis of Alternatives. Provides and considers possible subproject alternatives.
- Assessment of Anticipated Environmental Impacts and Mitigation Measures. Describes impacts predicted to occur as a result of the subproject and identifies suitable mitigation measures.
- Environmental Management Plan. Presents the EMP, including required construction and operation phase environmental mitigation measures, an Environmental Monitoring Plan (EMoP), reporting requirements, and capacity building.
- Information, Disclosure, Consultation and Participation. Describes the process undertaken for engaging stakeholders and carrying out IEE disclosure and public consultation.
- Conclusion. Presents conclusions drawn from the assessment and recommendations.
- Annexes. Presents additional supporting information.

D. Project Proponent

17. The Ministry of Finance will be the Executing Agency of the facility and the implementing agency is the Department of Drinking Water Supply and Sewerage Development (DDWSSD) under State Agency for Architecture, Construction, Housing and Public Utilities (SAACHPU).

E. Category of the Project

18. The SEFF Facility has been categorized as B for environment, therefore all the currently proposed or future subgrant activities should be categorized as B. In the event that a Category A Activity is proposed in the future, the SEFF Facility should be re-categorized. The Environmental Assessment and Review Framework (EARF) adopted for the Facility requires that subgrant activities are screened to determine their environmental category utilizing ADB's Rapid Environmental Assessment (REA) Checklists.

19. Based on the screening, the proposed subgrant activity 1 is classified as Environment Category B, requiring the preparation of this IEE. This category is defined as:

20. "Projects with potential to cause less significant fewer environmental impacts than Category A, yet still require a prescribed level of environmental management to protect the environment. For these projects an initial environmental examination (IEE) could be considered as final environmental assessment report if the stated document determines that an environmental impact assessment (EIA) is not required for the project under examination".

21. This categorization is based mainly on the fact that the project will likely have localized and site-specific impacts to physical and biological characteristics of the environment and that most of the impacts to the human environment can be adequately managed or mitigated by the management plans provided by this report.

II. PROJECT DESCRIPTION

A. Project Location and Area

22. The Project is located in the southern part of Osh city, the second largest city in Kyrgyz Republic (Figure 2). The proposed chlorine neutralization unit will be located within the existing chlorination plant at the Ozgor WTP (Figure 3 and Figure 4). The facility is surrounded by the Ak-Bura River, approximately 300 m away; Uvam irrigation canal, approximately 40 m away; and the nearest households are approximately 80 m away.

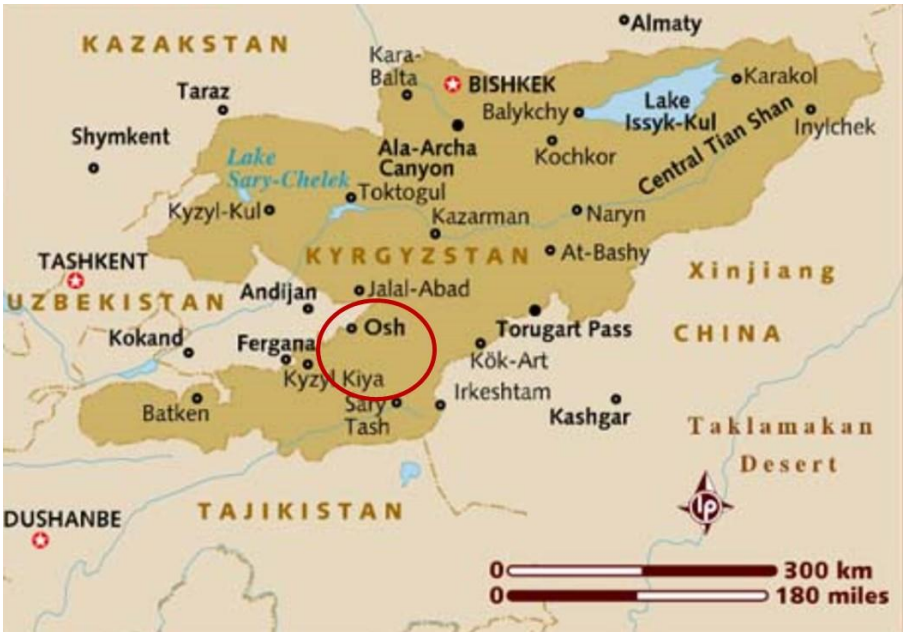


Figure 2 Map of Kyrgyz Republic

Figure 3 Chlorination Plant in Ozgor WTP

Figure 4 Project location map

B. Existing Chlorination Plant

23. The chlorination plant is located in an independent building within the compound of the Ozgor WTP. Currently, the chlorination facility stores up to eight containers of liquid chlorine with a capacity of 800 to 1000 kg, located in one room (Figure 5). This huge volume of the chlorine can be attributed to the amount of water to be treated daily (of 180,000 m³/day) and the difficulties with chlorine supply. In case of any emergencies (i.e. leakage), the chlorination facility is equipped with an alarm system, a ventilation system that can transfer the gas outside through a stack, and a sarcophagus that can isolate one drum of chlorine (Figure 6). However, this solution is not considered as an internationally accepted best practice, as in the case of a potential leak from several drums, no solution is envisaged.

Figure 5 Chlorine tanks and sarcophagus

Figure 6 Ventilation system and stack

24. The current emergency system only allows the extraction of vaporized chlorine from the storage room and is dispersed directly to the environment, which has the potential to adversely affect the surrounding environment. Classified as a highly toxic gas, chlorine presents potential risks, and a severe emergency may suddenly and unexpectedly occur at chlorine storage and handling sites. It is nonflammable but a strong oxidizer and highly corrosive, very toxic to aquatic organisms and birds. Chlorine can very easily enter the human body through the skin, the eyes, inhalation, or by being ingested. Potentially hazardous releases due to chlorine gas leaks is a crucial health, safety and social issue.

25. Liquid chlorine in a ruptured tank/drum, or spilled onto the ground or into water during an accident is expected to volatilize rapidly, forming a greenish-yellow cloud of chlorine gas on the ground. This gas cloud can be carried several miles away from the source of release, while maintaining dangerous levels of chlorine. Since chlorine gas is so reactive, it is not expected to remain in the environment very long after it is released. Careful neutralization practices can eliminate the risk for human and the environment. The proposed neutralization facility will aid in absorbing and neutralizing leaked chlorine gas prior to emission, thereby ensuring safe operations of the chlorination facility of Ozgor WTP.

C. Proposed Chlorine Neutralization Unit

1. General

26. The proposed chlorine neutralization unit will be designed to neutralize a maximum quantity of seven tons of chlorine gas in case of any accidents. The chlorine neutralization unit will be located in the adjacent room to the chlorine storage area in order to avoid freezing during wintertime and will occupy approximately 5 m^2 space (Figure 7). Examples of chlorine neutralization facilities are provided in Figure 8. The schematic diagram and proposed layout of the facility are provided in Figure 9 and Figure 10, respectively.

27. The foundation of the chlorine neutralization unit will be made of concrete, which should have a capacity to bear at least 10 tons of equipment. The Neutralization Tower will be connected to the room with drums by PVC or PE pipes. The blower with 4000 m^3/h capacity will absorb the chlorine gas and transfer it to the neutralization unit. The mixture of air and chlorine gas will be pushed through the caustic soda mixture and the depolluted air will be extracted through the stack with no risk of contamination.

Figure 7 Indicative location of the Chlorine Neutralization Unit

Figure 8 Examples of Chlorine Neutralization Facilities

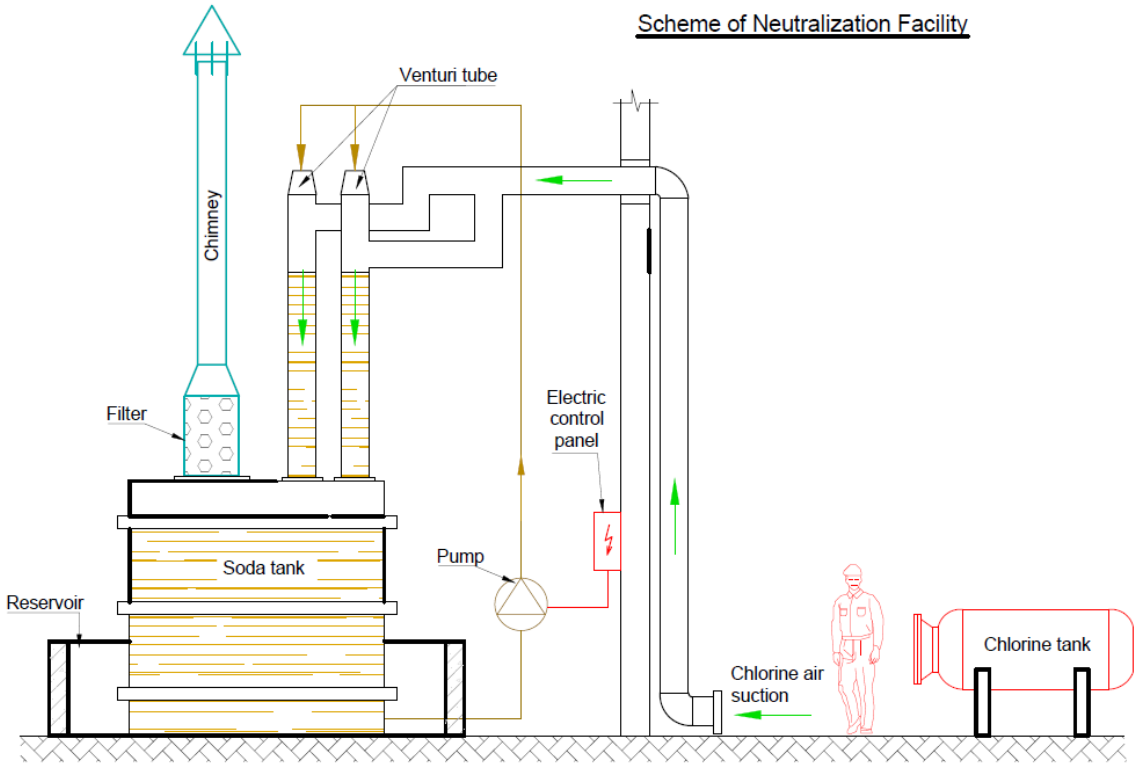


Figure 9 Schematic diagram of the proposed neutralization facility

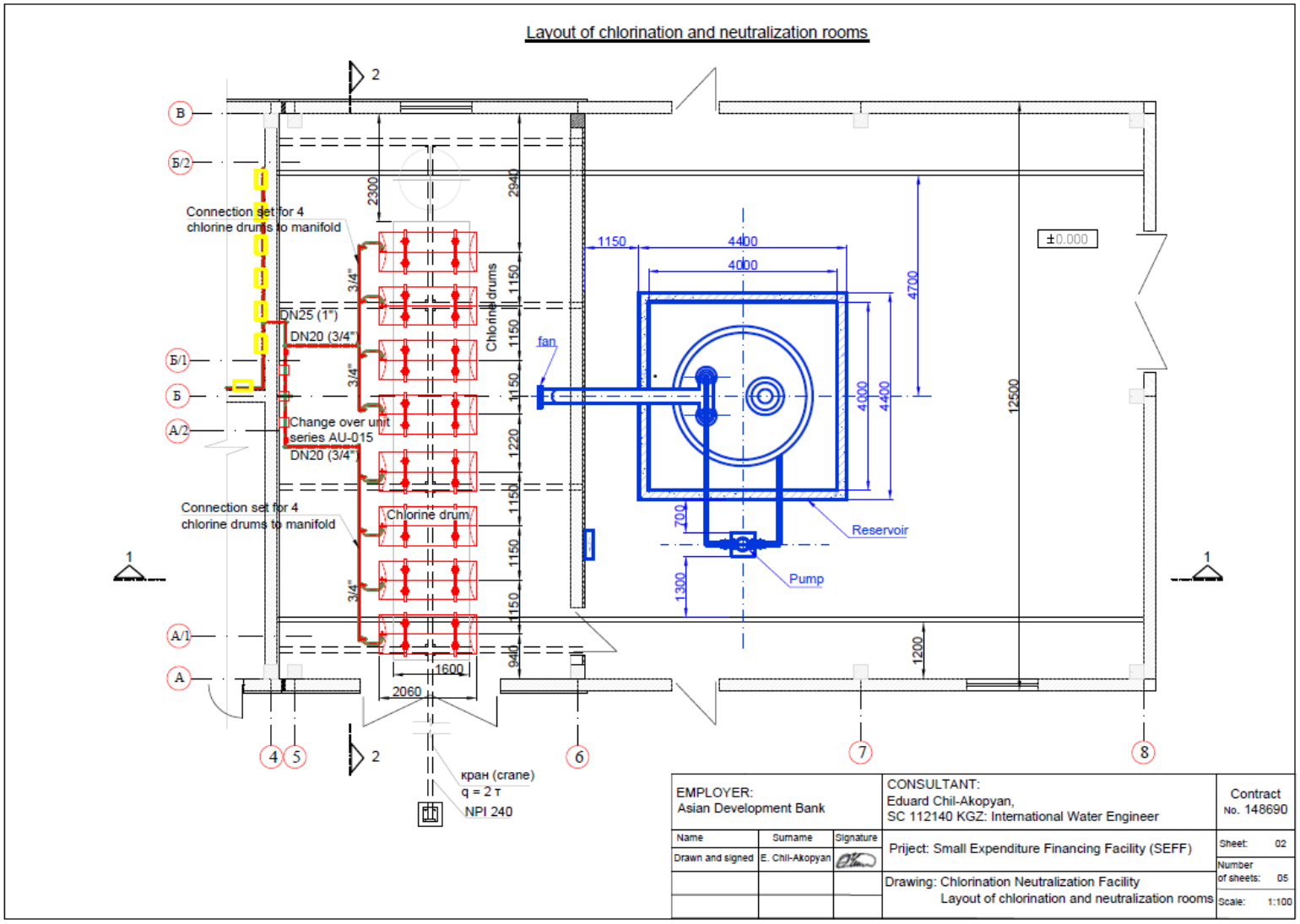


Figure 10 Proposed layout of chlorination and neutralization facility

2. Project specification and components

28. The Neutralization Tower will consist of two DN 300 ÷ DN 400 columns connected by piping to the chlorination room with drums. It works on the principle of gas washers with special neutralizing liquids (i.e. caustic soda). This equipment allows two functions at the same time in a single stage: the suction and the absorption. Soda is used as driving fluid in washers with liquid. The Neutralization Tower simultaneously ensures the suction of the polluted air and its mixture with the absorbent solution.

29. The Neutralization Facility will consist of the following characteristics:

General characteristics:

- Immediate flow rate of absorption 840 kg/hour,
- Final capacity of chlorine which can be absorbed should be 1000 kg,
- Air flow sucked up 4000 m^3/h.

General Dimensions:

- Height under ceiling: up to 6 meters,
- Total height with the vent: up to 10 meters,
- Length x Width: 4 x 4 meters max.,
- Required space (L x W): 5 x 5 meters max.,
- Weight empty: up to 3000 kg,
- Weight with Soda: up to 10000 kg.

