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Republic of Tajikistan

Ministry of Finance

Project Implementation Unit for Access to Green and Rural Development Finance

Strengthening Critical Infrastructure against Natural Hazards Project

Environmental Management Framework

Dushanbe 2017

List of abbreviations

IEE	Initial Environmental Examination
CEP	Committee for Environmental Protection
GBAO	Gorno-Badakhshan Autonomous Region
GoT	Government of Tajikistan
EA	Executive Agency
EIA	Environmental Impact Assessment
IEA	Initial Environmental Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
BP	Bank Procedure
FS	Feasibility Study
OP	Operation Policy
m	meter(s)
MAC	Maximal Allowed Concentrations
msl	Mean Sea Level
NGO	Non-Governmental Organization
NMT	Non- Motorized Transport
PSC	Project Supervision Consultant
SSEMP	Site Specific Environmental Management Plan
SEC	Supervision Engineering Company
UN	United Nations
USD	United States Dollars
WB	World Bank

Jamoat- The third level administrative unit in Tajikistan

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Executive summary

This Environment Management Framework (EMF) is a part of the compliance process with the World Bank (WB) policies and Tajikistan's National environmental legislation in relation to "Strengthening Critical Infrastructure against Hazards" Project. The EMF provides a detailed description of the anticipated direct and indirect environmental impacts associated with the proposed Project during key periods of work and a road map to the environmental measures needed to prevent and/or mitigate adverse environmental effects associated with the proposed Project.

Project background, objective and goals:

Tajikistan is prone to many natural hazards due its unique terrain, climate, geological and hydrological features. The country faces avalanches, landslides and rockfalls resulting from significant winter and spring precipitation in addition to mudflows and floods caused by significant snow-melt and intense spring rain. The threat from glacier lake outbursts, i.e. rare but devastating flash floods released when temporary glacial lakes (created by sudden glacial surges in the Pamir Mountains) burst without warning, would, in general, affect all river-side communities along the whole length downstream (and some upstream) of the outburst.

The project objectives are to establish the foundation of the Government of Tajikistan's (GoT) long-term disaster risk management program and increase climate resilience by solving problems associated with rehabilitation of infrastructure affected by the impact of climate change, including mudflows, earthquakes, soil erosion and other natural disasters, which occur in Tajikistan.

The project includes four components:

Project Component 1 aims at strengthening of Tajikistan capacity for Management of Disasters Risk and includes the creation of Crisis Management Centers (CMCs) in Dushanbe and, possibly, in other regions of Tajikistan. The CMCs will be created either in a new building specifically constructed for that purpose, or in an existing building renovated/retrofitted for that purpose.

Component 1 also includes procurement of machinery and equipment for the Ministry of Transport and Agency for Melioration and Irrigation of Tajikistan as well as delivery of trainings for the Committee for Emergency Situation in data collection and improving of natural and manmade disasters risk management.

Project Component 2 aims at making critical infrastructure resilient against natural hazards. This Component will finance preparation of a feasibility study and detailed designs and construction of bridges, dykes and other flood protection Infrastructure. As an initial step the project within subcomponent I will target areas in the GBAO and Khatlon region that were affected by floods and mudflows and finance reconstruction of infrastructure to

reduce disaster risks and avoid potential damages in the long-term taken into account that the area is vulnerable to natural disasters.

Project Component 2, sub-component I includes construction of nine (9) bridges to replace the bridge structures damaged by natural disasters in 2015 in order to improve connection to remote Jamoats of GBAO.

Project Component 2, sub-component I description. The project sub-component has the following structural elements:

1. Construction of a new 33 m bridge over river of Yezgulem near the village of Jamak with 400m of access road
2. Construction of a new 18m bridge over river of Camochdara near the village of Andarvak with 300m of access road
3. Construction of a new 33m bridge over the river of Yezgulem near the village of Vishharv with 300m of access road
4. Construction of a new 24m over the river of Udob near the village of Udob with 160m of bank enforcement and 200m of access road.
5. Construction of a new 12m bridge over the river of Chihoh, near the village of Chihoh with 160m of bank enforcement and 100m of access road.
6. Construction of a new 36m bridge over the river of Vanch near the village of Chihoh with 250m access road
7. Construction of a new 30m bridge over the river of Obi-Sed near the village of Obi-Sed with 100m of flow diverting dams and 250m of access road
8. Construction of a new 18m bridge over the river Ardobak near the village of Ardobak with 100m of bank enforcement and 300m of access road
9. Construction of a new 18m bridge over the river of Barushondara on the road Dushanbe –Chorog with 200m of bank enforcement and 600m of access road.

All dimensions are approximate estimates and will be precisely determined during design phase. The new elements may be added to the Project if necessary.

Location: The Project Component 2 sub-component I will be implemented in three jamoats of Vanch dstirict (Jovidon, Teharv and Yezgulem) and jamoat N. Dodhudoev of Rushan district, in GBAO, Republic of Tajikistan.

Project Component 2, sub-component II will finance design and construction of flood protection including but not limited to reconstruction and/or reinforcement of dams, dykes and river embankments and improving the flow and bed load transport capacities of flow channels primarily for Khatlon sites that were damaged during July 2015.

The project subcomponent has the following structural components:

1. Bank protection structures at the confluence of Ziraki river to Dahana, close to Kulob city and in the closest vicinity of the airport of Kulob, length 3,700m;
2. Bank protection structures on the Yakhsu River near the villages Shobika and Larhobi in Vose district, length 3,500m;
3. Bank protection structures on the Kafirnigan River in Kabadiyan district, length 10,450m;

4. Bank protection structures and irrigation canal reconstruction near the Hoshodi settlement – Shaartuz district, length 400m;
5. Bank protection of the confluence of Kyzylsu and Yakhsu Rivers in Vose district, length 1,000m.

All lengths are estimated based on preliminary assessment of the flood experts and field representatives of ALRI and will be precisely defined during the design phase.

The project sub-component will be implemented in two jamoats of Kulob district (Dahana and Ziraki) and three jamoats of Vose district (Tugarak, Guliston, A. Avazov), in four jamoats of Qabodiyan district (Nosiri Khusrav, U. Nazarov, I. Niyazov, 20-solagii Istiqlol) and in one jamoat of Shaartuz district (T. Sadriddinov) in Khatlon region of the Republic of Tajikistan.

During implementation of both sub-components, the additional sites may be included in the Component should the funds be available.

Project Component 3: Contingent Emergency Response aims to improve Tajikistan's capacity to better respond to disasters. Following an adverse natural or man-made event that causes a major disaster; the Government of Tajikistan may request the Bank to re-allocate project funds to this component to partially cover emergency response and recovery costs. This component could also be used to channel additional funds should they become available as a result of the emergency.

Project Component 4 finances the Project Implementation Unit to ensure proper Management of the Project.

The Executive Agency (EA) for the Project is the Ministry of Finance of the Republic of Tajikistan. The project is implemented through the Project Implementation Unit (PIU) for Access to Green Finance and Financing of Rural Development. The Ministry of Transport and Agency for Melioration and Irrigation will contribute to the Project by providing consultancy for feasibility studies, detailed design and implementing relevant safeguards activities.

Main findings: Based on the existing WB policy the proposed project falls under Category B. The IEE confirmed that there are no significant environmental issues that could not be either prevented or adequately mitigated to levels acceptable to Tajik and International standards. A comprehensive Environmental Management Plan (EMP) has been prepared, with tables listing mitigation measures and monitoring actions to be undertaken during pre-construction, detailed design, construction and operating period of the Project.

Although most of the proposed works are relatively small scale, they could generate some potential minor and/or containable adverse environmental impacts mainly during the construction phase, such as: water and air pollution, loss of trees and bushes, noise, soil erosion, improper dumping of excavated sediments and other materials; possible deterioration of existing infrastructures, occupational hazards, etc.

At the same time, the Project will bring mostly positive environmental and social impacts and in particular improved and more sustainable access to services and as consequences

improvement of well-being with reduction of poverty and health risks. Direct positive impacts will be also generated by increased agricultural production, more employment and increased income, increased climate resiliency and adaptation capacity.