Characteristics and components of the neutralization facility:

- Caustic soda Storage Tank,
- Two washing columns DN 300 ÷ DN 400 with connection pipings,
- Recirculation pump with polypropylene parts (for soda flow of about 60 m^3/h,
- Pressure up to 4 bar and engine power up to 20 KWt,
- Blowers with 4000 m^3/h capacity,
- A vent extraction stack with filter and with protective hat,
- Control Panel,
- Flexible tubing for chlorine gas under vacuum,
- 5 years' warranty, and lifetime over 10 years.

30. A Supply and Installation type of Contract is recommended for the project. After the supply and installation of the neutralization facility, the supplier needs to conduct a special operations training for WTP employees, even though the system should be operated automatically.

D. Project Cost and Schedule

31. The activity cost is estimated at $0.625 million, consisting of $0.5 grant from ADB and $0.125 share of the government of Kyrgyz Republic. The construction period will be 12 months, with construction commencement tentatively scheduled for Q1 2020. The subproject expected lifetime is 25 years.

III. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. General

32. This section of the IEE presents an overview of the policy/legislative framework as well as the environmental assessment guidelines of Kyrgyz Republic. The section also identifies relevant ADB Safeguard Policies applicable to the project. The project will be required to comply with all relevant national and international environmental and social policies/guidelines.

B. Country Policies and Administrative Framework

1. Overall legal framework

33. The Constitution of the Kyrgyz Republic 2010 is the foundation for the whole normative and legal framework. It stipulates the right of all citizens for an environment favorable for human's life and health and compensation for damage caused to health or property by nature management activities.

34. The legal basis for environmental assessments in KR is formed by the Law on Environmental Protection (1999), the Law on Environmental Impact Assessment (1999), the Instruction on Procedures of State Environmental Expertise (2014), and the Instruction on Environmental Impact Assessment Performance Procedures in the Kyrgyz Republic (2015). These legal documents are supported by normative documents.

35. The Kyrgyz Republic is a party to 12 international conventions on environmental protection, with two related to EIA: Aarhus Convention on Public Participation in Decision-making and Access to Justice in Environmental Matters and Espoo (EIA) Convention for projects that are likely to have significant adverse environmental impacts across boundaries.

2. Institutional framework and legislation for environmental assessment

36. The State Agency for Environmental Protection and Forestry (SAEPF) is the key institution responsible for the establishment and implementation of environmental policy in Kyrgyz Republic. The Department of the State Ecological Expertise and Environmental Management under the SAEPF is responsible for reviewing environmental assessment documents. The State Ecological Expertise procedure is mandatory to any plans or projects with anticipated adverse impact on the environment and if activity is listed in law on EIA. According to the law, no project shall be considered fully operational without positive opinion of the State Ecological Expertise.

37. The EA system in KR is based on two subsystems: (i) OVOS (the Russian acronym for "Environmental Impact Assessment"), and (ii) Ecological Expertise (State Environmental Review, SER). A screening procedure based on screening lists identifies whether a project is the subject to environmental assessment. In case if it is required, an OVOS is conducted by an OVOS Developer hired by a Project Proponent. After presentation of an Environmental Impact Statement (EIS) for public consultations, the EIS is revised based on the feedback from the public. Then the OVOS report and a Statement of Environmental Consequences along with other supporting documentation is submitted to a state expert commission for the State Environmental Review (SER). The project may be approved, rejected, or sent for reexamination.

38. Public consultation should occur during the conduct of the OVOS and may also be initiated in parallel to the SER as Public Environmental Review (PER). The implementation of any project is permitted only following approval by the SER. The PER is a supplement to the SER and is of a recommendatory nature. The SER duration depends on the complexity of the project but should not exceed 3 months after submission of all OVOS documents.

3. Other governmental bodies with environment-related responsibilities

39. Other government institutions with a responsibility related to environmental matters are:

- Ministry of Health (safety and health issues);
- Ministry of Emergency Situations (natural hazards), and its subsidiary agency Kyrgyz Hydromet (KHM, or Hydromet, responsible for ambient air and water quality monitoring);
- Ministry of Agriculture (agricultural issues)
- State Committee for Industry, Energy and Subsoil Use (mineral resources, road construction materials, and
- quarries);
- Local administrations (social issues, land use, etc).

4. Applicable environmental standards

40. Relevant KR environmental standards and procedures include:

Air Quality, Sampling and Analysis

- GN 2.1.6.695-98 “Maximum Permissible Concentrations (MPC) of polluting substances in the atmospheric air of the populated areas”.
- GOST17.2.1.03-84. Environmental Protection. Terms and definitions of pollution control.
- GOST 17.2.4.02-81. Environmental Protection. General requirements for polluting substance detecting methods.
- GOST17.2.3.01-86 Environmental Protection. Atmosphere. Rules to control quality of the air in populated areas.
- GOST17.2.6.01-85. Environmental Protection. Atmosphere. Instruments for air sampling in the populated areas.
- GOST17.2.6.02-85 Environmental Protection. Atmosphere. Automated gas analyzers to control atmospheric pollution.
- RD 52.04.186-89 “Guidelines to control atmospheric pollution”.

Water Quality and Sampling

- SanPiN 2.1.4.002-03. "Drinking water. Hygienic requirements for water quality of the centralized drinking water supply. Quality control ".

Noise Levels, Measurement and Protection

- MSN 2.04-03-2005 "Noise protection"
- SN 2.2.4/2.1.8.562-96 "Noise in the workplace, in residential and public buildings and in the residential area";
- GOST 23337-78 * "Methods of noise measurement in the residential area and in residential and public buildings";

- MUK 4.3.2194-07 "Control of noise level in residential areas, residential and public buildings and premises»
- SNIP 23-03-2003 "Noise protection ".

C. ADB Safeguard Policy Statement (2009)

41. The ADB Safeguard Policy Statement (SPS 2009) serves as the main guidance for compliance with ADB safeguards requirements. The SPS promotes good international practice as reflected in internationally recognized standards such as the World Bank Group's EHS Guidelines. The policy is underpinned by the ADB Operations Manual for the SPS (Section F1, 2010).

42. All projects funded by ADB must comply with the SPS, which establishes an environmental review process to ensure that projects undertaken as part of projects funded by ADB loans are environmentally sound, are designed to operate in line with applicable regulatory requirements, and are not likely to cause significant environment, health, social, or safety hazards.

43. At an early stage in the project cycle, typically the project concept stage, ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Project screening and categorization are undertaken to:

- reflect the significance of the project's potential environmental impacts;
- identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, magnitude and sensitivity of the proposed project's potential impacts; and
- determine consultation and disclosure requirements.

44. An initial step in determining the project's environment category is to prepare a Rapid Environmental Assessment (REA) screening checklist, taking into account the type, size, and location of the proposed project. ADB assigns a proposed project to one of the following categories:

- **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an EMP is required.
- **Category B**. Proposed project's potential environmental impacts are less adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An IEE including an EMP is required.
- **Category C**. Proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.
- **Category FI**. Proposed project involves the investment of ADB funds to, or through, a financial intermediary

45. As noted previously, the proposed Subgrant Activity 1: Chlorine Neutralization Unit is classified as Environment Category B, requiring the preparation of an IEE (this report) including an EMP which will ensure (i) implementation of identified mitigation and management measures for anticipated adverse environment impacts; (ii) implementation of monitoring and reporting; and (iii) subproject compliance with the KR's relevant environmental laws, standards and regulations and ADB's SPS. This categorization was carried out based on ADB's Safeguard Policy Statement (2009), and the Facility's EARF.

D. Environmental Standards

46. The following standards will be applied for the project:

Table 1 Ambient air quality standards

Pollutants	Maximum concentration (mg/m^3) based on national legislation		IFC guidelines (mg/m^3)	
	Value	Concentration averaging period	Value	Concentration averaging period
Dust / Particulate matter	0.15	daily average	0.05	24-hour
Sulphur dioxide (SO_2)	0.5	daily average	0.02	24-hour
Nitrogen dioxide (NO_2)	0.085	daily average	0.2	1 hour
Carbon monoxide (CO)	3.0	daily average		

Source: GN 2.1.6.1338-03

Table 2 Noise standards

Description of activity/ category	Leq (dBA)		Lmax (dBA)	
	Day	Night	Day	Night
Areas directly adjacent to hospitals and sanatorium	45	35	60	50
Areas immediately adjacent dwellings, polyclinics, dispensaries, rest homes, holiday hotels, libraries, schools, etc.	55	45	70	60
Areas immediately adjacent to hospitals and dormitories	60	50	75	65
Recreational areas in hospitals and sanitariums	35		50	
Rest areas at the territories of micro-districts and building estates, rest houses, sanitariums, schools, homes of aged, etc.	45		60	

Source: SN (Sanitary Norms) 2.2.4/2.1.8.562-96 "Noise at workplaces, in dwelling rooms, in public buildings and at the area of residential development

IV. ANALYSIS OF ALTERNATIVES

A. No Action Alternative

47. The “No Action” Alternative is defined as a decision not to undertake the proposed Project. The “No Action” Alternative would result in increased risk of contaminating the surrounding environment should there be a leakage in the existing Chlorination Plant.

48. Chlorine is a hazardous substance and an uncontrolled release can have catastrophic effects. The use of chlorine for the disinfection of potable water supplies has been of great significance from a public health perspective but its application raises serious concerns which need prime attention from a safety point of view. The causes of concern are due to the following:

- Chlorine is highly toxic, corrosive and penetrating at ambient temperature which poses potential health risk to staff at water treatment plant and general public around, if released by accident.
- Chlorine is corrosive to the eyes, skin, and respiratory tract. Eye contact can cause permanent damage. Inhalation of the gas can cause pulmonary edema, a medical emergency that can be delayed for several hours, which can cause death. Rapid evaporation of the liquid may cause frostbite. Repeated exposure may permanently damage the lungs or cause chronic bronchitis. Chlorine may affect the teeth resulting in erosion, and cause skin rash. A single high exposure may cause similar health effects.
- Chlorine dissolves when mixed with water. It can also escape from water and enter air under certain conditions. Most direct releases of chlorine to the environment are to air and to surface water. Once in air or in water, chlorine reacts with other chemicals. It combines with inorganic material in water to form chloride salts, and with organic material in water to form chlorinated organic chemicals. Chlorine causes environmental harm at low levels. Chlorine is especially harmful to organisms living in water and in soil.
- Chlorine reacts violently with many organic chemicals (e.g. mineral oils, greases), hydrocarbons, silicones, and finely divided metals. It forms explosive mixtures with alcohols, glycols, ammonia and its compounds, and hydrogen over a wide range of concentrations.

49. Hence, the “No Action” Alternative would be a risk to the safety and sustainable operations of the existing Ozgor WTP.

B. Facility Siting

50. As the project will be constructed to support an existing facility, there are limited options in terms of selecting the location for the Neutralization Facility. The location should be adjacent to the room where the chlorine drums are stored. This means that the Neutralization Facility could only be located either in the adjacent room to the chlorination room, or expand and construct an area for the Neutralization Facility in either side of the chlorination room (Figure 11).

51. The adjacent room is quite large with an approximate size of 11800m x 12000m. As the Neutralization Facility will only require a maximum area of 5m x 5m, the existing adjacent room to the chlorination room was deemed as the best option for the project because it would necessitate less cost in terms of construction. The existing room will also help avoid freezing of the Neutralization Tower during wintertime.

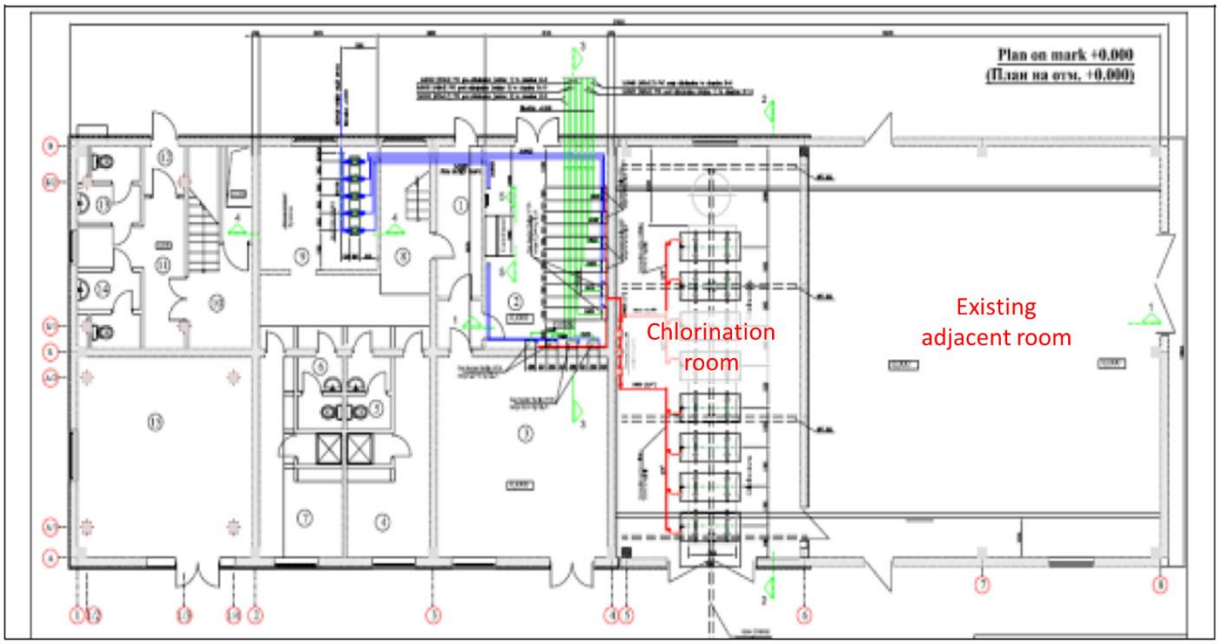


Figure 11 Current layout of Chlorination Station

C. Technology selection

52. The Chlorine Neutralization Unit primarily works as an emergency gas scrubber, designed to control catastrophic gas releases (e.g. chlorine, sulfur dioxide, ammonia) from a failure in the gas storage cylinder or system. There are two basic types considered for the neutralization of chlorine – wet and dry scrubbers. Both types of scrubbers perform the same basic function, which is to control gaseous emissions.

53. Wet scrubbers use a solution, such as water, lime slurry, or caustic soda solution, to saturate the particulates and compounds in the exhaust stream, weigh it down, and remove them from the gases. Dry scrubbers use dry reagents (e.g. alkaline slurry), that come into contact with the polluted stream, and react to either neutralize the hazardous compounds, or absorb them into a different, less harmful, substance.

54. The Uniform Fire Code, Article 80, states that the full contents of a single largest storage container of chlorine must be mitigated in thirty minutes. If a toxic gas release were to occur from a one-ton cylinder of chlorine, the laws of thermodynamics suggest that approximately 400 lbs of liquid chlorine would flash into vapor, and the remaining contents of the chlorine cylinder would spill out as a liquid at its boiling point.[1] As such, efficiency is the most critical aspect in selecting the type of technology.

55. In the case of the project, a chlorine neutralization unit utilizing a wet system (i.e. caustic soda as a neutralizing agent) was selected. While dry scrubbers are generally well-suited for applications in facilities that lack the infrastructure to properly handle wastewater and significantly cost less in terms of maintenance and operations costs, it cannot achieve the same level of pollutant removal as wet scrubbers. Wet scrubbers, on the other hand, are one of the most

[1] A. Acton. (2013). Sulfuric Acids-advances in research and application. Atlanta, GA. Scholarly Editions.

versatile and cost-effective pollution control technologies, with a collection efficiency of up to 99 percent[2]. Despite having a higher maintenance cost, it has a lower cost of purchase, able to neutralize highly corrosive gases, and can be retrofitted into the current equipment with little space requirements.

[2] Schifftner, K.C. and H.E. Hesketh. (1996). Wet Scrubbers (2nd Edition), Lancaster, PA. Technomic Publishing.

V. DESCRIPTION OF THE ENVIRONMENT

56. This section of the report discusses the existing environmental and social conditions within the corridor of the Project under the following sub-sections:

- Physical Resources (topography, air quality, hydrology, etc.);
- Ecological Resources (flora, fauna, protected areas);
- Social, Cultural, and Economic Resources (health, education, noise, cultural resources, transportation, etc.).

A. Physical Resources

1. General

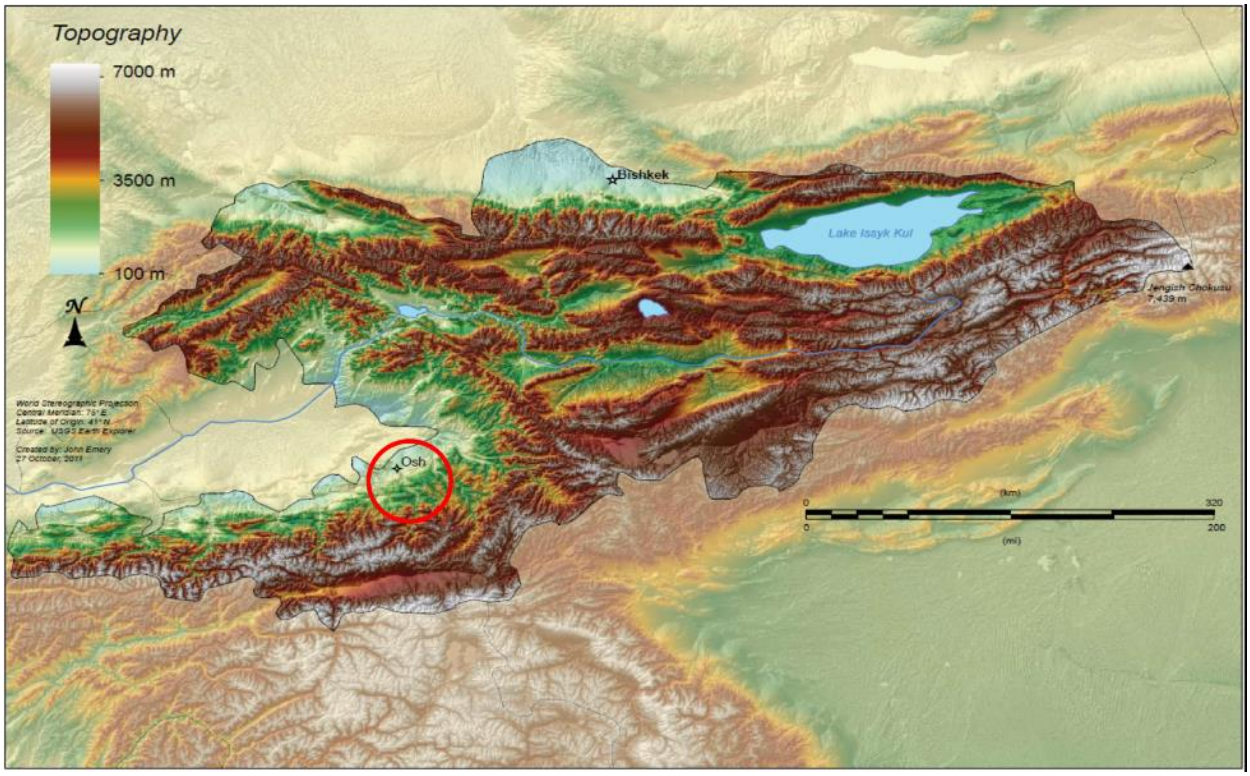
57. The Kyrgyz Republic is a land-locked country with an area of approximately 199,951 km^2, surrounded by the People's Republic of China, Kazakhstan, Tajikistan, and Uzbekistan (Figure 2). A large portion of the country is mountainous (94% of the country's area is occupied by mountains, average elevation is 2,750 masl), and it composes a part of the Tien Shan Mountains. Lenin Peak rises to 7,134 masl and Pobeda Peak is the highest mountain in the Tien Shan Mountains at 7,439m. The country is rich in hydropower resources with most of its hydropower plants situated in the Naryn River, the biggest tributary of the Syr Darya River.

58. The project is located in Osh city, which occupies an area of 182.5 km^2 and like the capital city Bishkek, is administered separately and not part of any region. The total population including suburb areas subordinated to city administration is 299,500.

2. Topography

59. The topography of the Kyrgyz Republic is very diverse. It varies in elevation from 400 to 7000 m. It has several massive mountain ranges drawn mainly in a near east-west directions and several dividing intermountain valleys and depressions.

60. Osh City is located in the south-western side of the Kyrgyz Republic at the boundary of the Republic of Uzbekistan. The territory of the city is situated in the eastern part of Fergana Valley that expands among Kyrgyz, Uzbekistan and Tajikistan. The terrain of the urban area inclines gently to the river. The altitude of the urban area is about 900-1000 m above sea level. Osh City is surrounded by gentle hills on the east and south. These hills run to high mountainous areas, connecting to the boundaries of China and Tajikistan. Figure 12 shows the topographic condition of the Kyrgyz Republic.



Source: USGS Earth Explorer, Kyrgyz Republic Topographic Map licensed under CC (John Emery).

Figure 12 Topographic map of Kyrgyz Republic

3. Soil and Geological Characteristics

61. The territory of Kyrgyz Republic is characterized by mountain terrain, which occupies part of the Tien Shan range and a small part of the North Pamir. One of the most distinctive features of the geological structure of the Kyrgyz Tien Shan is the presence of two megacomplexes of its constituent rocks. The lowest of these is represented by a highly dislocated variety of sedimentary, igneous and metamorphic rocks of Paleozoic and pre-Paleozoic age, and the upper consists of weakly metamorphosed, mainly continental sedimentary Mesozoic and Cenozoic strata. The layers of the lower megacomplex are composed by numerous ranges of the Tien Shan and foundation of the intermountain basins, and Cenozoic deposits fill intermountain basins and foothills. The orogenic system divides the territory of Kyrgyz Republic into three parts: the Northern, Middle and Southern Tien Shan. Osh Oblast belongs to the Southern Tien Shan.

62. The Hercynian fold system of the Southern Tien Shfan is located southward of the folded structures of the Middle Tien Shan. The South Tien Shan fold system belongs to the sedimentary and volcanic strata of the middle and upper Paleozoic. Lower Paleozoic and Precambrian rocks make up the base of the Hercynian folded complexes. Most outcrops of the Lower Paleozoic deposits are limestone, chert, clay and siliceous shales, sandstones containing fossils Cambrian and Ordovician.

63. From a geomorphological point of view, the region is a sub-mountain complex with is tectonic-erosive-accumulative relief as is represented by the terraced alluvial valley of the Ak-Bura River.

64. Geolithological structure of the area is formed by surface deposits of intermountain troughs formations represented by alluvial-proluvial upper quaternary coarse grounds (pebbles). Surficial deposits are clayey grounds (loams, sandy loams) of different thickness and with soil-vegetable layer, and anthropogenic formations of modern age (represented by artificial roadbed and embankment of pebbles with thickness up to 1.0-1.45 m).

65. In the lower parts of the region, at an altitude of 900-1,500 masl, there are gray soils (light, dark and typical ones). At altitudes of 1,500-3,000 masl, there are different subtypes of brown soil (typical, carbonate), and in the more humid areas under spruce forests there are dark brown leached soils. In the subalpine zone there are meadow-steppe and mountain meadow soils.

66. Soil erosion is a major environmental issue throughout the Kyrgyz Republic due to seismic activity, steep slopes, the fragility of the soils and human activities (such as inappropriate livestock management, the removal of protective vegetative cover and poor water management practices).

4. Natural Hazards

67. The geography, tectonic regime and topography of the Kyrgyz Republic make it highly prone to natural hazards such as earthquakes, landslides, floods, windstorms, glacial lake bursts and drought. Due to the mountainous terrain, most of the country is subject to significant landslide hazard. Mudflows and floods occur frequently and cause significant damage. Floods are most often caused by heavy rains, snow and glacier melt, and/or a combination of these factors.

Earthquakes

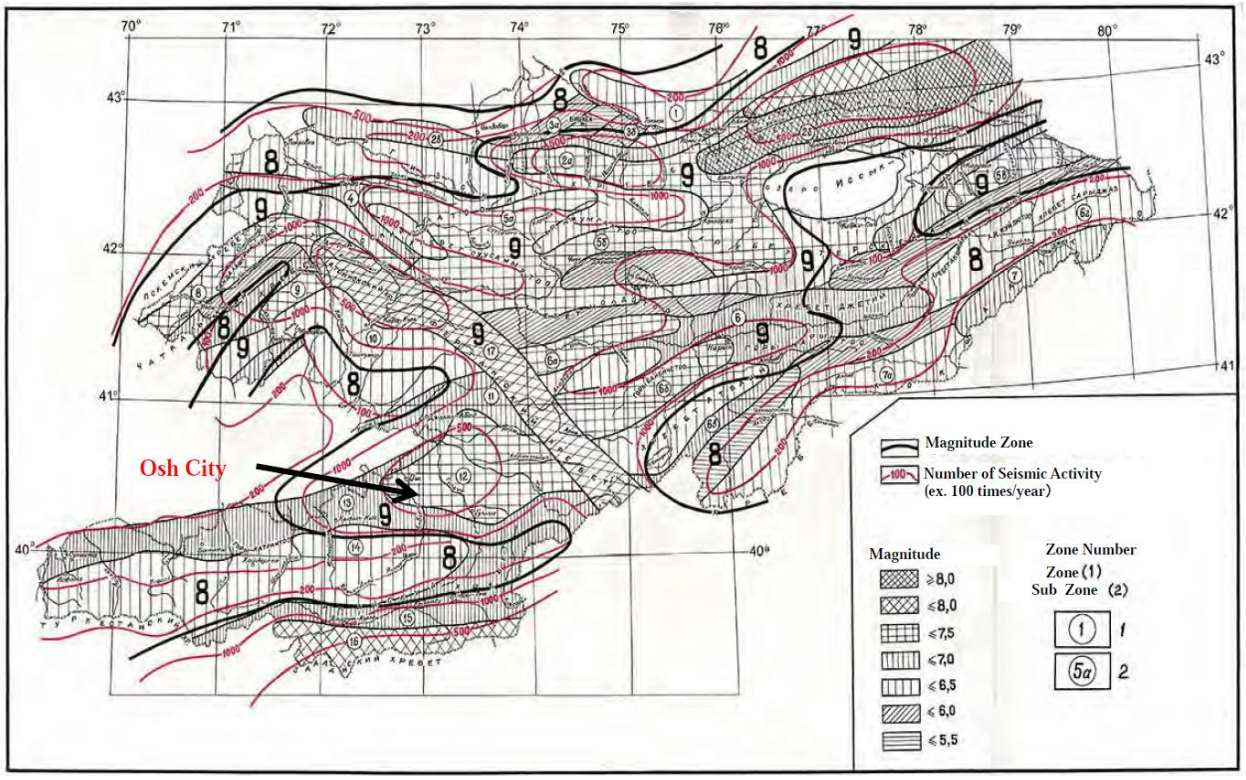
68. Central Asia is one of the areas of the world most prone to earthquake hazards. Within the last century, most of the capitals of the region have been seriously damaged at last once. Since the biggest fault in Central Asia, the Talas-Fergana Fault stretches from the east to the north of Osh city, the vicinity of Osh city is prone to seismic disasters.[3] A seismic zoning map of Kyrgyz is shown in Figure 13. This shows that the area of Osh may experience up to 500 seismic activities a year that may have a magnitude of up to 7.5 in the Richter scale.

Landslides

69. The strong relief of the Tien Shan and its high elevation are responsible for particular natural conditions. The mountain regions are marked by a large diversity of climatic conditions, soils, and vegetation, which can induce an increased susceptibility to slope failure and thus, make the access difficult to the higher territories. The strong relief and high tectonic activity of the Tien Shan also contribute to the general instability of the mountains which, combined with climatic changes, atmospheric and anthropogenic influences, can cause the development of dangerous gravitational movements of mountainous slopes: landslides, rockfalls, avalanches and their transient processes.[4]

[3] JICA. (2016). Data collection survey in Osh City road transportation in the Kyrgyz Republic.
[4] Kalmetieva Z.A., et al. (2009). Atlas of Earthquakes in Kyrgyzstan. Bishkek, Central-Asian Institute for Applied Geosciences and United Nations International Strategy for Disaster Reduction Secretariat Office.

70. The most active landslides processes in Kyrgyz Republic are observed in the southern areas. In the Osh Province, this includes the basins of the rivers Jassy, Kara-Kuldja, Tar, Gulcha, Ak-Bura, and Kyrgyz-Ata.



Source: SNiP KR 20-02:2009 (Construction Norms and Regulation)

Figure 13 Seismic zoning map of the Kyrgyz Republic

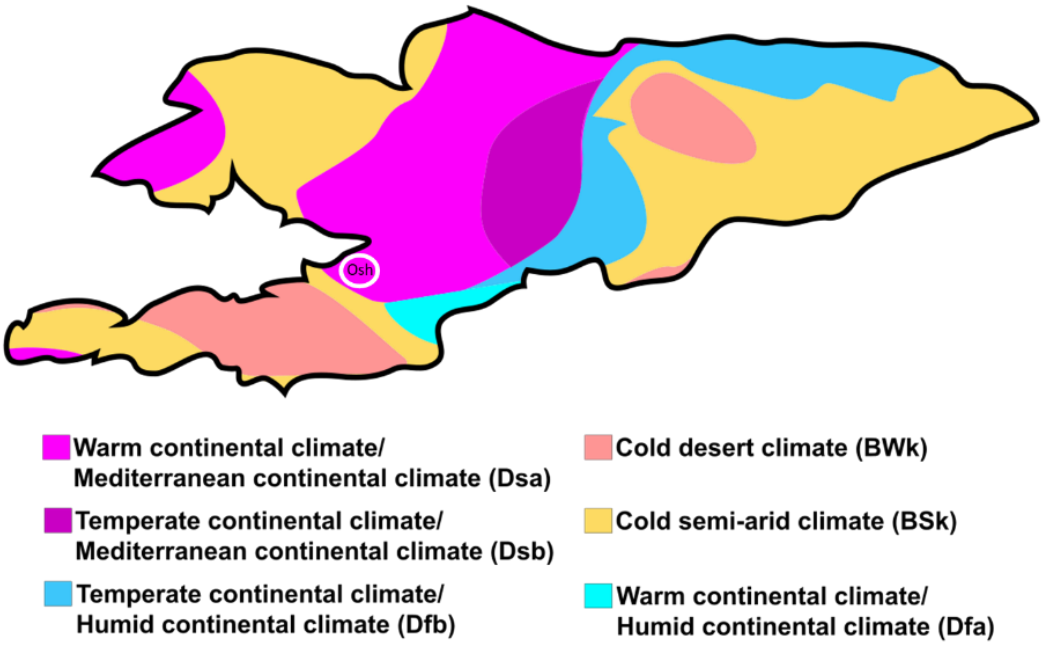
5. Climate and Air Quality

a. Climate

71. The climate of the Kyrgyz Republic is primarily influenced by the mountains, the country's position near the middle of the Eurasian landmass, and the absence of large water bodies enough to influence weather patterns. These factors create a distinctly continental climate that is mainly characterized by cold winters and hot summers, and has significant local variations such as fluctuations in the air temperature, precipitation, hours of sunshine, solar radiance and cloudiness. Frosty weather persists until the end of February and intrusions of cyclones from the south-west during the cold period of the year bring humid, tropical air from the Mediterranean and the Arabian seas, with heavy precipitation in Fergana Valley and on the slopes around it.