The cumulative impact of the proposed Project will be obviously positive from environmental and social point of view. New bridges will accelerate development of trade, agriculture and traditional arts and most likely will trigger new activities. It will facilitate exploration and recovery of rich mineral resources of the region including precious and semi-precious stones, iron, nickel, etc. Flood protection structures will protect settlements, existing infrastructure (roads, bridges, airport, railways), agricultural land and industrial facilities. The project undoubtedly will make local Infrastructure resilient against natural disasters and climate change.

Long-term indirect adverse impacts of the Project implementation may lead to the increasing pressure on natural resources because of the better access and accelerated economic development. As an example, the remaining forest in the area may suffer from illegal timbering. It is recommended to enforce regulations on the use of natural resources and pollution control and more actively communicate with the local communities during the implementation period.

Overall implementation of the EMP will be the responsibility of the EA. EA contracted International Consulting Company for preparation of the FS and Detailed Design. Afterwards EA will contract a third party to carry out rehabilitation and construction works.

Public Consultation Process: Wide stakeholder consultations were undertaken during the period from November 2016 to January 2017. In the course of the meetings, the Project has been introduced, the IEE process explained and potential impacts discussed as well as recommendations, comments and concerns/complaints have been collected.

The consultations with villagers, local officials and government representatives in target areas (4 Jamoats) identified no adverse environmental impacts, which could not be mitigated by the measures envisaged in the EMP. In addition, consultations with the Environmental Departments at two districts and other authorities did not reveal any specific environmental issues that would result from project works, including potential impacts to protected natural areas.

The communities strongly support the Project activities. They welcomed the project ideas and expressed their hope that it will be implemented in accordance with the requirements of national and international legislation in the social and environmental sphere.

On the basis of the consultations and the site visit of the Project area, it appears that the Project will have no insoluble adverse environmental impacts, but instead more potentially positive social and environmental impacts.

Recommended actions: Special care needs to be taken to prevent grievances, especially during construction. Proper communication and participation before and during the rehabilitation works for the bridges construction and flood protection structures can discover possible problems and thus the EMP and the construction plan will be adjusted accordingly. Complaints and grievances due to planning, construction and operation will be

addressed to the district and community administration levels, but the central government and the EA will also be involved in the problem-solving process if needed.

Implementation of the EMP and the proper mitigation of environmental impacts associated mainly with the construction period of the project is required.

When the detailed designs are completed the impacts and mitigation measures will need to be further reviewed to take account of how the contracts are set up and in light of any correction of the Project proposal, thus the revised and adapted EMP must be an integral part of the construction contracts.

During the preparation for the construction phase, future contractors must be notified and prepared to co-operate with the executing agency, project management, supervising consultants and local population to mitigate the impacts.

To ensure that all of the above mitigation actions are completed according to the requirements of the EMP, the PIU, Supervision Company and Contractor's Environmental Specialists shall monitor the project works. .

I - COMPONENT CREATION OF THE CRISIS MANAGEMENT CENTERS

1 Environmental assessment of the activities under Component 1

Component 1 includes the creation of Crisis Management Centers (CMCs) in Dushanbe and, possibly, in other regions of Tajikistan. The CMCs will be created either in a new building specifically constructed for that purpose, or in an existing building renovated/retrofitted for that purpose.

Associated civil works will likely pose minor environmental and health and safety risks. These risks include dust, noise, vibration, risks related to improper management of construction waste, health and safety risks during construction, and other.

1.1 Generic environmental mitigation measures for construction activities

1.1.1 General requirements

Before starting the CMC activities, it is necessary to inform the local construction and environment inspectorates and local communities about upcoming activities in the media and/or at publicly accessible sites (including the site of the works). Furthermore, it is necessary to have in place all legally required permits for proposed civil works. All construction activities should be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment. Construction workers should be properly dressed, having when necessary respirators and safety glasses, harnesses and safety boots.

1.1.2 Protection of air quality and dust minimization.

During construction, it is necessary to use debris-chutes and to keep demolition debris in controlled area, spraying with water mist to reduce debris dust. It is strictly prohibited to burn construction/waste material at the site. During transportation of any other dusty material to the construction site, watering or covering of the cargo should be implemented. Dust on the rehabilitation site during a dry season of the year can be reduced by watering the ground surface.

1.1.3 Noise reduction.

Before any work commence, it is recommended to inform all potentially affected parties and especially the neighbors either directly or through local billboards or newspapers about the activities. The noise should be limited by using good management practice and limiting works to the day time only. The construction equipment and machinery used should be calibrated according to the Noise Standards.

1.1.4 Construction wastes and spills

A general requirement is that construction waste is sorted and removed in an organized way and disposed on an authorized landfill. All valuable materials (doors, windows, sanitary fixtures, etc) should be also carefully dismantled and transported to the storage area assigned for this purpose. Valuable materials should be reused within the Project or sold back to the suppliers. Waste wherever possible should be minimized, separated and handled accordingly. Separated wastes are more manageable. Non-usable materials should be taken to appropriate place for recycling. For non-recyclable wastes, the wastes will be deposited on city landfill as agreed with a municipality. Open burning and illegal dumping of any waste is strictly prohibited. In addition to solid wastes, some amounts of hazardous wastes will be produced on the site like those the remaining from paint works, enamels, oiled packaging, oils, material contaminated with oil, insulation material, etc. All wastes have to be collected and handed over to the organization authorized to collect and transport hazardous waste.

1.1.5 Asbestos issues

No Asbestos Containing Material (ACM) will be allowed to be used for CMC construction.

1.1.6 Temporary storage of material (including hazardous materials)

Stockpiling of construction material should be avoided if possible. If not, construction material should be stored on the construction site, and protected from weathering. Hazardous materials like paints, oils, enamels and others should be kept on impermeable surface with secondary containment/ and adsorbents like sand or sawdust should be kept for handling small spillage.

1.1.7 Ensuring workers health and safety

The personnel should be at minimum equipped with the personal protective equipment such as rubber gloves, goggles, facemasks with filter, as well as helmets. All equipment should be of decent quality and compatible with EN standards. Before the construction works, all workers have to pass labor safety training course. In addition, it is necessary to carry out the routine inspection of the machinery and equipment for the purpose of the maintenance and observance of the time of repair, training and instruction of the workers engaged in maintenance of the machinery, tools and equipment on safe methods and techniques of work. Special attention should be paid to welding operations. It is prohibited to distribute the faulty or unchecked tools for work as well as to leave off hand the mechanical tools connected to the electrical supply network or compressed air pipelines. It is also prohibited to pull up and bend the cables and air hose pipes.

1.1.8 Environmental Management Plan Checklist for CMC construction activities

The Entity responsible for the development of the detailed design study for the CMC will have to also fill in the EMP Checklist document (Attachment 1 below) and submit it for the clearance by the PMU environmental specialist. The requirement of the EMP Checklist will

form the part of the bidding documentation for construction contractors and should be adequately reflected in the contractors' budget.

II- COMPONENT INITIAL ENVIRONMENTAL EXAMINATION FOR STRENGHENING CRITICAL INFRASTRUCTURE

This Chapter of EMF includes an Initial Environmental Assessment (IEA) and Environmental Management Plan (EMP) for Component II, subcomponents I and II of "Strengthening Critical Infrastructure against Natural Hazards" Project.

2 Introduction and basic data

2.1 Project Component 2 background

In response to the request for financial assistance, the WB provided an advance to the Government of Tajikistan for preparation of the feasibility study, Detailed Design and Bidding Documents for Rehabilitation of 9 bridges in Vanch and Rushan districts of Gorno Badakhshan Autonomous (GBAO) region and rehabilitation/reconstruction of 5 flood protection sites in Kulob, Vose, Qubodiyon and Shaartuz districts of Khatlon Region. within the Strengthening Critical Infrastructure against Natural Hazards Project. The proposed project envisions establishing the foundation of the Government of Tajikistan's long-term disaster risk management program. Due to unique terrain and geological and hydrological features, Tajikistan is prone to diverse natural hazards such as floods, earthquakes, landslides, mudflows, droughts and heavy snowfalls. As an initial step, the Project will target areas in the GBAO and Khatlon Region that were affected by floods and mudflows in July 2015 and finance reconstruction of related infrastructure to reduce disaster risks and avoid potential damages in the long-term taken into account that the area is vulnerable to natural disasters.