72. The climate of Osh belongs to the Hot Summer Continental Climate (Dsa) under the Koppen Climate Classification (Figure 14). Flat valleys and the foothill zone are characterized by hot summers and moderately cool and snowless winters. The highest precipitation levels are in Uzgen district and reach up to 1,000 mm/year. The lowest precipitation levels are in Chon-Alai and Aravan districts (up to 300 mm/year).

73. Table 3 shows general conditions of the climate in Osh City. The mean annual temperature is 12°C and annual precipitation is 378.7mm. The warmest month, on average, is July with an average temperature of 25.1°C The coolest month on average is January, with an average temperature of -3.4°C.



Source: derived from World Koppen Climate Classification, licensed under CC (Ali Zifan).

Figure 14 Koppen climate map of Kyrgyz Republic

Table 3 General climate information (Osh City)

Month	Month												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average temperature (°C)	-3.4	-0.7	6.9	14.6	19.4	23.5	25.1	23.3	18.6	12.1	5.2	-0.6	12
Average precipitation (mm)	34.4	43.2	58.3	50.2	44.8	19.8	10.7	5.8	6.4	35.1	38.5	31.5	378.7
The number of days with precipitation	6.9	7.3	8.5	7.9	8.2	5.7	3.8	2.5	2.5	4.7	5.4	6	69.4
Average humidity (%)	79	76.5	67.8	58.4	52.2	44.6	46.8	51.5	54.5	62.1	70.8	79.6	62
Average wind speed (km/h)	2.9	3.2	5.4	6.5	6.8	6.8	6.1	5.8	4.7	4.3	3.6	2.9	4.9

Source: http://www.weatherbase.com

b. Air Quality

74. Air pollution levels in the Kyrgyz Republic are a serious concern within the urban areas. The primary sources of air pollution in Kyrgyz Republic's major cities are thermal power stations, cement plants, chemical industries, urban transport and mining activities. Small industrial,

municipal and transport enterprises also contribute to routine and sporadic atmospheric emissions.

75. Ambient air quality monitoring in the vicinity of the project area was not conducted as the project is not foreseen to contribute any significant impacts to air quality. Table 4 presents air quality information available for Osh. The table provides the average values based on daily realtime measurements taken in June 2019 for major air pollutants. The air quality index (AQI) is also calculated based on World Health Organisation (WHO) guidelines, as well as international standards developed by the United States Environmental Protection Agency (EPA). AQI for Osh is 42 (average), which is defined as moderately polluted.

Table 4 Ambient air quality conditions in Osh

AQI	$PM_{2.5}$	PM_{10}	O_3	NO_2
	(mg/m^3)			
42	0.021	0.0237	0.043	0.02

Source: https://air.plumelabs.com/air-quality-in-osh-6pnE (average values for the month of June 2019)

6. Water Resources

76. Rivers in Kyrgyz Republic stretch across approximately 150,000 km, made up of more than 40,000 rivers and streams. The main source of water for the rivers of Kyrgyz Republic is melting water from the numerous glaciers and snowfields in the mountains, while rainfall contributes less than one fifth of the water volume. The Naryn River is the longest river in the country. The majority of water in Kyrgyz Republic drains into the basin of the Aral lake. The rivers Amudarya, Syrdarya, Chu and Talas form the major hydrographic systems.

a. Lakes and Rivers in Osh Oblast

77. The Ak-Bura River (Figure 15), which bisects Osh, is part of the Naryn River basin. The Naryn River rises in the Tien Shan mountains and flows west through the Fergana Valley into Uzbekistan, where it merges with the Kara Darya River to form the Syr Darya.

78. The Ak-Bura River starts in the mountains approximately 150 km south of Osh and flows roughly in a northerly direction through Osh and into Uzbekistan and the Naryn River basin. It has a water catchment area of 2,430 km^2 with an average altitude of 3,030 masl. The Papanskoye Reservoir, constructed in 1981, is approximately 20 km upstream of Osh City center.

79. The Ak-Bura is fed by upper mountains precipitation including snow and glacial runoff. According to over 40 years of data collected from the Tuleken Village Hydrological Station, the average annual flow was 21.6 m^3/s. Lowest flows occur in February (7.3 m^3/s), and highest flows occur in July (50.2 m^3/s). The highest recorded flood discharge was 170 m^3/s.

80. In the upper reaches of the Ak-Bura River there are young unconsolidated Neogene-Paleogene sediments, erosion of which results in high turbidity which averages 200 mg/l. This leads to abundant mudslides and floods, which makes the water even more turbid. The problem is further exacerbated during high rainfall events, leading to turbidity levels of up to 19,000 mg/l (2012).

81. The nearest point of Ak-bura River, albeit a narrow portion of the river, to the project site is approximately 300m away.

Figure 15 Ak-bura River upstream of the project site

b. Irrigation canals

82. There are eight main canals forming part of the Ak-bura river basin. These are Aravan, Akbura Canal (AAC), Kairma, Yujny, Joipas, Uvam, Ykkalik, Right Bank Canal (PMK) and Muan. Irrigated agriculture is the main water user in the river basin. Uvam is approximately 40 m away from the project site, right across the perimeter of Ozgur WTP.

Figure 16 Uvam irrigation canal near the project site

B. Ecological Resources

83. The environment of Kyrgyz Republic is characterized by high species diversity primarily due to the high mountain ranges of the Tien Shan and Pamir-Alai, and the accumulation of water from the upper strata of the atmosphere. The Tien Shan and Pamir-Alai ranges act as a bridge connecting fauna and flora of the Himalayas and Hindu Kush across Pamir with biota of Siberia, and across Dzungar Ala-Tau and Altay with biota of Mongolia. These two factors result in an extreme and unique combination of different flora and fauna elements and underpin the significance of the biodiversity of Kyrgyz Republic. The country exhibits a rich diversity of natural resources – species, ecosystems, and landforms.

84. Occupying only 0.13 percent of the world's terrestrial area the Kyrgyz Republic has over two percent of world's flora species and three percent of world's fauna species and is one of the world's 200 regions of high environmental priority[5]. The number of species per area unit is the highest in the Central Asia.

1. Flora

85. The world largest walnuts and fruit forests are located in the Kyrgyz Republic covering 70,000 hectares. They represent a unique natural formation and primarily grow in Ferghana and Chatkal ranges at the elevation of 1,000-2,200 masl.

86. Vegetation in Kyrgyz Republic is typically zoned by altitude. In the north, at altitudes up to 1,500 masl there is wormwood-ephemeral-halophytic semi-desert vegetation. Higher at the slopes of the foothills and low mountains up to 2,000 m, there are fescue-feather grass steppes with piliferous couch grass westward and bulbous barley and saryndyz to the east. At 3,000 masl there are juniper forests and woodlands in combination with fescue-feather grass and meadow steppes are located. Above 3,000 masl subalpine and meadow steppe begin interspersed with rocks. In the east, where there is more rainfall, fescue-feather grass steppes are followed by alpine meadows. Above there is the forest zone, where there are walnut-fruit (mainly on the slopes of the Fergana ridge), maple, juniper and fir forests. At an altitude of 3,000 m, subalpine meadow and meadow steppe, dominated by the rocky ridges and rocky slopes appear.

87. In the south, where the region of Osh is located, in the lower parts (up to 3000 m), there are subalpine and alpine meadows, prairies, grasslands and alpine desert steppes. The list of endangered species of flora present in the southern part of Kyrgyz is provided in Table 5.

Table 5 List of endangered species of flora present in Southern Kyrgyz

Species name	Common name
Eremurus zenaidae	Zenaida's Tulip
Delphinium knorringianum	Knorring's Larkspur
Colutea brachyptera	Short-winged Bladder-senna
Kosopoljanskia hebecarpa	Wolly-fruited Kosopoljanskia
Dorema microcarpum	Microcarpous Dorema

Source: UNDP-UNEP (2012) and https://www.wildlife.kg/

[5] UNDP-UNEP Poverty and Environment Initiative in the Kyrgyz Republic. (2012). The National report on the State of the Environment of the Kyrgyz Republic. Bishkek.

88. The ecological conditions in the immediate vicinity of the project area is mostly represented by anthropogenic landscapes, settlements and some agricultural fields. There are no specially protected natural areas in the immediate vicinity of the project area. The nearest protected area would be the Akbuurin Wildlife Refuge, which is more than three kilometers away from the project site.

2. Fauna

89. According to official data, there are more than 500 species of vertebrates (including 83 mammals, 368 reptiles and 75 fishes), 2,000 species of fungi and over 3,000 insect species. Losses of habitat (deforestation), competition with livestock, hunting and poaching has caused the number of species to shrink.

90. The fauna of Osh Oblast is diverse, mostly found within the walnut-fruit forests, there are foxes, wolves, badgers, weasels, brown bear, wild boar, roe deer, and porcupine; and in the high mountains there are mountain goats and snow leopards. The list of threatened species found within the region are provided in Table 6 and Table 7.

Table 6 IUCN Red List of Threatened Species*

Species name	Common name	IUCN Category	Taxonomic Class
Alsophylax loricatus	Strauch's even-fingered gecko	VU	Reptilia
Aquila heliaca	Eastern imperial eagle	VU	Aves
Aquila nipalensis	Steppe eagle	EN	Aves
Chlamydotis macqueenii	Asian houbara	VU	Aves
Clanga clanga	Greater spotted eagle	VU	Aves
Columba eversmanni	Yellow-eyed pigeon	VU	Aves
Cyprinus carpio		VU	Actinopterygii
Falco cherrug	Saker falcon	EN	Aves
Haliaeetus leucoryphus	Pallas's fish-eagle	EN	Aves
Luciobarbus brachycephalus		VU	Actinopterygii
Neophron percnopterus	Egyptian vulture	EN	Aves
Oxyura leucocephala	White-headed duck	EN	Aves
Panthera uncia	Snow leopard	VU	Mammalia
Phrynocephalus saidalievi		VU	Reptilia
Streptopelia turtur	European turtle-dove	VU	Aves
Vanellus gregarius	Sociable lapwing	CR	Aves
Vormela peregusna	Marbled polecat	VU	Mammalia

*Species potentially found within 50km from the project site
Source: BirdLife International, UNEP-WCMC and IUCN 2018

Table 7 Red Book of Kyrgyz Republic list of endangered species of fauna present in Southern Kyrgyz

Species name	Common name
Prionus tschitscherini	Tschitscherin’s Root Borer
Kirgisobia bohnei	Kirghizobia Longicorn Beetle
Agrionemys horsfieldi	Steppe, or Afghan, Tortoise
Varanus griseus	Desert monitor
Pseudopus apodus	Zheltopusik (armour glass-lizard)
Spalerosphis diadema	Diadem, or Clifford’s rat snake
Gypaetus barbatus	Lammergeier

Species name	Common name
Neophron percnopterus	Egyptian vulture
Gyps himalayensis	Himalayan Griffon
Gyps fulvus	Eurasian Griffon
Aegypius monachus	Cinereous vulture
Bubo bubo	Eurasian eagle-owl
Rhinolophus (R.) bocharicus	Bokhara horseshoe bat
Phinolophus hipposideros	Lesser horseshoe bat
Barbastella leucomelas	Asian barbastelle (Asiatic wide-eared bat)
Tadarida teniotis	European free-tailed bat
Martes foina	Beech marten
Lynx lynx	Eurasian Lynx
Uncia uncia	Snow Leopard
Ovis ammon	Argali
Hystrix indica	Indian Crested Porcupine

Source: UNDP-UNEP (2012) and https://www.wildlife.kg/

91. As the vicinity of the project area is disturbed by urban and agricultural development, the probability that a habitat of endangered or extinct species may occur here is unlikely.

3. Protected Areas and Special Areas for Protection of Biodiversity

92. In order to maintain natural biodiversity, Kyrgyz Republic has established a network of protected areas. In accordance with the classification adopted by the International Union for Conservation of Nature (IUCN), the protected areas of the republic belong to the following four categories:

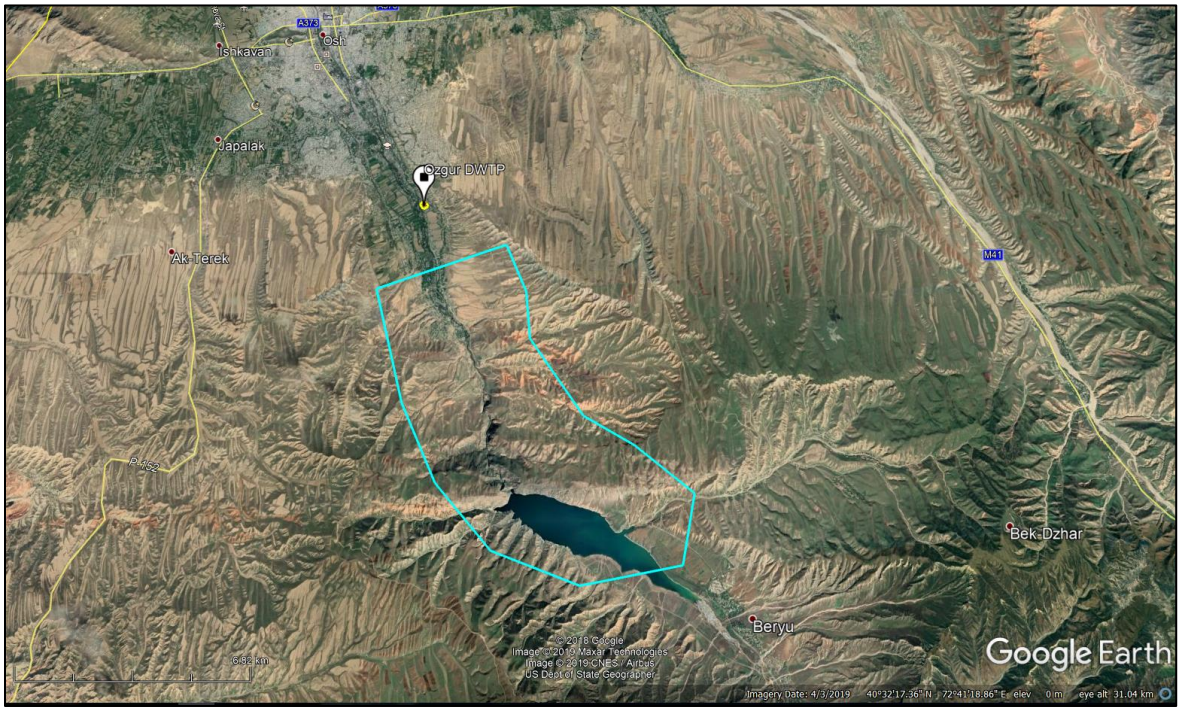
- Category I Reserves where any economic or other activity which violates the development of natural systems are prohibited
- Category II National Parks with different range of protection from reserve to recreation
- Category III Natural monuments or geological reserves
- Category IV Reserves that are created for the protection of the individual components of natural systems, and are further subdivided into four categories, namely: forest, botanical, hunting and complex.

93. Figure 17 shows the distribution of specially protected areas in the Kyrgyz Republic. The system of Specially Protected Nature Areas (SPNA) consists of 89 PAs covering an estimated 7.6 percent of the country, all of which are under the direct or indirect responsibility of the State Agency for Environment Protection and Forestry; 11 state nature reserves and 12 state nature parks are under the management of SAEPF.

94. In Osh Oblast, there is one State Reserve (Zapovedniks), namely Kulun-Ata, and there are two National Natural Parks, Kara-Shoro and Kyrgyz-Ata. The nearest specially protected area to the project site is the Akbuurin Wildlife Refuge, which is a 100 km^2 nationally designated special protected area (IUCN Management Category IV). It was established in 1975 with a purpose of conserving breeding areas of pheasant, see-see partridge, and chukar. Akbuurin is located approximately more than three kilometers away from the project site (Figure 18). The boundaries of Akbuurin shown in the map is based on the World Database on Protected Areas (WDPA), hence, actual boundaries based on national legislation may differ.

The State of the Environment in Central Asia: Illustrations of Selected Environmental Themes and Indicators

Figure 17 Kyrgyz Republic National Protected Area System as of 2015



Data source: World Database on Protected Areas (WDPA)

Figure 18 Location of Akbuurin Wildlife Refuge

C. Social, Cultural, and Economic Resources

1. Population

95. Over the past ten years (2009-2019), the Kyrgyz national population increased from 5.36 million to 6.39 million, with an average growth rate of approximately 1.8 percent (Table 8). Meanwhile, the populations of Osh Oblast and Osh City have increased to an average of 2.2 percent in the same period. The change in population is influenced by natural population growth, which is formed under the influence of changes in fertility and mortality rates, as well as the level of population migration. As the migration balance is still characterized by an excess of the number of emigrants over immigrants, population growth is achieved only through natural growth.

96. As of 2018, age group population is distributed to below working age (33.88%), of working age (58.58%), and above working age (7.55%), with people of working age dominating majority of the population (Table 9).

97. As a result of emigration, as well as differences in the level of natural reproduction, there have been changes in the national composition of the population. Thus, proportion of Kyrgyz, Uzbeks and other nationalities increased, and proportion of Russians, Ukrainians, Belarusians, Jews, Germans and others decreased. But despite the high emigration in the 1990s and early 2000s, representatives of all nationalities historically living in the country are preserved. In total, more than 100 nationalities live in the country, the most numerous of them (as of the end of 2018) are Kyrgyz (73.3% of the total population), Uzbeks (14.7%), and Russians (5.6%) (Table 10).

Table 8 Population in Kyrgyz Republic

Population (in thousands)	2012	2013	2014	2015	2016	2017	2018	2019
Kyrgyz Republic	**5,551.9**	**5,663.1**	**5,776.6**	**5,895.1**	**6,019.5**	**6,140.2**	**6,256.7**	**6,389.5**
Osh oblast	1,147.7	1,173.2	1,199.9	1,228.4	1,259.7	1287.5	1,314.1	1341.9
Osh city	255.8	260.4	265.2	270.3	270.3	281.9	288.8	299.5

Source: National Statistical Committee of the Kyrgyz Republic (2019)

Table 9 Population by age group

Population group	Population as of 2018
Below working age	2,119,502
Of working age	3,665,077
Above working age	472,151

Source: National Statistical Committee of the Kyrgyz Republic (2019)

Table 10 Population by ethnic group

Ethnic group	2018	2018
Total	6,256,730	**100**
Kyrgyz	4,587,430	73.3
Uzbek	918,262	14.7
Russians	356,637	5.6
Dungan	69,093	1.1
Uighurs	57,002	0.9
Tajiks	54,976	0.9

Ethnic group	2018	2018
Turks	43,411	0.7
Kazakhs	35,541	0.6
Tatars	27,200	0.5
Azerbaijanis	20,406	0.4
Koreans	17,074	0.3
Ukrainians	11,252	0.2
Germans	8,269	0.1
Turkmen	2,139	0.0
Chechens	1,690	0.0
Byelorussian	851	0.0
Armenians	797	0.0
Georgians	570	0.0
Jews	455	0.0
Moldovians	374	0.0
Lithuanians	144	0.0
Estonians	98	0.0
Letts	75	0.0
Other ethnic groups	45,220	0.7

Source: National Statistical Committee of the Kyrgyz Republic (2019)

98. Osh city covers 182.5 square kilometres and like the capital city Bishkek, is administered separately and not part of any region, although it is the seat of Osh Region. The total population including suburb areas subordinated to city administration is 299,500. The city is the second largest in terms of population scale, officially called "The southern capital". The city is divided into 11 administrative regions called as territorial councils. Aside from the city territory, 11 suburban villages are administered by the city: Almalyk, Arek, Gulbaar-Toloykon, Japalak, Kengesh, Kerme-Too, Orke, Pyatiletka, Teeke and parts of Ozgor and Tölöykön.

2. Social infrastructure

99. The Kyrgyz Republic ranks 120th of 188 countries in the 2016 Human Development Index (UNDP); in 2014, it was classified by the World Bank as a lower-middle-income country. Chronic poverty and related food insecurity and malnutrition, climatic and environmental risks, gender inequalities, disparities in regional economic development and reliance on remittances are major challenges in the country.

100. The key social and economic indicators of Kyrgyz Republic is shown in Table 11. Gross domestic product (GDP), calculated by the production method, according to preliminary estimates, in 2018 amounted to 557.1 billion KGS, which has increased by 4.8 percent compared to GDP in 2017. However, as in other former Soviet countries, the literacy rate remains high at >99% among people aged 15 and above (2009).

101. The share of the tertiary sector (it mainly consists of trade, transportation & communication and public administration) 46.8 percent in 2018. The share of the secondary sector (it mainly consists of manufacturing and etc.) is the second highest share at 27.4 percent, and the primary sector (it mainly consists of agriculture and etc.) shows a share of 11.7 percent.

Table 11 Kyrgyz Republic key social and economic indicators

		2016	2017	2018
1	Resident population (million people)	6.14	6.25	6.38
2	Natural population growth (thousand people)	124.6	120.4	138.1
3	Total GDP (billion som)	476.3	530.5	557.1
4	% in GDP:			
5	Agriculture	12.8	12.5	11.7
6	Industry and construction	26.6	27.3	27.4
7	Services	47.5	47.1	46.8
8	GDP per capita (thousand som)	81.8	89.3	91.8
9	GDP in % to a previous year	102.1	102.6	101.4

Source: National Statistical Committee of the Kyrgyz Republic (2019)

102. The poverty level in 2017 in the whole country, calculated by consumer spending, was 25.6 percent, an increase of 0.2 percentage points compared to the previous year. In the city of Osh, poverty level is higher, estimated at 33.5 percent in 2017, an increase of 26.5 percentage points compared to the previous year. Approximately 1.6 million people in the country lived below the poverty line in 2017, 72 percent of which were residents of rural settlements.

3. Agriculture and Industry

103. Agriculture is the main sector of employment in the Kyrgyz Republic, and accounts for around one quarter of the GDP. As for January 1, 2018, more than 429,000 economic entities operating in agriculture sector, forestry and fishing have been registered in the Kyrgyz Republic. Among them, about 323 thousand, or 75.4 percent of the total number of such entities accounted for farms, 105 thousand subjects, or 24.6 percent - for individual entrepreneurs engaged in agricultural production. The volume of gross output of agriculture, forestry and fisheries sector, in 2017, for the Republic as a whole, amounted to 208,530 million KGS.

104. Osh is a known major industrial center during the Soviet period, hosting cotton and silk plants, clothing and footwear factories, and food processing, engineering, and metalworking enterprises. Manufacturing, electric-power, fuel, construction materials, food processing, and flour, cereal and feed mill industries remain important. Textile and tailoring industries are the most significant light industries, and Osh has a leading role in the production of cotton cloth in the country.

4. Health and Sanitation

105. Health care for the population of Kyrgyz Republic is provided by a combination of interregional, regional, district, and other medical centers. The health care resources in the country is provided in Table 12.

106. In terms of sanitation, approximately 91 percent of the population have access to safe sources of drinking water and only 31 percent have sustainable access to sewerage. In general, sewage systems in the country were constructed between 1960s to 1990s and most are past its intended lifespan. More than half of small towns and oblast centers do not have centralized sewerage and wastewater treatment plants. In the city of Osh, 95.7 percent have access to safe sources of drinking water and only 25.4 have sustainable access to sewerage.

Table 12 Health care resources

Health care resources	Count (2018)
Number of doctors (total thousand people) per 10,000 population	14.1 22
Number of nursing staff (total thousand people) per 10,000 population	35.6 57
Number of hospital institutions, units	187
Number of hospital beds (total thousand people) per 10,000 population	26.6 42
Number of institutions, providing primary medical (sanitarian) assistance	146
Number of primary health worker (doctor's assistants) and obstetrical centers, units	1,045
Number of beds for pregnant and lying-in women	2.7
Number of beds for sick children, thousand	5

Source: National Statistical Committee of the Kyrgyz Republic (2019)

Table 13 Access to water and sewerage

	Percentage (2017)
Population with access to safe sources of drinking water	
Kyrgyz Republic	91.1
Osh City	95.7
Population with sustainable access to sewerage	
Kyrgyz Republic	31.3
Osh City	25.4

Source: National Statistical Committee of the Kyrgyz Republic (2019)

5. Infrastructure and Transportation

107. The geographical location of the Kyrgyz Republic in Central Asia provides favorable conditions to develop the country's existing transport networks as transit corridors. The road network in the country comprises 34,000 km roads of which 18,000 km are commonly used motorable roads. In terms of the highway network, arterial highways are of special importance for the national economy. One of the most strategically important arterial roads is the Bishkek-Osh highway with a length of about 678 km. It connects the North and South of the country and supports common economic and political activities.

108. The Kyrgyz Republic has an extensive network of electricity transmission lines with a length of 6,600 km and 190 substations. The National transmission company "JSC National Electric Grid of Kyrgyzstan" provides electric supply generated by the internal hydropower generating plants. The company also imports and exports electricity through various cross-border transmission lines to the neighboring countries of Kazakhstan, Uzbekistan and Tajikistan.

109. The Osh Airport, one of two international airports in the country, is located in the northern part of the city. It is 840 masl and has a runway of 2,600 m. From this airport flights to the CIS and other countries are operated. Rail transport is represented by branch lines of the Uzbek railways in the cities of Osh and Kara-Suu. These are important for transporting trucks cargo to and from the region.

6. Physical and Cultural Resources

110. There are no historically or culturally significant sites identified within the vicinity of the project site. The nearest cultural heritage site is Sulaiman-Too, a sacred mountain which was once a major place of Muslim and pre-Muslim pilgrimage, located more than eight kilometers away from the project site. Sulaiman – Too, located on the west of the urban area in Osh city, is one of the world heritage sites in the country. Among the comparatively plain urban area, the steep rocky mountain is naturally a symbolic landmark. Sulaiman-Too Mountain dominates the surrounding landscape of the Fergana Valley and forms the backdrop to the city of Osh. In medieval times, Osh was one of the largest cities of the fertile Fergana valley at the crossroads of important routes on the Central Asian Silk Roads system, and Sulaiman-Too was considered an important place of pilgrimage for travelers.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

111. Based on legislation, project description and secondary information, environmental impacts and suitable mitigation measures have been identified and prepared. As the project will be built within an existing plant and since there are no protected areas located within the project's vicinity, the environmental impacts are deemed site-specific, and related to the human environment associated with noise levels, pollutant emissions, and health and safety of workers. A detailed description of the impacts is provided in the following sections. The impacts were divided into the following types: impacts arising during the design phase, impacts arising during the construction phase, and impacts arising during the operation phase.

B. Methodology

112. An environmental impact is any change in physical, biological, and socioeconomic conditions, and physical cultural resources resulting from project activities. The methodology for identifying potential impacts and associated mitigation measures consists of the following steps:

- collection of project information and screening of preconstruction, construction and operational stage activities to identify those with the highest potential for environmental impacts;
- characterization of potential environmental impacts based on information on the proposed project and on available environmental data, and site visits; and
- identification of appropriate mitigation measures.

113. The impact assessment process was based on the overall project context, which is defined by the specific activities and project components established in each of the phases of the Project, namely the pre-construction, construction, and operation phases. An understanding of the existing baseline environmental conditions also played an important role in the impact assessment

114. **Impact identification.** The impact identification exercise was done to identify potential sources of risks, areas of impacts, events and their likely causes and potential consequences. The technical design, the project's potential incidents that may occur in each work areas were the basis of the identification of impacts.

115. **Impact analysis.** Once potential impacts were identified, these were assessed as to the potential severity of loss (consequence) and to the probability of occurrence (likelihood). These quantities can be either simple to measure, in the case of the value of an accident as a result of interaction with a known hazard, or impossible to know for sure in the case of the probability of an unlikely event occurring (emergency). Therefore, in the assessment process it is critical to make the best educated guesses possible in order to properly prioritise the implementation of design controls and for future reference in the management process.

- Likelihood (probability)

116. Likelihood is a way of expressing knowledge or belief that an event or incident will occur or has occurred. Table 14 presents the categories used to estimate the frequency of occurrence of potential impacts.

Table 14 Likelihood descriptors

Level	Descriptor	Description	Frequency	Probability
5	Almost certain	The event is expected to occur in most circumstances	Once per week	>90%
4	Likely	The event would occur on recurrent intervals	Once per month	51-90%
3	Occasional	The event occurs on an irregular basis	Once per year	21-50%
2	Unlikely	The event would be an uncommon occurrence and would occur in remote circumstances	Once per 5-10 years	10-20%
1	Rare	The event may occur only in exceptional circumstances. The event is not likely to occur in this location	Once within 10 years	<10%

- Consequence

117. Consequence is something that logically or naturally follows from an action or condition. Hence, it is the relationship of a result to its cause or a logical conclusion or inference. In the assessment, the consequence of each identified impact was aligned with the Likelihood and assessed using a matrix.

118. To determine the critical impacts, the maximum reasonable or foreseeable consequence of the impact occurring (not the worst case) was used to determine the required controls. Table 15 shows the various categories used to determine the consequence of potential impacts.