2.1.1 **Project Sub -Components**

Project Component 2 aims at making critical infrastructure resilient against natural hazards. This Component will finance preparation of the feasibility study and detailed designs and construction of bridges, dykes and other flood protection Infrastructure. As an initial step, the Project within subcomponent I will target areas in the GBAO that were affected by floods and mudflows in July 2015 and finance reconstruction of infrastructure to reduce disaster risks and avoid potential damages in the long-term taken into account that the area is vulnerable to natural disasters.

Project Component includes two sub- components:

Project Component 2, sub-component I includes design and construction of nine (9) bridges to replace the bridge structures damaged by natural disasters in 2015 in order to improve connection to remote Jamoats of GBAO.

Project Component 2, subcomponent II will finance design and construction of flood protection including but not limited to reconstruction and/or reinforcement of dams, dykes and river embankments and improving the flow and bed load transport capacities of flow channels primarily for 5 Khatlon sites that were damaged during July 2015.

During implementation of both sub-components the additional sites may be included in the Component should the funds be available.

2.2 Purpose of Initial Environmental Assessment

The purposes of this IEA are to: (i) analyze the policy, legal and administrative framework relevant to rehabilitation, modernization and construction of vital infrastructure, including bridges; ii) analyze available baseline data on the environmental issues and their trends, (iii) identify possible negative and positive environmental impacts of the Project and propose mitigating measures if required; (iv) provide a framework for environmental quality monitoring in the project implementation areas; (v) develop guidelines for environmentally sound construction practices and; (vi) assist in the inter-agency coordination and the public/NGO consultation process. IEA provides a road map to the environmental measures needed to prevent and/or mitigate adverse environmental effects associated with this Project. The IEA provides a detailed description of the direct and indirect environmental effects associated with the proposed subproject during key periods of work.

2.3 Methodology applied for Environmental Impact Assessment

During the preparation of IEA the following methodology has been applied: Existing baseline data (including all available environmental legislation and guidelines) and relevant reports from previous Tajik road and flood projects were collected, reviewed and analyzed. The field trips have been undertaken in November 20- December 2016 to examine the proposed project sites from the environmental point of view and undertake initial disclosure of the Project to stakeholders. Discussions held with local experts from the Ministry of Transport (MoT), the Research and Design Institute, the Road Administration in Vanch and Rushan, the local Environmental Protection Departments Managers in Vanch and Rushan, the Committee of Environmental Protection (CEP) under the GoT, Dushanbe, Agency for Land Reclamation and Irrigation (ALRI), local ALRI Departments in Kulob, Vose, Qabodiyan, and Shaartuz, local Environmental Protection Departments in Kulob, Vose, Qabodiyan, and Shaartuz. Informal interviews and participatory discussions were held with people living in the villages of the Project area nearby the Project bridges and flood protection structures. Environmental and social issues and engineering data were reviewed and taken into account

to identify environmental impacts and mitigation measures during design, construction and operating phase.

Additional public consultation will be carried out in the Project area after completion of the Feasibility Study (FS) and detailed design due to possible changes in design.

2.4 Project Location

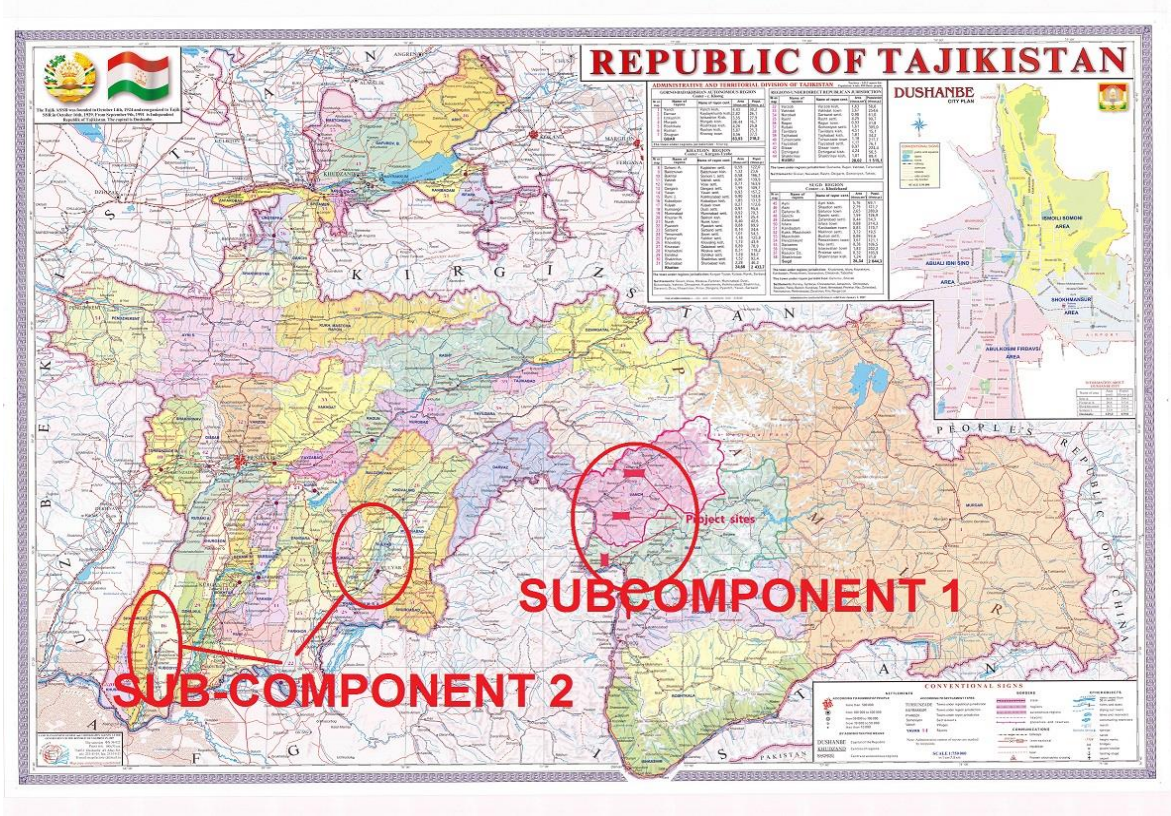


Figure 1 Project Location map

The Republic of Tajikistan is a landlocked Central Asian country, which was a part of the Soviet Union until obtaining independence in September 1991. Tajikistan borders the Kyrgyz Republic in the north, China in the east, Uzbekistan in the north and west and Afghanistan in the south. The capital of the country is city of Dushanbe. Tajikistan is a mountainous country with 93% of territory occupied by mountains and above 50% located at altitudes above 3,000m above msl.

The total estimated population of the country is 8.6 (2016 estimates) million people. The proposed Project Component located in Gorno Badakhshan Autonomous Region (GBAO) and Khatlon region of Tajikistan. GBAO is situated in the eastern part of Tajikistan occupying about 64.1 km^2 or 44.9% of the area of Tajikistan with the population of about 221.4 thousands people (2014 estimates) making up only about 3% of the total country population. GBAO is a rural region with only 13.8% of urban population living in the capital city of Chorog.

The Project Component 2, sub-component 1 sites are located within Vanj and Rushan districts of GBAO.

Vanj district is located between Darvoz and Yazgulam ridges. It has borders with the Tavildara district, in the east with the Murghab district, in the south with the Rushan district, in the west with Darvoz district of Tajikistan and Badakhshan province of Afghanistan. Vanj district is crossed by the river Vanj and Yazgulem from the north-east to south-west.

Rushan district is located between Yazgulem and Rushan ridges. It has borders with Vanj, in the east with the Murghab district, in the south with Shugnan district of Tajikistan, in the west with Shugnan district of Afghanistan.