Table 15 Consequence descriptors

Descriptor	Description
A – Insignificant	No lasting effect. Low-level impacts on biological, physical, or social environment. Limited damage to minimal area of low significance.
B – Minor	Minor effects on biological, physical, or social environment. Minor short-medium term damage to small area of limited significance.
C – Moderate	Moderate effects on biological, physical, or social environment but not affecting ecosystem function. Moderate short-medium term widespread impacts (e.g. significant land disturbance).
D – Major	Serious environmental or social effects with some impairment of ecosystem function and may result to fatality and/or severe/irreversible disability to one or more person. Relatively widespread medium-long term impacts to the community.
E – Catastrophic	Very serious environmental or social effects with impairment of ecosystem function and short/long term health effects that may lead to multiple fatalities or significant irreversible human health effects. Long term, widespread effects on significant environment (e.g. unique habitat, river systems and community land).

119. **Impact evaluation.** A five-level qualitative description of the likelihood and consequences for each impact was used to provide a semi-quantitative method showing the interaction of consequence and likelihood as a final evaluation or rating for each identified impact. Table 16 presents the impact assessment matrix.

120. In general, the impacts are assessed on a scale of A to E, where A and E represent the minimum and maximum possible impact of an occurrence of a risk. The likelihood or probability of occurrence is likewise assessed on a scale from 1 to 5, where 1 represents a low probability of the risk event actually occurring while 5 represents a 100 percent probability of occurrence. The overall risk assessment is then Low, Medium, High and Critical/Extreme.

Table 16 Impact assessment matrix

Impact assessment matrix			Consequence				
			Insignificant	Minor	Moderate	Major	Catastrophic
			A	B	C	D	E
Likelihood	Almost Certain	5	High	High	Extreme	Extreme	Extreme
	Likely	4	Moderate	High	High	Extreme	Extreme
	Occasional	3	Low	Moderate	High	Extreme	Extreme
	Unlikely	2	Low	Low	Moderate	High	Extreme
	Rare	1	Low	Low	Moderate	High	High

C. Identification of impacts and corresponding mitigation measures

1. Pre-construction Phase

121. Pre-construction phase impacts are related to the project siting and the associated land acquisition and preparation activities. In the case of this project, the proposed location is within the existing Ozgor WTP and the physical works will be minimal and within the existing facilities of the plant. Hence, there are no anticipated impacts at this stage.

2. Construction Phase

122. During construction, activities will involve (i) minor physical works within the existing chlorination facility in Ozgor WTP and (ii) installation of the chlorine neutralization unit. As the project activities will not involve any major earthworks, there are no anticipated impacts on topography and geology. Potential construction phase impacts are mainly focused on the control of atmospheric emissions and noise levels through monitoring, good housekeeping practices and proper management of wastes, and occupation health and safety practices for the contractor's workforce.

a. Impacts on physical resources

(i) Air quality and noise levels

123. Air quality impacts during construction will be minimal and will originate from construction machinery exhausts and from dust generated from construction works. Air pollution may affect the population near the project site, but this will be localized and temporary.

124. The following mitigation measures will be implemented by the contractor to reduce emission levels of construction equipment: (i) maintenance of construction equipment to maintain its good condition and to avoid, as far as possible, engine idling; (ii) prohibition of the use of machinery or equipment that is a source of excessive pollution (for example, visible exhaust

gases); and iii) vehicles at the construction site, if any, should be shut down if it is not in use or remains unattended for more than 3 minutes.

125. Noise level is also anticipated to be minimal and will temporarily occur due to construction works and from operating construction equipment. Noise generating activities may include the use of jackhammers, cement cutters, electric saws, and welding machines, as well as noise generated from hand tools such as sledgehammers and drills. The noise generated from these activities may exceed the IFC WB limit of 70 dBA or OSHA limit of 90 dBA, and require the use of hearing protection devices (HPDs). The noises may be continuous or may be impulse noise where the noise created is of high intensity, but for a very short duration.

126. Propagation of sound may be affected by various factors such a distance from source, wind direction, ground effects, barriers, reflection, and temperature. In the case of this project, the noise-generating activities is anticipated to be limited only to minor construction works (i.e. the use of power tools), which without any mitigation is not expected to exceed 115 dBA[6]. As the nearest settlement is approximately 80 m and considering that the doubling of distance from the noise source results to a reduction of approximately 6 dB, construction works for the project is anticipated to cause minimal disturbance to the nearest settlements. Moreover, the private land plots have fences made of concrete or similar materials thus playing the role of noise attenuators.

127. Given the low level of impact anticipated during project construction and due to time constraints, baseline noise measurements were not taken. However, noise impact monitoring prior and during construction will be carried out in accordance with the provisions of the EMP.

128. The potential negative effects of noise will also be further reduced by limiting construction work to daytime hours (i.e. from 08:00am to 19:00PM), as well as by limiting the transportation of construction materials through the settlements. Nearby community will be informed regarding schedule and duration of construction works.

(ii) Soil and land resources

129. Wastes such as construction and domestic debris will be generated during the construction activities and can cause soil contamination and may serve as disease vectors. The contractor will therefore need to practice good worksite and construction camp management. With the scope of physical works, the establishment of accommodation camps is not anticipated. However, should there be a need for one, the contractor will be required to extend good housekeeping and proper waste management in accommodation camps.

130. The Contractor will be required to prepare and implement a Waste Management Plan to be approved by the DDWSSD. It will include, but will not be limited to the following:

- Appropriate temporary waste storage containers will be provided at construction sites and worker camps, if any.
- All wastes will be reused or recycled to the maximum extent possible. Wastes will be regularly sorted into what can be reused or recycled. Waste which cannot be reused or recycled will be transported on a regular basis to approved landfill sites.

[6] University of Washington. (2004). Construction Industry Noise Exposures. Retrieved from http://depts.washington.edu/occnoise/content/carpentersIDweb.pdf.

- Fuels, oils and hazardous materials will be stored in a secure bunded area with impermeable floor and weatherproof roof, and good management practices will be adopted to prevent spills of fuels, oils and hazardous materials. Hazardous wastes will be collected and treated by an accredited third-party organization.
- There should be no final waste disposal on site.
- Waste incineration at or near the site is strictly prohibited.

131. The Contractor will be held responsible for proper removal and disposal of any significant residual materials, wastes, and contaminated soils that remain on the site after construction.

(iii) Surface water resources

132. The project site is surrounded by the Ak-Bura River, approximately 300m away and Uvam irrigation canal, approximately 40m away. Despite the proximity to these surface water resources, construction works will be limited within the existing plant, which is separated by a concrete fence and a road, and with an existing drainage system. Hence, potential impact on surface waters during construction is unlikely. Nevertheless, the contractor is required to implement a Waste Management Plan to avoid any land and water contamination.

b. Impacts on ecological resources

133. Given that the project location is within the existing Ozgor WTP and with no presence of ecological receptors as it is located within an urban area (i.e. heavily modified environment), no significant ecological environmental impact is foreseen.

c. Impacts on social, cultural, and economic resources

(i) Community health and safety

134. Some adverse impacts on the population in the project area are expected during the construction phase (in some cases, these impacts have been previously described):

- Dust will be generated from construction works and by vehicles, reducing air quality. Vehicles and other machinery will also release exhaust gases.
- Noise will be generated from the movement of vehicles, physical works, and the transportation of construction materials, albeit minimal.
- Disturbance to traffic during delivery of construction materials and/or equipment

135. The anticipated impacts are temporary and very localized. Mitigation measures for dust and noise have been discussed in previous sections. For potential disturbance to traffic, prior to commencing operations, the contractor will inform local authorities about the scope and schedule of construction activities (i.e. delivery of equipment and materials) and expected disruptions. As far as practical, movements of vehicles will be limited within peak hours of traffic, and traffic control staff and/or diversion signaling will be provided as required.

(ii) Occupational health and safety

136. Use of heavy construction machinery, tools, and materials may cause physical hazards to workers, which could be caused by noise and vibration, dust, handling heavy materials and

equipment, falling objects, work on slippery surfaces, fire hazards, chemical hazards such as toxic fumes and vapors, and others.

137. The Contractor will prepare an environment, health and safety (EHS) plan for the construction works on the basis of the EMP and in compliance with relevant national laws and regulations. The EHS Plan will be submitted to the Engineer for approval.

138. The EHS plan will include the following: (i) Adequate health care facilities (including first aid facilities) within construction sites; (ii) Training of all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work; (iii) Provision of personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection in accordance with country legislation; (iv) Potable drinking water to all workers; (v) Sanitary latrines and garbage bins in construction site, which will be cleared when reaching capacity. The contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual workplace.

(iii) Physical cultural resource

139. There are no known physical cultural resources in the project area, hence, no impacts to physical cultural resources is anticipated;

3. Operation Phase

140. During operation phase, the chlorine neutralization unit will be basically on standby and will only fully operate in case of emergencies (i.e. chlorine leakage). The anticipated impacts will mainly be related to the storage of sodium hydroxide (NaOH) or caustic soda, which is the mixture used to neutralize chlorine.

a. Impacts on physical resources

(i) Air quality and noise level

141. During operation phase, the proposed project will result in safer operation of the Ozgor WTP. The chlorine neutralization unit will only function when a leak is detected in the chlorination facility and will thus, ensure cleaner air emissions. Minimal noise may be generated from the neutralization tower. However, considering that it will only fully operate during emergency cases and that it will be located inside the building, the impact is negligible. No additional mitigation measure is required.

(ii) Land and water resources

142. During operation, a mixture of sodium hydroxide (NaOH) or caustic soda will be stored in the chlorine neutralization unit's storage tank. Caustic soda is a highly corrosive substance used as a neutralizing agent. Failure to follow the safety instructions provided by the manufacturer may endanger not only persons, but also the environment and the actual facility.

143. The hazard of caustic soda in the environment is caused by the hydroxide ion (pH effect). A high concentration in water will result in toxic effects to aquatic organisms. However, a low

concentration in water will not result in any significant effects because caustic soda will be neutralized by other substances present in water (i.e. dissolved carbon dioxide and organic acids) and thus, pH will not increase.

144. The primary concern in storage and handling of caustic soda is health and safety. Mitigation measures to prevent leakage from the storage tank and to ensure safe operations of the project is discussed in 3.c.i. (occupational health and safety).

b. Impacts on ecological resources

145. Given that the project location is within the existing Ozgor WTP and with no presence of ecological receptors as it is located within an urban area (i.e. heavily modified environment), no significant ecological environmental impact is foreseen.

c. Impacts on social, cultural, and economic resources

(i) Community health and safety

146. The project is foreseen to benefit the community by ensuring its health and safety by providing an added layer of security in case of large-scale chlorine leakage in the Ozgor WTP.

(ii) Occupational health and safety

147. The most significant potential impact of the project during operation is on health and safety due to accidental spill or leakage of the caustic soda/NaOH (used as neutralizing agent). Caustic soda is the most typical of the strong alkalis and is highly corrosive. Although there is no danger of it exploding or igniting, it reacts with various acids, such as hydrochloric acid, and is neutralized and generates considerable exothermic heat of neutralization. It corrodes metals, such as aluminum, tin, and zinc. During this process, it generates hydrogen, which has the potential to behave as an explosive gas. It is highly hygroscopic, and absorbs the moisture, carbon dioxide, or sulfur dioxide in the air.

148. Alkalis have a decomposing effect on proteins, which may gradually penetrate the deep tissues unless the adhered alkali is completely removed. In particular, if the eyes are exposed to an alkali, since eye tissue is rapidly affected causing a lowering or loss of vision, great care should be taken. Even a dilute solution can affect the tissue of the skin if it repeatedly comes into contact with the skin, which may cause dermatitis or chronic eczema. If the concentration of the solution is high, the affected tissue rapidly decomposes.

149. To mitigate potential impacts on health and safety, the design of the chlorine neutralization unit will be in line with international best practice: i.e. storage and handling of corrosive substances. All engineering controls will be in place during operations, operators/workers will be trained accordingly, and protective equipment requirements and personal hygiene measures will be strictly enforced for workers, i.e. wearing protective goggles and rubber clothing as required. The caustic soda storage tank should have a bunding (i.e. concrete or pit-like structure) surrounding the structure to contain any leakages and prevent it from causing harm. A hazardous material management protocol and an emergency response plan will be in place to provide guidance to workers in storage and handling, as well as in cases of emergencies.

150. To prevent any leakages, maintenance of the chlorine neutralization unit will be done in accordance with the manufacturer's requirements. Typically, this will require replacement of NaOH solution and cleaning of the storage tank after every alarm operation of the neutralization tower with chlorine release and/or after one year at the latest. No solution will be permitted to enter domestic drain system untreated. The NaOH solution will be disposed of as an industrial/hazardous waste, and its collection, transfer, and disposal will be entrusted to licensed industrial waste disposal services.

D. Impact assessment matrix

The summary of the identified impacts and corresponding mitigation measures is provided in Table 17. With the mitigation measures in place, all of the impacts would have low residual risks. Out of all the potential impacts, the health and safety risk during operation phase has the highest rating in terms of consequence (without mitigation) primarily because of the inherent risk to workers' safety in handling hazardous materials.

Table 17 Impact assessment matrix

IDENTIFIED RISK EVENT			BASE RISK LEVELS				RESIDUAL RISK LEVELS			
			Impact				Residual Impact			
	Aspect	Potential Impact	Likelihood	Consequence	Risk	Proposed Mitigation Measures	Likelihood	Consequence	Risk	
I. Construction Phase										
1	Air quality	Air pollution due to construction machinery exhausts and dust generated from construction works	**3**	**B**	**Moderate**	(i) Maintenance of construction equipment to maintain its good condition and to avoid, as far as possible, engine idling; (ii) prohibition of the use of machinery or equipment that is a source of excessive pollution (for example, visible exhaust gases); and iii) vehicles at the construction site, if any, should be shut down if it is not in use or remains unattended for more than 3 minutes.	**3**	**A**	**Low**	
2	Noise levels	Increased noise levels due to construction works and operation of construction equipment	**3**	**B**	**Moderate**	Limit construction work to daytime hours (i.e. from 08:00am to 19:00AM), limit the transportation of construction materials through the settlements. Nearby community will be informed regarding schedule and duration of construction works. Noise impact monitoring during construction is carried out in accordance with the provisions of the EMP.	**3**	**A**	**Low**	

IDENTIFIED RISK EVENT			BASE RISK LEVELS				RESIDUAL RISK LEVELS			
			Impact				Residual Impact			
	Aspect	Potential Impact	Likelihood	Consequence	Risk	Proposed Mitigation Measures	Likelihood	Consequence	Risk	
3	Soil and land resources	Contamination due to improper waste disposal (i.e. construction and domestic wastes)	4	B	High	The Contractor will be required to prepare and implement a Waste Management Plan to be approved by the DDWSSD. It will include, but will not be limited to the following: (i) appropriate temporary waste storage containers will be provided at construction sites and worker camps, if any; (ii) All wastes will be reused or recycled to the maximum extent possible. Wastes will be regularly sorted into what can be reused or recycled. Waste which cannot be reused or recycled will be transported on a regular basis to approved landfill sites; (iii) Fuels, oils and hazardous materials will be stored in a secure bunded area with impermeable floor and weatherproof roof, and good management practices will be adopted to prevent spills of fuels, oils and hazardous materials; (iii) hazardous wastes will be collected and treated by an accredited third-party organization; (iv) there should be no final waste disposal on site; (v) waste incineration at or near the site is strictly prohibited. The Contractor will be held responsible for proper removal and disposal of any significant residual materials, wastes, and contaminated soils that remain on the site after construction.	3	A	Low
4	Community health and safety	Disturbance to traffic during delivery of construction materials and/or equipment	3	A	Low	Prior to commencing operations, the contractor will inform local authorities about the scope and schedule of construction activities (i.e. delivery of equipment and materials) and expected disruptions. As far as practical, movements of vehicles will be limited within peak hours of traffic, and traffic control staff and/or diversion signaling will be provided as required.	3	A	Low

IDENTIFIED RISK EVENT			BASE RISK LEVELS				RESIDUAL RISK LEVELS		
			Impact				Residual Impact		
	Aspect	Potential Impact	Likelihood	Consequence	Risk	Proposed Mitigation Measures	Likelihood	Consequence	Risk
5	Occupational health and safety	Physical hazards to workers, which could be caused by noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, chemical hazards, and others.	4	B	High	The Contractor will prepare an environment, health and safety (EHS) plan for the construction works on the basis of the EMP and in compliance with relevant national laws and regulations. The EHS Plan will be submitted to the Engineer for approval.	3	A	Low
II. Operations Phase									
6	Land and water resources	Contamination due to accidental spill or leakage from caustic soda storage tank, and improper waste disposal	3	B	Moderate	The design of the chlorine neutralization unit will be in line with international best practice. All engineering controls will be in place during operations, operators/workers will be trained accordingly. A hazardous material management protocol and an emergency response plan will be in place to provide guidance to workers in storage and handling, as well as in cases of emergencies. To prevent any leakages, maintenance of the chlorine neutralization unit will be done in accordance with the manufacturer's requirements. Typically, this will require replacement of NaOH solution and cleaning of the storage tank after every alarm operation of the neutralization tower with chlorine release and/or after one year at the latest. No solution will be permitted to enter domestic drain system untreated. The NaOH solution will be disposed of as an industrial/hazardous waste, and its collection, transfer, and disposal will be entrusted to licensed industrial waste disposal services.	2	B	Low

IDENTIFIED RISK EVENT			BASE RISK LEVELS				RESIDUAL RISK LEVELS		
			Impact				Residual Impact		
	Aspect	Potential Impact	Likelihood	Consequence	Risk	Proposed Mitigation Measures	Likelihood	Consequence	Risk
7	Occupational health and safety	Adverse health effects due to accidental spill or leakage of caustic soda (NaOH)	3	C	High	The design of the chlorine neutralization unit will be in line with international best practice. All engineering controls will be in place during operations, operators/workers will be trained accordingly, and protective equipment requirements and personal hygiene measures will be strictly enforced for workers, i.e. wearing protective goggles and rubber clothing as required. A hazardous material management protocol and an emergency response plan will be in place to provide guidance to workers in storage and handling, as well as in cases of emergencies. To prevent any leakages, maintenance of the chlorine neutralization unit will be done in accordance with the manufacturer's requirements. Typically, this will require replacement of NaOH solution and cleaning of the storage tank after every alarm operation of the neutralization tower with chlorine release and/or after one year at the latest.	2	B	Low

VII. ENVIRONMENTAL MANAGEMENT PLAN

151. The objectives of the EMP are to ensure (i) implementation of identified mitigation and management measures for anticipated adverse environment impacts; (ii) implementation of monitoring and reporting; and (iii) project compliance with the Kyrgyz Republic's relevant environmental laws, standards and regulations and ADB's SPS. This section also details the roles and responsibilities of the personnel who will be involved in the implementation of the EMP.

A. Implementation arrangements

152. The Ministry of Finance (MoF) is the project's executing agency (EA). The Department of Drinking Water Supply and Sewerage Development (DDWSSD) under the State Agency for Architecture, Construction, Housing and Public Utilities (SAACHPU) is the project's implementing agency (IA) under the overall guidance of its Director.

153. The responsibilities for environmental management and monitoring are as follows:

- DDWSSD through its Project Management Office (PMO) has overall responsibility to ensure that Government and ADB environment-related safeguard policies are adopted. DDWSSD is also responsible for coordinating and supervising the compliance monitoring presented in the EMoP. The DDWSSD also prepares quarterly environmental monitoring reports for submission to ADB.

- ThePMO is responsible to ensure that the implementation of supervision, monitoring and reporting is undertaken according to the project guidelines and manuals and in compliance with the Financing Agreement and the EMoP.

- The Design and Supervision Consultant (DSC) is responsible for incorporation of mitigation measures into engineering design and technical specification, and into relevant clauses in the contract documentation.

- The DSC National Environmental Specialist (NES), in conjunction with the DDWSSD, is responsible for mitigation compliance monitoring presented in the EMoP and for preparing monthly environmental progress reports submitted to the DDWSSD.

- The Regional State Environment Protection Department is responsible for general environment monitoring activities during operation.

- The Contractor is responsible for:
  - Construction phase mitigation implementation; air and noise monitoring; and reporting, as outlined in the EMP and contract specifications.
  - All mitigation measures will be incorporated in the Technical Specifications of the Works Contract and should be implemented by the Contractor. The costs to implement the measures excluding the ambient monitoring of noise is to be included in the rates of the relevant items in the Bill of Quantities (BOQ). Ambient monitoring is included as a provisional sum in the BOQ to ensure that the monitoring will be implemented as required.

- The Contractor will recruit a health, and safety environmental (HSE) Officer, who will be responsible for implementing the Contractors' environmental responsibilities and liaise with the Client, the PMO, DSC and district administration. The HSE Officer will also be responsible for health and safety aspects of work sites.
- The Contractor will submit bi-weekly environmental progress reports to the DSC NES, the DSC will validate reports then submit to DDWSSD.

- After the project completion, Oshgorvodokanal (OVK) will be responsible for operation and maintenance of the project.

154. Implementation responsibilities by construction phase are summarized in Table 18.

Table 18 Environmental Management Responsibilities

Project phase	Responsible organization	Responsibilities
Pre-construction phase / Detailed Design	DSC	Incorporation of mitigation and monitoring measures into engineering design and technical specification. Translation of mitigation and monitoring measures into clauses in contract documentation.
	DDWSSD and SAEPF	Review and approval of environmental mitigation, monitoring and management measures
Construction	Contractors	Implementation of required environmental mitigation measures. Preparation of Site-Specific Environmental Management Plans (SEMP) Recruitment of qualified consultants or agencies to undertake noise monitoring as presented in the EMoP. Submission of bi-weekly environmental management reports to the DSC NES.
	DSC's supervision engineers assisted by DSC NES	Supervise implementation of the environmental mitigation measures, which are carried by the Contractors, through environmental inspections as presented in the EMoP, carried out in conjunction with DDWSSD, and through review of monitoring data provided by the Contactor. Provision of awareness/training to employees and technology transfer to Contractors.
	DDWSSD	In conjunction with DSC NES, verify Contractor compliance with EMP the through environmental compliance inspections as presented in the EMoP. Approval authority for the Contractor's SEMP. Preparation of quarterly environmental progress reports to ADB. Verify compliance with Government legal environmental requirements.
Operation	SAEPF	Ensure compliance with Government legal environmental requirements.
	OVK in cooperation with district/regional administrations	Undertake routine and random monitoring.

B. Environmental Management Plan

155. The EMP covers the proposed project and describes the various measures designed to avoid, mitigate, and compensate the adverse environmental impacts on all physical, ecological, and human resources within the project's corridor of impact.

156. To ensure that the proposed mitigation measures will be carried out by the contractors during the construction period, the design consultant will clearly set out in the bidding documents and contract documents, the contractor's obligation to undertake the respective environmental mitigation measures.

157. The EMP consists of two tables. Table 19 provides information on the required measures to reduce environmental impacts and defines the responsible parties for the implementation of these mitigation measures. Table 20 sets out the general information about environmental monitoring. To ensure that mitigation actions are implemented in accordance with the requirements of the EMP, monitoring shall be undertaken through instrumental or observational monitoring.

158. Results of the project's environmental performance, consisting of the EMP implementation and results of the monitoring activity, have to be properly documented and reported.

Table 19 Environmental Management Plan

Activity	Potential impacts	Mitigation measures	Responsibility	Budget source
Construction phase				
Various construction works and installation of equipment	Air pollution due to fugitive dust and exhaust emissions from construction equipment operation	The contractor will (i) maintain construction equipment to good standard and avoid, as much as possible, idling of engines; and (ii) ban the use of machinery or equipment that cause excessive pollution (e.g., visible smoke).	Contractor	Contractor's budget
	Disturbance of adjacent settlements due to elevated noise and vibration levels	Limit work from 08.00 am to 19.00 PM. In addition, a limit of 70 dBA is established and strictly observed near the construction site. Limit the transportation of construction materials through the settlements. Nearby community will be informed regarding schedule and duration of construction works.	Contractor	Contractor's budget
	Land and water contamination due to improper waste disposal	The Contractor will be required to prepare and implement a Waste Management Plan to be approved by the DDWSSD. It will include but will not be limited to the following: (i) appropriate temporary waste storage containers will be provided at construction sites and worker camps, if any; (ii) All wastes will be reused or recycled to the maximum extent possible. Wastes will be regularly sorted into what can be reused or recycled. Waste which cannot be reused or recycled will be transported on a regular basis to approved landfill sites; (iii) Fuels, oils and hazardous materials will be stored in a secure bunded area with impermeable floor and weatherproof roof, and good management practices will be adopted to prevent spills of fuels, oils and hazardous materials; (iii) hazardous wastes will be collected and treated by an accredited third-party organization; (iv) there should be no final waste disposal on site; (v) waste incineration at or near the site is strictly prohibited. The Contractor will be held responsible for proper removal and disposal of any significant residual materials, wastes, and contaminated soils that remain on the site after construction	Contractor	Contractor's budget

Activity	Potential impacts	Mitigation measures	Responsibility	Budget source
	Physical hazards to workers, which could be caused by noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, chemical hazards, and others.	The contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual work place. Prior to the commencement of works, the work site personnel shall be instructed about safety rules for their respective works. The Contractor will prepare an environment, health and safety (EHS) plan for the construction works on the basis of the EMP and in compliance with relevant national laws and regulations. The EHS Plan will be submitted to the Engineer for approval.	Contractor	Contractor's budget
	Disturbance to traffic during delivery of construction materials and/or equipment	Prior to commencing operations, the contractor will inform local authorities about the scope and schedule of construction activities (i.e. delivery of equipment and materials) and expected disruptions. As far as practical, movements of vehicles will be limited within peak hours of traffic, and traffic control staff and/or diversion signaling will be provided as required.	Contractor	Contractor's budget
Operation phase				
Storage of caustic soda and maintenance of the neutralization tower	Land and water contamination due to accidental spill or leakage from caustic soda storage tank, and improper waste disposal	The design of the chlorine neutralization unit will be in line with international best practice. All engineering controls will be in place during operations, operators/workers will be trained accordingly. A hazardous material management protocol and an emergency response plan will be in place to provide guidance to workers in storage and handling, as well as in cases of emergencies. To prevent any leakages, maintenance of the chlorine neutralization unit will be done in accordance with the manufacturer's requirements. Typically, this will require replacement of NaOH solution and cleaning of the storage tank after every alarm operation of the neutralization tower with chlorine release and/or after one year at the latest. No solution will be permitted to enter domestic drain system untreated. The NaOH solution will be disposed of as an industrial/hazardous waste, and its collection, transfer,	DSC Vodokanal (OVK)	Operating budget

Activity	Potential impacts	Mitigation measures	Responsibility	Budget source
		and disposal will be entrusted to licensed industrial waste disposal services.		
	Adverse health effects to workers due to accidental spill or leakage of caustic soda (NaOH)	The design of the chlorine neutralization unit will be in line with international best practice i.e. install facilities for the safe storage of caustic soda or facilities for recovering it and preventing it from causing harm such as concrete bunding or pit-like structures. All engineering controls will be in place during operations, operators/workers will be trained accordingly, and protective equipment requirements and personal hygiene measures will be strictly enforced for workers, i.e. wearing protective goggles and rubber clothing as required. A hazardous material management protocol and an emergency response plan will be in place to provide guidance to workers in storage and handling, as well as in cases of emergencies. To prevent any leakages, maintenance of the chlorine neutralization unit will be done in accordance with the manufacturer's requirements. Typically, this will require replacement of NaOH solution and cleaning of the storage tank after every alarm operation of the neutralization tower with chlorine release and/or after one year at the latest	DSC Vodokanal (OVK)	Operating budget

Table 20 Environment Monitoring Plan

Key environmental aspects per project phase	Inspection/ parameters to be monitored	Sampling and measurement plan			Institutional responsibility
		Methodology	Frequency	Location	
Construction phase					
Air quality Air pollution due to fugitive dust and exhaust emissions from construction equipment operation	Dust	Visual observation	Daily	Construction site and inhabited areas	Contractor
		Suitable instrumental monitoring device	Once a month	Construction site and inhabited areas	Qualified Consultant or Agency recruited by Contractor
Noise Disturbance to adjacent settlements due to elevated noise and vibration levels	Ambient noise monitoring: Monitoring with noise meters to ensure construction noise is less than 65 dB in the daytime for inhabited areas	Noise meter (Type I noise meter)	Once before the start of works and then once a month during construction phase	At sensitive receptors (i.e.residential areas) adjacent to construction site	Qualified Consultant or Agency recruited by Contractor
Wastes Proper waste disposal	Waste generation volume by type of waste and proof of disposal	Visual inspection, recording	Weekly during construction activities.	Project area, construction camps if any	DSC/ DDWSSD
Occupational health and safety Physical hazards to workers	Safety incidents and near misses	Inspections, observations, recording	Continuous	Project area	DSC/ DDWSSD
Operation phase					
Occupational health and safety	Safety incidents and near misses	Inspections, observations, recording	Continuous	Project area	OVK
	Inspection to check for leaks or any potential causes of leaks. Ensure that equipment is maintained or serviced in accordance with the manufacturer's recommendation.	Visual inspection, recording	Periodically, as suggested by manufacturer	Chlorine neutralization unit location	OVK

C. Environmental Reporting

159. Environmental reporting will be undertaken as follows:

- The Contractor will submit monthly progress reports on mitigation implementation and the results of any monitoring undertaken in that period to the DSC, with a copy also sent to the DDWSSD.
- The DSC NES will submit monthly environmental progress reports to the DDWSSD based on environmental monitoring undertaken in that period and the Contactors' biweekly progress reports.
- The DDWSSD will submit bi-annual environmental progress reports to the ADB, documenting the environmental management measures and monitoring results. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has already been addressed, the report should explain the manner by which the issue was resolved. If the monitoring has identified a weakness or deficiency in the implementation of the EMP that has not yet been addressed, a corrective action plan (CAP) should be developed. The CAP should describe actions necessary to address each area of concern; prioritize these actions; identify responsibilities for implementation of each corrective action; identify a timeline for their implementation; and, present a schedule for communicating the results of plan implementation to affected communities.