The proposed Project sub-component 2 is located in Khatlon Region of Tajikistan. Khatlon Region is situated in the south-western part of Tajikistan and it is the most populous of the four first-level administrative regions. It is situated in the southwest of the country, between the Hisor (Gissar) Range in the north and the Panj River in the south and borders Afghanistan in the southeast and Uzbekistan in the west. The capital is the city of Qurghonteppa, formerly known as Kurgan-Tyube.

Khatlon has an area of 24,800km^2 and consists of 24 districts – 14 in Western Khatlon and 10 in Eastern Khatlon. The total population of Khatlon in 2008 was 2,579,300,[1] up from 2,149,500 according to the 2000 population census. The population in Khatlon is mainly engaged in agriculture.

The project sites are located within Kulob and Vose districts in Kizilsy/Yakhsy river basin and Qubodiyon and Shaartuz districts in Kafernihan river basin of Khatlon Region.

2.5 Need for the Project

According to the Committee for Emergency Situations since 1998, GBAO faced as many as 830 of recorded natural disasters with a total lethal toll of 66 people. The Infrastructure in Vanj district has been damaged by the strong earthquake, which took a place in Vanj in January 2015. The following July 2015 floods left the vital infrastructure including the bridges in critical state. The estimated damage in Vanj and Rushan districts amounted to US$ 3.8 million. Some of the bridges were completely destroyed and other were damaged to a significant degree that are not allowed fully to perform their tasks.

The improvement of the transport Infrastructure is a critical component of safety, development and well-being for the population of remote communities in Vanj and Rushan Districts.

Floods are the most frequently occurring hazard in the country and pose a significant threat to Tajikistan, affecting not only mountainous and hilly rural areas that are sparsely populated, but also major urban areas. Generally, floods occur either in spring following heavy rains or during snowmelt in the summer time. However, due to more variable precipitation and climate change, unseasonal floods are expected to be among the extreme events faced by the country. For instance, in July 2015 a series of destructive floods and

mudflows occurred throughout Tajikistan as a result of unusually high temperatures which caused increased melting of glaciers. The Gorno-Badakhshan Autonomous Oblast (GBAO) and Khatlon region were among the affected areas. Many riverbeds and banks of the rivers in Khatlon region were damaged, endangering nearby settlements and exposing them to a higher risk of flooding; households in various areas were completely destroyed or partially damaged, livestock killed. The Government of Tajikistan estimates that economic loss due to the July 2015 floods are in the range of US$ 100 million, which constitutes around 1.1% of Tajikistan's gross domestic product (GDP).

3 Legislative and Regulatory Network

This section reviews the regulations and laws applicable to environmental management of the proposed Project. The Environmental Management issues of this Project are based on the requirements of the legislation of Tajikistan and World Bank Environmental policies. The legal environmental protection framework in the Republic of Tajikistan includes various pieces of legislation including the Constitution, laws and governmental provisions of the Republic of Tajikistan and International Environmental Conventions ratified by the Tajik parliament

3.1 Overview of Environmental Legislation

3.1.1 **The Constitution of the Republic of Tajikistan**:

- Guarantees the exclusive state ownership of land, mineral resources, water, airspace, fauna and flora and other natural resources and their sustainable use in the interests of all people (Article 13).
- Announces the freedom of economic activities and private property as well as legal protection for all types of property, including private property (Article 12).
- Guarantees everyone the right to health protection and undertakes measures for the improvement of the environment (Article 38).
- Imposes on each individual the duty of protecting natural, historical and cultural sites (Article 44).

3.1.2 **The Law on Environmental Protection**

This is the fundamental basic law governing environmental protection. The Parliament of the RT passed the law on June 22, 2011 (No.485) replacing the old law on Nature Protection of RT (No. 905, 27/12/1993) with amendments (No. 30, 10/2002; No. 75 2/12/2002; No. 58 15/4/2004):

- The law determines the main goals, principles and tools for Environmental Protection in Tajikistan and announces the priority of ecological values in the sustainable development of Tajikistan.
- Announces the right to a healthy environment (Article 10) and provides tools for the implementation of this right. It includes the right to environmental information (Article 11) and the right to public participation (Article 13).
- Provides a legislative framework for environmental regulation and establishes a system of state control over violations of environmental regulations. Determines the governmental authority in the protection of the environment.
- Provides economic mechanisms for environmental protection, including the duty of the enterprises to repair any damages to the environment and a payment system for the usage of natural resources and pollution.

- Provides the basis for establishment of ecological standards for maximum allowed pollutant concentrations and development of permits and emissions limits.
- Determines the compensation requirements for environmental damage from enterprises and individuals (Section 16).
- Provides the obligations to utilize environmental expertise for all potentially damaging activities; stipulates that evidence-based principles of Tajikistan's environmental policy should give priority to environmental actions to combine economic and other activities that have an impact on the environment with nature preservation and the sustainable use of resources.
- Defines the applicable legal principles, the protected objects, the competencies and roles of the Government, the Committee for Environmental Protection, the local authorities, public organizations and individuals.
- Stipulates also measures to secure public and individual rights to a safe and healthy environment and requires a combined system of environmental expertise and environmental impact assessment of any decision on an activity that could have a negative impact on the environment.
- The Law also defines environmental emergencies and ecological disasters and prescribes the order of actions in such situations, defines the obligations of officials and enterprises to prevent and eliminate the consequences, as well as the liabilities of the persons or organizations that caused damage to the environment or otherwise violated the Law.
- The Law establishes several types of controls over compliance with environmental legislation: State control, ministerial control, enterprise control and public control.

Comply with the provisions of this law specified in details in the following documents:

3.1.3 The Law on the State Ecological Review (No 818, 16/4/2011)

The law replaced the old edition # 20 from April 22, 2003. According to the law, all national and local projects, concepts, programs and schemes which as a result of implementation require usage of natural resources or/and may adversely affect the environment are subject to the state ecological review. The law:

- Regulates the general principles of environmental expertise.
- Determines the type and authority of ecological experts including state and public environmental expertise.
- Provides the list of activities that are subject to mandatory environmental expertise. The projects of the republican and local levels, which may adversely impact environment are subject to the state ecological review.
- Provides procedures for submission and payment for environmental expertise and responsibility of the authorized state body (Article 18).
- Determines the schedule for environmental expertise. Decisions shall be made within 30 days after acceptance of documentation by the authorized governmental body. New edition of Law determines the deadline for decision making as 30 days after submission of design documentation, for the complex projects a review period was extended up to 60 days.

Provides provisions for public environmental expertise, which could be initiated by the stakeholders, but with final decision being made by the state environmental expertise.

3.1.4 Environmental Impact Assessment process in Tajikistan

The law on the state ecological review includes the provisions (Article-22) for Environmental Impact Assessment (EIA) process in Tajikistan. In order to implement this provision GoT issued a resolution "On the Procedure of Preparation and Undertaking of Environmental Impact Assessment (EIA) (No. 509 from August 6, 2014) which replaced the old version of Governmental Resolution (2006). This document describes the procedure for EIA and determines the roles of the parties including state authorities and other stakeholders. The Resolution divides the activities by categories according to the scope and degree of anticipated adverse environmental impact. The activities with the anticipated highest environmental hazard relate to the category I and activities of category IV relate to the lowest risk. Category I activities require full EIA process to be applied with preparation of a comprehensive EIA report and submission to Environmental Review for approval. The activities of Categories II, III, IV require the preparation of Environmental Protection section as a part of design documentation with identification of environmental impacts and mitigation measures. The Resolution does not identify the category for bridges rehabilitation projects, however due to localization of the bridges within the rural roads network they relate to Category III.

3.1.5 The Law on Environmental Monitoring

The law determines organizational legal, economic and social framework for environmental monitoring in the country;defines the objectives, goals, responsible entities and principles of environmental monitoring in Tajikistan; introduces the united system of environmental monitoring in the country and outlines the rules for using information resources;defines the regulatory authority and the requirements for public participation.

3.1.6 The Law on Protection of Atmospheric Air

The law was passed in December 2012 and replaced the old edition of February 1, 1996. The law:

- Provides legislative basis for air protection
- Determines the goal and purposes and main principles of air protection
- Determines the objects and subject of air protection and provides the general principles of classification of sources of air pollution and pollutants
- Determines responsibility for the regulation and management of the issues protection of atmospheric air at different levels of governance.
- Introduces economical mechanisms of air protection including obligatory payments for discharge of air pollutants to atmosphere and stimulation of air protection measures. The payments for the quantity of pollutants exceeding the allowed limits are increased by 5 times.
- Provides regulatory requirements for introduction of scientifically based air quality standards including Maximal Allowed Concentrations (MAC) and discharge

permitting air polluters and air protection requirements for various conditions. Any enterprise affecting the quality of atmospheric air is required to obtain a special permit to release pollutants to the atmosphere.

- Includes provisions for ozone layer protection and management of trans-boundary air pollution.
- Provides requirements for statistics, inventory, reporting of air pollutants and monitoring of air pollution activities. Any enterprise having the stationary and mobile sources of air pollution is obliged to submit the report for approval of maximal allowed emissions (emissions limits) from the enterprise operations based on the inventory of all anticipated sources of emissions and calculation of pollutants.

The former Soviet Union standards for air pollutants “Integrated standards on air quality I and part II (Dushanbe, 1991)” are still in use in Tajikistan. In accordance with article 18, the planning of any constructional activity associated with air pollution should take into account the best available information provided by a relevant authority about: (i) background level of pollution; (ii) existent environmental quality and discharge standards

The design and construction of the objects, which may significantly adversely affect the air quality, is prohibited.

The law prescribes that all physical and juridical entities have obligation to take necessary measures in order to prevent the adverse effects of noise, vibration, electromagnetic fields and other sources of threat to environment and human health. The proposed Project does not require to obtain an air emissions permit .

3.1.7 The Law on Ecological Audit

The Law on Ecological Audit includes provisions for ecological audit of the enterprises and other organizations. The environmental audit is defined as analysis and assessment of the compliance of the activities of entity with environmental legislation and regulations. The law determines goals, objectives, objects and principles of ecological audit. An ecological audit may be initiated by an entity or by a governmental authority. The audit initiated by the governmental authority is obligatory. No information is available about additional regulations issued for this law.

3.1.8 The Law on Industrial and Domestic Waste

The law was passed by the Parliament of RT under No 109 on 25.07 2005 replace an earlier version of the law under No 44. The law assigns responsibility for the proper waste management to the waste producers and requires proper supervision and monitoring of waste generating and disposal activities. During design, construction and operation of enterprises, structures or other facilities physical and juridical faces are responsible for compliance with established waste management procedures and standards.

3.1.9 Water Code

The Water Code stipulates the policies on water management, permits, dispute resolution, usage planning and cadaster. It promotes rational use and protection of water resources exercised by all beneficiaries and defines the types of water use rights, authority and roles

of regional and local governments for water allocations among various users, collection of fees, water use planning, water use rights and dispute resolution. The Code delegates Water User Associations to operate and maintain on-farm irrigation and drainage infrastructure.

3.1.10 Land Code

The current Land Code (1992) defines the types of land use rights, the authority and the role of regional and local governments for land allocation, collection of land taxes, land use planning, land use right mortgaging and settlement of land disputes. It defines the rights of land users and leaseholders, and defines the use of a special land fund for the purpose of land privatization and farm restructuring. The Code regulates land relations and it is directed at the rational —use and protection of land and fertility of the soil. The land may be used in a rational manner only and the Code allows local authorities to decide what constitutes —rational land use. It also includes mechanisms that make it possible to take the land-use permit away from farmers, including in situations where land use causes land degradation.

3.1.11 International Conventions

Tajikistan joined and ratified the following International Environmental Conventions:

a. Convention on Biological Diversity, 1997;
b. UN Framework Convention on Climate Change, 1998;
c. The Ramsar Convention (joined in 2000);
d. Convention on the Conservation of Migratory Species of Wild Animals(joined 2001);
e. Stockholm Convention on Persistent Organic Pollutants (ratified 2007);
f. Aarhus Convention (joined 2001)

The International treaties take precedence over national legislation, therefore the above mentioned Conventions constitute also a legal basis in the relevant areas of environmental protection in the country.

3.1.12 Environmental Administrative Network in Tajikistan

The main governmental administrative body responsible for supervising environmental issues is the Committee for Environmental Protection under the Government of the Republic of Tajikistan. It is divided into a number of Departments. During the implementation, the Project may closely interact with the several Departments including:

- Department of the state environmental expertise (obtaining environmental approval of designed activities)
- Department (Inspectorate) for water protection.
- Department for the protection of atmospheric air.
- Department for waste management (The Project may need to obtain a permit for disposal of domestic waste).

The Committee for Environmental Protection, the Sanitary Inspectorate of the Ministry of Health and Inspectorate for Industrial Safety and the Mining Inspectorate undertakes the state control over various aspects of environmental compliance. Public control is carried out by public organizations or trade unions and can be exercised with respect to any governmental body, enterprise, entity or individual.

3.1.13 The Penalty System for the Breach of Environmental Regulations

Tajikistan administrative regulations and criminal law include a comprehensive system of penalties for the breach of the environmental legislation. The punishments vary from the relatively small fines (up to 300 of minimal units) to the life imprisonment for the ones found by court guilty in ecocide. The inspectors may directly impose the fines and/or compensations for the damage to the Environment and/or they may be inflicted by court through litigation.

3.2 Overview of the World Bank Environmental Requirements of

The projects funded by WB are subject to internal environmental safeguards issued by the Bank. The aim of these safeguards is to prevent and mitigate the negative impacts onto the population and their environment in the process of project development. They provide guidance to the Bank and the borrower in the identification, preparation and implementation of programs and projects. These safeguards include the following policies and guidelines:

OP/BP 4.01 Environmental Assessment

OP/BP 4.04 Natural Habitat

OP 4.09 Pest Management

OP 4.11 Physical Cultural Resources

OP/BP 4.12 Involuntary Resettlement

OP 4.10 Indigenous People

OP/BP 4.36 Forests

OP/BP 4/37 Safety of Dams

OP/BP 7.50 Projects on International Waterways

The description of applicability of these policies to the proposed Project is as follows:

3.2.1 OP/BP 4.01 Environmental Assessment

The main purpose of this policy is to ensure that WB-funded projects are environmentally and socially sound and sustainable and environmental issues are fully integrated into decision-making process. The policy also includes public consultation and public disclosure requirements and describes the tools and procedures to mitigate or avoid the negative economic, social and environmental issues that may arise. The WB requires the environmental screening for project categorization to determine the appropriate extent and

type of environmental assessment (EA). The World Bank classifies proposed projects into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Environmental Assessment (EA) evaluates potential environmental impacts and risks related to the project, examines project alternatives, identifies ways of improving the selection of project alternatives, planning, designing, and implementation by prevention, minimization, mitigation, or compensation of adverse environmental impacts. Policy determines the following project categories depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A projects have adverse impacts on the environment that are broad, varied affect areas beyond project footprint, involve major resettlement or alteration / degradation of natural habitats; hazardous materials. A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project "situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA in accordance with Appendix B of OP/BP 4.01.

(b) Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document)

(c) Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA actions are required for a Category C project.

(d) Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary in subprojects that may result in adverse environmental impacts.

The proposed project is classified Category B as potential adverse impacts are limited and particularly only on the project site, fewer in number and scope; largely reversible, readily mitigated through the use of known measures.

3.2.2 OP/BP 4.04 O Natural Habitats

The aim of the policy is to ensure conservation of the natural habitat as one of the essential conditions for sustainable development. Natural habitats are land and water areas where (i) the ecosystems' biological communities are formed largely by native plant and animal species, and (ii) human activity has not essentially modified the area's primary Environmental functions. All natural habitats have biological, social, and economical value of existence. Natural ecosystems of rivers and forests usually support various degrees of complexity of flora and fauna.

The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats. Appropriate conservation and reduction measures of consequences must be determined for the project in the case of an impact on natural habitats. In this case environmental experts will be involved throughout the whole process.

If the EIA process identifies that any natural habitat will be significantly changed, the proposed Project will not be possibly to finance. The preliminary IEA indicated that no natural habitats are expected to be adversely affected by the Project. Therefore, the Project does not trigger the WB natural habitats policy.