160. Prior to construction works, the Contractor shall provide a comprehensive SEMP covering the aspects described in the EMP. The SEMP should be submitted to the DSC for endorsement and DDWSSD for approval. No physical or construction works can commence without prior approval of DSC and DDWSSD. The SEMP should cover the following aspects:

- Method statement or plan for the execution of construction and installation works
- Dust and noise management
- Layout and details of work camp, if any, and the proposed measures to address adverse environmental impacts resulting from the establishment of the work camp
- Waste management plan covering the provision of waste bins, regular collection, and appropriate disposal for various types of wastes (i.e. domestic, construction, hazardous) consistent with appropriate regulations
- Emergency response plan in case of spills, accidents, fires, and the like.
- General health, and safety, and environment (HSE) plan

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

161. ADB's SPS has specific requirements for information disclosure and public consultation. Information disclosure involves delivering information about a proposed project to the general public and to affected communities and other stakeholders, beginning early in the project cycle and continuing throughout the life of the project. Information disclosure is intended to facilitate constructive engagement with affected communities and stakeholders over the life of the project.

162. In addition, the Kyrgyz Republic is a member of the United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) that also has provisions to ensure that project objectives and environmental considerations are made public.

163. In this regard, a public consultation meeting was carried out in accordance with ADB's Public Communications Policy (2011) and SPS (2009), and as well as Kyrgyz Republic's Law on Environmental Expertise (1999). The public consultation meeting was held on 9 July 2019 in Osh City to capture the stakeholders' opinions about the project, and agree on the project activities. It was organized by the Department of Drinking Water Supply and Sewerage, Osh City Administration and Osh Vodokanal by inviting key project stakeholders in the city. Details of the consultation, including all supporting information, is presented in Appendix 1 of this IEE.

164. During the public consultations, a power point presentation was presented, which outlined the technical features of the planned project and explained the potential environmental impacts, together with associated mitigation measures. The presentation was delivered in Russian, with explanations in Kyrgyz as necessary, followed by an open forum where stakeholders were able to raise their questions and concerns. The representatives of the Osh Vodokanal answered technical questions and clarified issues that were raised. Printed hand-outs of the presentations were prepared and distributed to the participants for their information, and as a way of disseminating information concerning environmental concerns of the project to the neighboring community.

165. The open forum provided a venue for an interactive discussion, with questions focusing on construction of chlorine neutralization unit, costs related to this project, and project benefits to the public. The summary of issues raised by the stakeholders during public consultation is presented in Table 21.

166. During the public consultation the GRM was also discussed. Stakeholders were informed that the GRM established for the Ozgor WTP will be a continuous process that envisages a collaboration between the Implementation Agency and the community during the entire project cycle.

167. The stakeholders were also informed that the IEE incorporates comments and suggestions from all concerned stakeholders. The final IEE report will be made available on local language on the DDWSSD official website and in English on ADB's website.

168. Without exception, participants were supportive of the proposed activity, which will enhance safety operation of the chlorination plant for the benefit of the neighboring community and they expect that the project works will start in due time.

Table 21 Summary of issues raised during public consultation

#	Issues raised	Response	Addressed in IEE
1.	Project costs and implementation period	The activity cost is estimated at $0.625 million, consisting of $0.5 grant from ADB and $0.125 share of the government of Kyrgyz Republic. Expected duration of the project is 12 months, starting date – beginning of Q1 2020	Information is presented in Section II.D. of this report.
2.	Scope of the project activities to be implemented with the proposed chlorine neutralization facility.	More detailed information on chlorine neutralization facility based on the project description was provided.	Details provided in Section II.D. of this report.
3.	The benefits to the public from the proposed project activity.	The proposed neutralization facility will aid in absorbing and neutralizing leaked chlorine gas prior to emission, thereby ensuring safe operations of the chlorination facility of Ozgor WTP, including mitigation of adverse impact to the surrounding WTP neighborhood.	Details provided in Section II and VI of this report.
4.	Noise impact from the construction works to the neighborhood located close to Ozgur WTP	Certain noise impact mitigation measures will be implemented: (i) setting and observing a noise limit of 70 dBA and (ii) establishing works schedule form 08:00AM to 19:00PM	Information is presented in section VI of this report.
5.	Important issue of water quality (turbidity) in the drinking water supply system, when it is raining.	Osh Vodokanal responded to this particular question, since it was out of the scope of the proposed project activity.	N/A

IX. GRIEVANCE REDRESS MECHANISM

A. Grievance Redress Function and Process

169. A grievance redress mechanism (GRM) responsive to ADB Safeguard requirements was established for the previous EARR project. The same procedure will be adapted for this project.

170. The GRM provides a basis for receiving, managing, reviewing, and facilitating the resolution of issues, concerns, complaints, or grievances raised by affected people (APs) regarding the project's performance. Based on this mechanism, aggrieved APs may access the GRM through local points of contact (LPC) and will be assisted by the DDWSSD and the GRG tasked with all activities needed to discuss a grievance, validate and assess the scope of impacts, decide on redress actions needed, and instruct and facilitate the functioning of the GRM. The GRG is composed of a core group and an independent observer (Oblast Ombudsman) to make informed and balanced decisions on complaints lodged.

171. Citizen complaint and grievance redress procedures have been developed in compliance with the Law of the Kyrgyz Republic "On procedure of processing complaints of citizens" as well as ADB Safeguard Policy. The grievance redress process involves the following steps:

- Complaints/appeals received from APs are registered by DDWSSD Correspondence Department. After review by the Deputy Chief Architect (DCA) of Osh City (responsible for technical project implementation matters), complaints are passed to the appropriate department for review. Received complaints are divided into complains/appeals related to the project and those not related to the project.
- Complaints/appeals related to the project are received and registered by the DDWSSD and acknowledged by letter signed by the DCA to the complainant within 7 days of registration.
- Complaints/appeals related to the project which can be resolved under authority of the DCA will be studied and decided. DDWSSD provides internal review of the grievance, determines eligibility, and advises the DCA accordingly. A response letter will be prepared by the DDWSSD signed by the DCA and sent to the complainant within 14 days of complaint registration.
- In the event an eligible complaint cannot be resolved within DDWSSD immediate authority, the GRG is triggered. The CDA will convene the Grievance Redress Group (GRG) which will consider the balance between the complainant and the public interest. Members of GRG will review the complaint and meet with the complainant. If necessary, they may consult with legal expertise and/or request for additional information from the complainant, local authorities (LAs), or governmental agencies.
- After the GRG completes its investigation, a letter will be prepared by the DDWSSD signed by the DCA, and sent to the complainant advising of GRG decision and associated action within 21 days after registration.
- If the complainant does not agree with the decision, he/she will have five days to request the reconsideration of his/her complaint. If reconsideration (appeal) is not requested, the case will be closed. This will be clearly stated in the response letter.
- Complaints found ineligible or disputed decisions may also be taken by complainants to the courts.

- If the AP is not satisfied with the Court judgment, there may be an opportunity for appealing to a higher level of court. The AP may also choose to approach ADB under the Accountability Mechanism.

172. For managing the project complaint handling system, DDWSSD will furnish the GRM with necessary staff and facilities and will provide administrative and financial support as required. Although the GRM provides an integrated complaints handling system, separate data bases will be maintained containing information about complaints related to the ADB Safeguard Policies. All grievance-related documentation will be kept until the project is formally closed. DDWSSD will include a summary data on complaint processing and results in progress reports submitted to ADB.

173. DDWSSD, with assistance from local leaders, and community representatives, will inform the presence of the GRM to the public and project area communities through dissemination of project information through local media, and in consultations with affected persons and the public.

B. Local Point of Contact

174. Affected people may lodge complaints for registration through a personal visit, call or letter to designated local points of contact (LPC) established at the local government level in the project area. LPCs nominated by LAs have been presented by DDWSSD and trained on environmental issues to monitor implementation, respond to AP queries, and receive AP complaints. Upon receiving complaints, the LPC will promptly forward them to DDWSSD, activating the GRM process described above.

C. Grievance Redress Group

175. The GRG for the project includes the following:

1. DCA of Osh City (chairperson);
2. Representative(s) from involved subproject area local governments: Osh City Mayor's Office;
3. DDWSSD Safeguard Specialist; (member);
4. Representative of the Ombudsman of Osh City/Oblast (independent observer)
5. Technical specialist(s) from the relevant organizations as required by the nature of the complaint filed. The technical expertise to objectively review and resolve the case may be solicited from the following state and non-state organizations:
   - PMO/DSC
   - State Registration Services (Gosregister)
   - Ministry of Agriculture
   - State Agency for Environment and Forestry
   - Ministry of Justice
   - Other agencies

X. CONCLUSION AND RECOMMENDATION

176. The proposed project will ensure the safe and sustainable operation of the existing Ozgor Water Treatment Plant.

177. During construction, the likely impacts are minimal dust and noise during construction and installation of equipment and potential contamination of land and water due to improper waste disposal. During operation, the likely impacts are associated with health and safety risks, and potential contamination due to improper storage and handling of substances used to neutralize chlorine gas.

178. During the preconstruction period, the key task to be implemented by SAACHPU and DSC is the inclusion of the EMP mitigation and monitoring measures into the bidding contract specifications. During construction period, the contractors will need to (i) undertake air quality and noise sampling, (ii) prepare and implement the required management plans (i.e. site-specific environmental management plan, waste management plan),and (iii) enforce occupational health and safety requirements as prescribed by law. During the operation period, OVK will need to prepare and implement a hazardous materials management procedure and an emergency response plan to ensure the safe operation of the chlorine neutralization unit.

179. Based on the analysis undertaken in this report, it is concluded that:

(i) The proposed project will have limited and site-specific environmental impacts. Overall, the project will have significant positive socioeconomic and environmental benefits that will ensure sustainable operations of the Ozgor WTP. Any minimal adverse environmental impacts associated with the project can be addressed through the application of appropriate mitigation measures;

(ii) The project's categorization as ADB Category B for environment is confirmed; and

(iii) This IEE is considered sufficient to meet ADB's environmental safeguard requirements for the project, and no additional studies are required.

Appendix 1

List of participants and photos from the Public Consultation

Date: 9, July 2019
Venue: Osh City Hall

List of Participants of Public consultation on Environmental Impact Assessment of the proposed chlorine neutralization facility

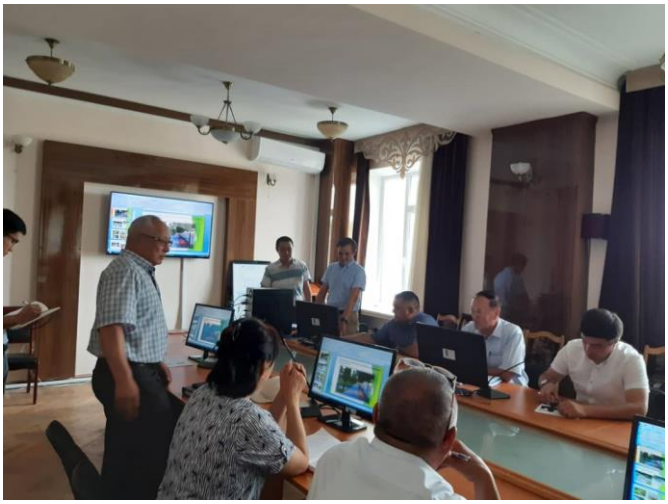
Table 1 – Public Consultations participation summary

Meeting #	Location	Date/ Approx. Time	Language	Participant Nos.
1	Osh (City Hall)	09/07/19 14:00 - 15:00	Ru/ Kyr	19
			Total	19

Table 2 – List of participants

No	Name	Position
1.	Ismailov Kh. Kh.	Head, Amir-Temir Municipal Territorial Administration #5
2.	Ularov K.	Acting Head, Ozgur-Zhapalak Municipal Territorial Administration
3.	Topchubaev T.	Ozgur-Zhapalak Municipal Territorial Administration
4.	Kekibaev N.	Turan Municipal Territorial Administration
5.	Attokurov A.	Kerme-Too Municipal Territorial Administration
6.	Mirzabaev R.K.	Turan Municipal Territorial Administration
7.	Abdykadyrov B.A.	Kerme-Too Municipal Territorial Administration
8.	Karimov M.A.	Manas-Ata Municipal Territorial Administration
9.	Tursunova U.Zh.	Amir-Temir Municipal Territorial Administration #5
10.	Osmonova O.S.	Osh Vodokanal
11.	Saybidinov A.	Municipal Territorial Administration #6
12.	Egamberdiev R.	Sulaiman-Too Municipal Territorial Administration #2
13.	Sultanov B.K.	Municipal Territorial Administrations Coordinator at Osh City Mayor's Office
14.	Zheenbekov A.A.	Manas-Ata Municipal Territorial Administration
15.	Akbaraev U.	Osh Vodokanal
16.	Toktakunov S.	Osh City Mayor's Office
17.	Abdikayumova Sh.	Osh Vodokanal
18.	Zheenbaev A.	Osh Vodokanal
19.	Kurbanali kyzy Aigerim	Department of development of drinking water supply and sanitation at Gosstroy o KR

Photos:



Регистрационный лист

Общественные слушания по проекту АБР: «Установки нейтрализации хлора на водоочистной станции «Озгур» Ош Водоканала.

г. Ош, 9 июля 2019г.

№	Full name/ ФИО	Organization/ Место работы	Adress/ Адрес	Signature/ Подпись
1.	Исламов Х.Х	МТУ №5 Амир Темур [illegible]	г. Ош ул. Т. Салиев	
2.	Уларов. К	и.о. [illegible] ТУ	г. Ош. с Кенен	
3.	Токтубаев Т	НО Жапалак +	с Кенен.	
4.	Керимбаев Н	МТУ им. „Турон"	Анар 13	
5.	Атонмуров А	МТУ №3 Керме-Тоо	Ак-Тилек	
6.	Мирзабаев Р.Т.	МТУ №1 Турон	Набережная	
7.	Абдыкадыров Б.А.	МТУ №3 „Керме-Тоо"	Т. Кулатов 27/24	
8.	Каримов М.А	МТУ №4 "Манас-Ата"	ул. Солиева 27	
9.	Турсунова У.Ж.	МТУ№5 Амир-Темур	г. Ош ул. С. Айни 1а	
10.	Осмонов Ж	„Ошгорводоканал"	г. Ош микр. Ак-Тилек	
11.	Сейдазимов А.	"№6 МТУ зам нач.	г. Ош.	
12.	Эгамбердиев Р.	N2 МТУ Сулайман-Тоо Зам.н	г. Ош	
13.	Сыдыков Б.К.	[illegible] МТУ	[illegible] г. Ош	
14.	Трейнбаев Н.А.	МТУ-4 Манас-Ата	г. Ош ул. Разанова	
15.	Абдрабаев А.	ИП „Ошгорводоканал"	ул. [illegible]	
16.	Тезекбаев А.	„Ошгорводоканал"	ул. Привокзальная"	
17.	Адылканова Ш.	М.П. „Ошгорводоканал"	ул. Привокзальная"	
18.	[illegible] С.	[illegible] г. Ош [illegible]	ул. Ленина	
19.	Курбанали к. Айгерим	DРПВ Госстрой КР	г. Ош	
20.				
21.				
22.				
23.				
24.				