3.2.3 OP 4.11 Physical Cultural Resources

This policy requires the protection of "cultural property" (including archaeological, historic, religious sites). The cultural property comprises the remains left by previous human inhabitants. Projects that will significantly damage non-replicable cultural property will be excluded from funding. Projects shall include a plan for the protection and/or enhancement of cultural properties accidentally encountered (chance findings). The assessment did not reveal any cultural resources the project may likely damage, except the part of old cemetery between bridges No 2 and 3 near the village of Andarvak. Reallocation of several graves may be necessary for rehabilitation of the access road to bridge No 3. Therefore, this OP/BP may be triggered during the project implementation.

3.2.4 OP 4.10 Indigenous People

The aim of the policy is to ensure that the development process fully respects the dignity, human rights economies and cultures of indigenous people. Although a part of the population in the Project area speak different languages (Yazgulemi and Rushani), they do not fall under definition of indigenous people due to the lack of customary cultural, economic, social, or political institutions that separate them from the dominant society and culture of Tajikistan. They are considered to belong to larger groups of Tajiks, have very good command of the Tajik language and use it for education, work and other needs outside their households. The project implementation will not adversely affect any local communities. Therefore, the project does not trigger the OP 4.10 policy and preparation of Indigenous People Plan is not required.

3.2.5 OP/BP 4.36 Forests

The Bank's current forests policy aims to reduce deforestation, enhance the environmental contribution of forested areas, promote reforestation, reduce poverty, and encourage economic development. This policy includes adoption of a comprehensive and environmentally sound forestry conservation and development plan that clearly defines the roles and lights of the government, the private sector, and local people.

Although local forest authority clams the availability of spots of forest within the Vanch and Yezgulem valleys it is heavily modified and located far outside of the project sites. As natural forests do not exist within the Project area, this OP/BP will not be triggered by this Project.

3.2.6 OP/BP Involuntary Resettlement

This policy covers direct economic and social impacts that are caused by the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on livelihoods.

If a project requires either land acquisition or resettlement (as defined above), either a shortened or full Resettlement Action Plan (RAP) will be required, depending on the scale of the impact (significant or non-significant). A Social Assessment Document and a Resettlement Framework have been prepared by PIU on the basis of the undertaken social survey.

The Project will likely not require re-settlement, however, some land acquisition, including assets(e.g water mill, trees) will be required for the bridge and access road and location of construction camp. Therefore, the policy may be triggered by the Project.

3.2.7 OP/BP 4.37 Safety of Dams

The policy aims to ensure that for the life of any dam the appropriate measures are taken and sufficient resources provided for the safety of the dam irrespective of its funding sources or construction status. The Project does not trigger the policy as no dams are associated with the Project implementation.

3.2.8 OP 4.07 – Water Resources Management

Bank involvement in water resources management entails support for providing potable water, water supply and sewerage projects, flood control, and water for productive activities in manner that is economically viable, environmentally sustainable, and socially equitable.

The Bank supports projects for avoiding water logging and salinity problems associated with irrigation investments by (i) monitoring water tables and implementing drainage network where necessary, and (ii) adopting best management practices to control water pollution.

It also supports projects establishing strong legal and regulatory frameworks to ensure that social concerns are met, environmental resources are protected, and monopoly pricing is prevented. The Bank requires legislation or other appropriate arrangements to establish effective coordination and allocation procedures for interstate water resources.

The Project does not trigger the policy, as very limited amount of water resources is required for the Project implementation and the Project does not change the existent system of water distribution.

3.2.9 **OP 7.50 – Projects on International Waterways**

This policy applies to the following types of international waterways:

- any river, lake, canal, or similar water body that forms a boundary between, or any river or surface water body that flows through, two or more states;

- any tributary or other surface water body that is a component of any waterway described in (a) above; and

- any bay, gulf, strait, or channel bounded by two or more states or, if within one state, recognized as a necessary channel of communication between the open sea and other states and any river flowing into such waters.

This policy applies to the following types of projects:

a) hydroelectric, irrigation, flood control, navigation, drainage,

b)water supply and sewerage, industrial, and similar projects that involve the use or potential pollution of international waterways, and

c) detailed design and engineering studies of projects under a) above.

The Bank requires that the international aspect of a project on an international waterway is dealt with at the earliest possible opportunity. If such a Project is proposed, the Bank requires the beneficiary state, if it has not already done so, to formally notify the other riparian states of the proposed project and its project details.

However, the Project is granted an exception from notification requirements under the OP 7.50 since it will be implemented in the “ongoing schemes, involving additions or alterations that require rehabilitation, construction, or other changes that in judgment of the Bank will not adversely change quality and quantity of water flows to other riparians; and will not be affected by other riparians’ possible water use. The project will also not cover works and activities that would exceed the original water scheme, or alter or expand its scope and extent to such extent as to make it appear a new or different scheme. Therefore, the Project will still trigger OP 7.50 but no notifications for riparian countries are required.

4 Project Component 2 Description

This section provides the General Description of the proposed project Component 2 including available technical details

4.1 Project Component 2 subcomponent 1

The proposed Project sub-component comprises the preparation of the feasibility study and detailed design for construction of 9 bridges in Vanch and Rushan districts of GBAO,

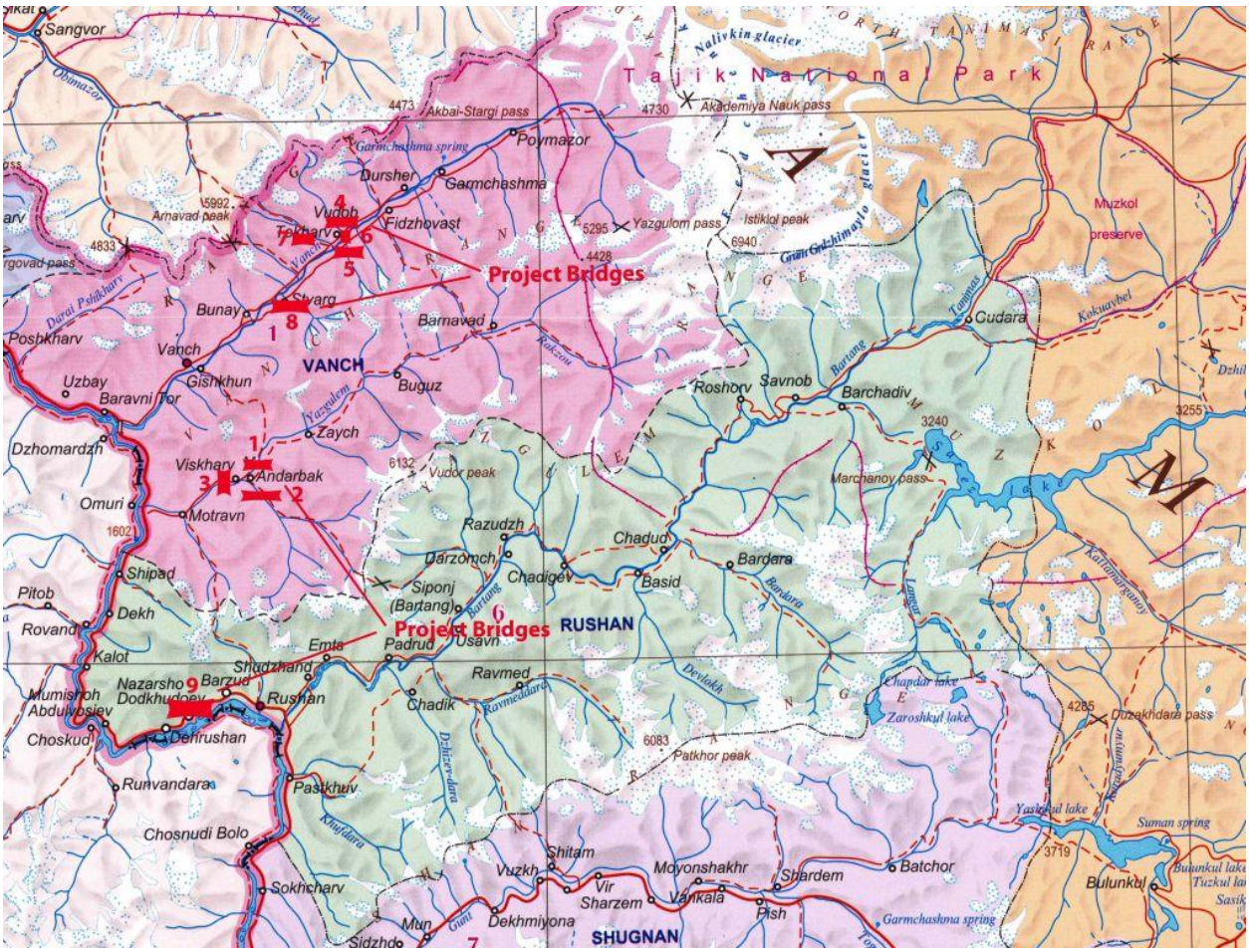


Figure 2 Location of the project bridges within Vanj and Rushan districts

At the current stage, the different design options are under considerations, and therefore the types and precise parameters of designed bridges are not determined. For this reason, the consequence of construction activities, types and quantities of required construction materials for different bridges may vary and will be determined at the stage

of Detailed Design. However, apparently that bridge construction will include the following activities.

1. Removal of an old bridge structure: The old bridge will be removed at the early stages of physical works if the change of bridge location is not possible or feasible. In the case when bridge relocation is feasible, the old crossing structure will be preserved until completion of a new bridge in order to ensure uninterrupted crossing of the river by local people during construction.
2. Clearing of the site will include removal of vegetation as well as stripping of top-soil for temporary storage.
3. Direct construction works, including preparation of foundations, erection and installation of steel structural components, beams, slabs, pylons and structures, painting of bridges and anti-corrosion coating.
4. Bank and channel protection by reinforcement concrete blocks and rip-rap
5. Installation of railings, signs and other components of bridges and access road furnishing.

Table1 below shows estimated dimensions of the new bridges designed under the Project

Table 1.Proposed dimensions of the project bridges

No of the bridge	Name of road and Reinforcement	Name of watercourse	Approximate total length of the new bridge(m)	Approximate new width with pedestrian walks(m)	Approximate rehabilitation length of access roads(m)
1	Vanch-Yazgulam	Yazgulam river	35	7	400
2	Vanch-Yazgulam	Obi-Andarvak river	20	7	300
3	Vanch-Yazgulam	Yazgulam river	35	7	300
4	Vanch-bolo	Udob river	26	7	200
5	Chikhoh-Ravgada	Obi Chokhoh river	17	7	100
6	Vanjo-bolo	Vanj river	38	7	250
7	Vanjo-bolo	Obi Sed river	35	7	250
8	Vanjo=bolo	Ardobak river	20	7	200
9	Dushanbe-Kulob-Khorog-Kulma, Km 538	Barushhondara river	20	13	600

4.2 Description of Component 2 sub-component 1 project sites to be financed under the Project and potential impacts

This sub-section provides a preliminary review of project sites bridges, including description of existent state, types of required works and possible consequences for environment.

Photo 1 Bridge over the river of Yazgulam on the road Vanj-Yazgulem near the village of Jamag.

Current state: 14m long bridge structure with metal I-beams and wood flooring. The exposed concrete supports foundations are eroded and partly washed out by floods. Dimensions are insufficient for floods causing further scour of foundations. Access to the bridge is complicated due to small turning radius. The bridge does not meet requirements for carrying capacity and peak flood capacity.

Proposed action: Access road improvement and riverbank protection is required. The project proposes construction of a new approximately 35m bridge with 200m of access road from each side.

Potential impacts:

- Temporary water pollution in construction stage
- Dusting
- Cutting of bushes, shrubs and trees
- Temporary interruption of river crossing

Photo 2 *Bridge over the river of Camochdara on the road Vanj-Yazgulem near the village of Andarvak*

Current state: 10m in length simple beam-type bridge with span built from two steel I beams and wood flooring. The bridge structure with eroded and partly washed out foundations and insufficient dimensions for floods.

Proposed action: Access road improvement and riverbank protection is required. The Project proposes construction of a new approximately 20 m bridge with 150m of access road from each side.

Potential Impacts:
- Removal of water mill
- Temporary interruption of river crossing
- Noise
-Cutting of fruit trees <10
-Temporary water pollution during the construction

Photo 3 Bridge over the river of Yazgulem on the road of Vanj-Yazgulem near the village of Vishharv

Current state: Cable strayed 26m bridge with the width across the pylons axes of 4.05m. The bearing cable is worn. The bridge dimensions are insufficient with the supports foundations eroded by floods. The landslide is located near abutment.

Proposed action: The construction of a new 33m bridge with 4.5 m in width carriageway and 0.75m sidewalks and 150m of access road from both sides proposed under the Project.

Potential impacts:

- Disturbance of graveyard and possible relocation of several graves for access road.
- Temporary worsening of water during construction works due to erosion sedimentation
- Downstream erosion and sedimentation

Photo 4 Bridge over the river of Udob on the road to Vanji Bolo near the village of Udob

Current state: The mudflow washed out the bridge and nearby structures. The temporary 5m bridge with concrete supports serves for crossing. During the peak flow season, the river channel is overwhelmed. The foundations of 5m bridge are eroded and dimensions are insufficient for floods.

Proposed action: Access road improvement and riverbank protection is required. The construction of a new approximately 25m bridge with 4.5 m in width carriageway and 1.0m sidewalks from both sides proposed under the Project. The new bridge requires 100m of access road from both sides and approximately 80m of bank protection from both sides.

Potential Impacts:

- Cutting of riverside shrubs, bushes, trees
- The temporary worsening of the quality of water due to erosion and sedimentation during construction phase.
- Noise
- Dusting
- Disturbance of the bridge crossing

Photo 5 Bridge over the river Obi-Chikhoh on the road Chikhoh-Ravganda near the village Chikhoh of Vanj district

Current State: The simple 4.1m long beam bridge with width of 5.5m. The span is made from two steel I-beams with concrete support foundations of 2.7m in height. The foundations are eroded by floods and exposed due to insufficient dimensions of the bridge.

Proposed actions: Access road improvement and riverbank protection is required. The construction of a new 17 m bridge with 4.5 m carriageway and 0.75m sidewalks from both sides proposed under the project. The new bridge requires 50m of access road from both sides and approximately 80m of bank protection and channel improvement from both sides.

Potential impacts;

- Cutting of trees and shrubs
- Noise
- Dust Generation

Photo 6 Bridge over river of Vanj on the road to Vanji bolo near the village of Chikhoh

Current state: Cable strayed 36m bridge with 5.0m in width supports. The left tributary river of Chikhoh joins river of Vanj about 150m up from the bridge location and washes out the existent access road. The bridge pylons skewed, probably because of collision with heavy vehicle, and not subject to rehabilitation. Supports foundations are eroded and bridge dimensions are insufficient for floods. Access road improvement and riverbank protection is required.

Proposed action: The construction of a new approximately 38m bridge with 4.5 m carriageway and 0.75m sidewalks from both sides proposed under the Project. The new bridge requires a protection dyke for the left tributary channel improvement and access road of the total length of about 250m.

Potential Impacts:

- Cutting of the riverside trees and bushes
- Temporary worsening of the quality of water at the construction phase
- Interruption of the river crossing
- Air quality worsening due to work of machinery and dusting

Photo 7 Bridge over the river of Obi-Sed on the road Vanji Bolo near the village of Sed

Current state: A two span bridge has the length of 24m. The main spans made of two steel I beams with the carriageway paved by orthotropic material. Pavement is fractured and deeply deformed. Left bank support is inclined along the flow because of intense scouring. The support foundations atr rotated and bared by erosion. Currently, they are in critical state requiring urgent protection.

Proposed action: construction of a new approximately 35m bridge with 4.5 m carriageway and 0.75m sidewalks from both sides proposed under the Project. The new bridge requires 50m of bank protection from both sides and approximately 250m of access road.

Potential Impacts:

- Cutting of riverside bushes, shrubs and trees (Hippóphaë, Salix),
- Temporary worsening of water quality
- Erosion and sedimentation during construction

Photo 8 Bridge over the river of Ardobak on the Vanji Bolo road near the river of Ardobak

Current state: The simple beam 7.0m bridge in width of 4.50m. The span structure consists of two I beams and is covered by reinforced concrete slab 0.25m thick.
During the peak flood season, water covers the whole channel area and flow partly bypasses the bridge due insufficient bridge dimensions.
Proposed action: construction of a new approximately 20m bridge with 4.5 m carriageway and 0.75m sidewalks from both sides proposed under the Project. The 60m bank protection is required from both sides with 100m of the access road from both sides.

Potential Impacts:

- Cutting of trees (Elaeágnus) and shrubs
- The temporary disturbance of river crossing
- The temporary worsening of water quality during the construction phase
- Noise

Photo 9 Bridge over Barushondara at km 538 of the road Dushanbe-Kulyab-Khorog-Kulma

Current state: The earth and mudflow carrying large boulders destroyed the existent bridge including carriageway, sidewalks and railings on 21 July 2015. The flow completely blocked the river. The destructed bridge had a length of 10.0m with width of 7.0m. The span structure consisted of 7 precast concrete slabs. The bridge supports and access road are buried under the earth and mud deposits brought by flow. Bank protection is not visual and most likely destroyed. The probability of a new large scale mud & earth flow is high and requires higher bridge dimensions to pass it.

Proposed action: A new 18m bridge with 10m in width passageway and 1m sidewalks from both sides. The cleaning of the river channel and 200m bank enforcement is also required. The construction of 600m access road will be required.

Potential Impacts:

- The temporary disturbance of river crossing
- Temporary worsening of water quality during the construction phase
- Air pollution due to the work of machinery and dust generation during the construction phase

4.3 Sub-component 2 Description

This sub-section provides the general description of the proposed Project including the details on location, current state, proposed actions and potential impacts.

4.3.1 **Project Sub-component 2 Scope**

Capital works for flood protection may include but will not be limited to reconstruction and/or reinforcement of dams, dykes and river embankments, and improving the flow and bed load transport capacities of flow channels, particularly in the zones with dense settlement and transport infrastructure, e.g. housing, public institutions, bridges.

The proposed Project comprises the preparation of the feasibility study and detailed design for reconstruction/rehabilitation of 5 flood protection sites in Kulob, Vose, Qubodiyon and Shaartuz districts of Khatlon Region.

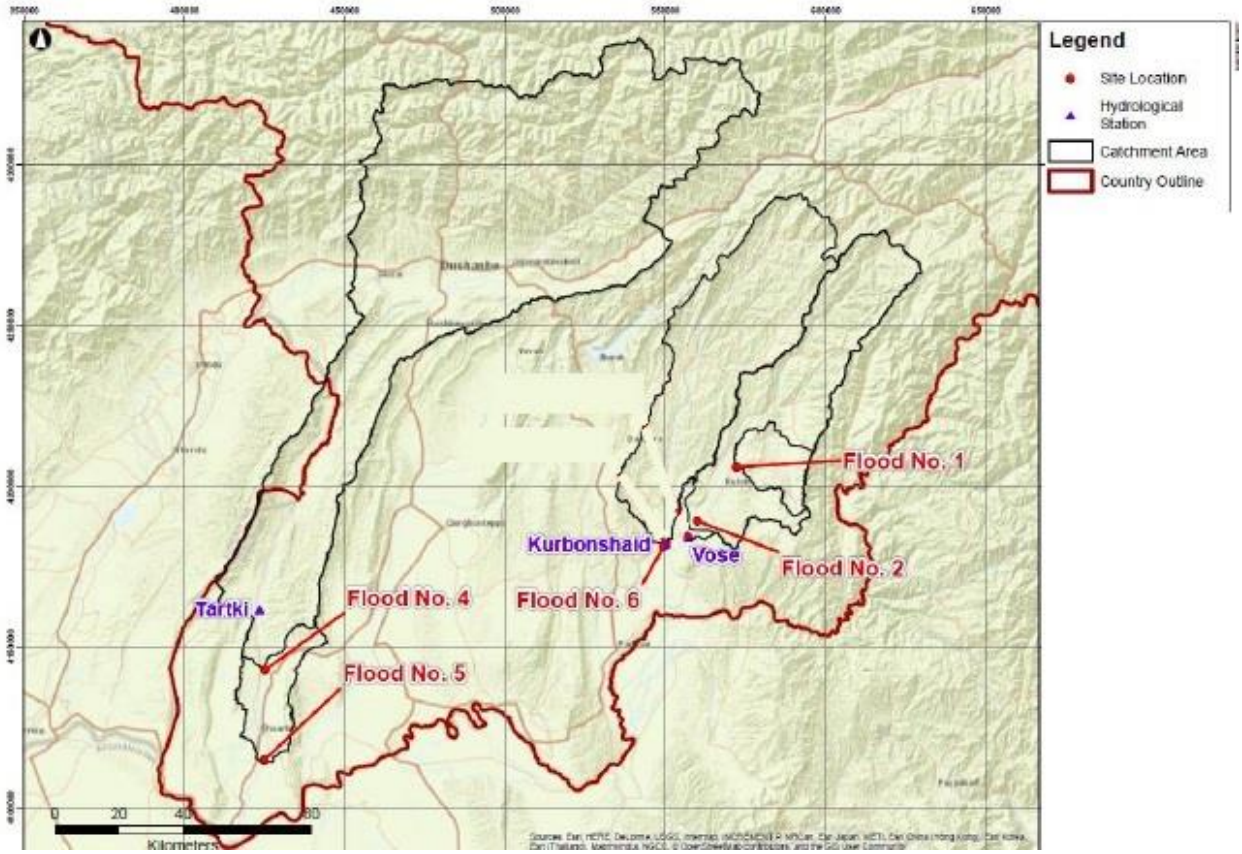


Figure 3 Site locations – Khatlon region

The table below shows estimated lengths of the flood protection structures to be designed within the Project.

Table 2 the proposed length of flood protection infrastructures

Flood protection	River	Approximate total length of flood protection (m)
1.	Dahana	3700
2.	Yakhsu	3500
3.	Yakhsu and Kizilsu	1000

4.	Kafernigan	400
5.	Kafernigan	10450

4.3.2 Description of the Project sites to be financed under the Project and potential impacts

I. River bank protection works along the right bank and clearing of Dakhana river bottom, from the confluence of Ziraki river bed before confluence with Yakhsu river, Kulob district, length - 3,7 km.

Location:

Flood Protection No. 1, is a damaged levee on the right bank of Dakhana River near the Kulob airport, with a total length of 3.7 km. The site's coordinates are 37°59'54.85"N 69°49'21.78"E.

The site is located in the vicinity of Kulob district, Khatlon Region, in the lower part of the Dakhana River, from the confluence of Ziraki River to the confluence of Dakhana River to Yakhsu River.

Figure 4 Location Plan for flood No1

Current state:

The river has been protected with levees on both banks near Kulob city. A section of levee on the right bank of the river approximately 3.7 km long has been damaged, primarily during the 2010 flood event. Since then, erosion of the right bank has been progressing and at least 13ha of arable land is exposed to river flow in that area.

Photo 10 Existing embankment on the left bank

Proposed action:

Action proposed consists of reconstruction of damaged 3,700m long levees, with possible upstream extension. There will be no increase or decrease in the flow velocity.

Potential impacts:

Temporary worsening of water quality in construction stage

Dusting

Noise

II. Rehabilitation of destroyed areas of the left bank of Yakhsu river in Shobika and Lyarhobi villages, Vose district, length - 3,5 km

Location:

The site, Flood Protection Structure No. 2, is a damaged levee on the left bank of Yakhsu River near the town of Vose, with a total length of 3.7 km. The site's coordinates are 37°50'52.12"N, 69°40'55.25"E. The site is located in Vose District, Khatlon Region.

The site is located in the wide floodplain of meandering and braided channel of the Yakhsu River. The catchment is non-glacial, but does have seasonal snow cover. Figure 5 presents a location plan of Flood Protection Structure No. 2.

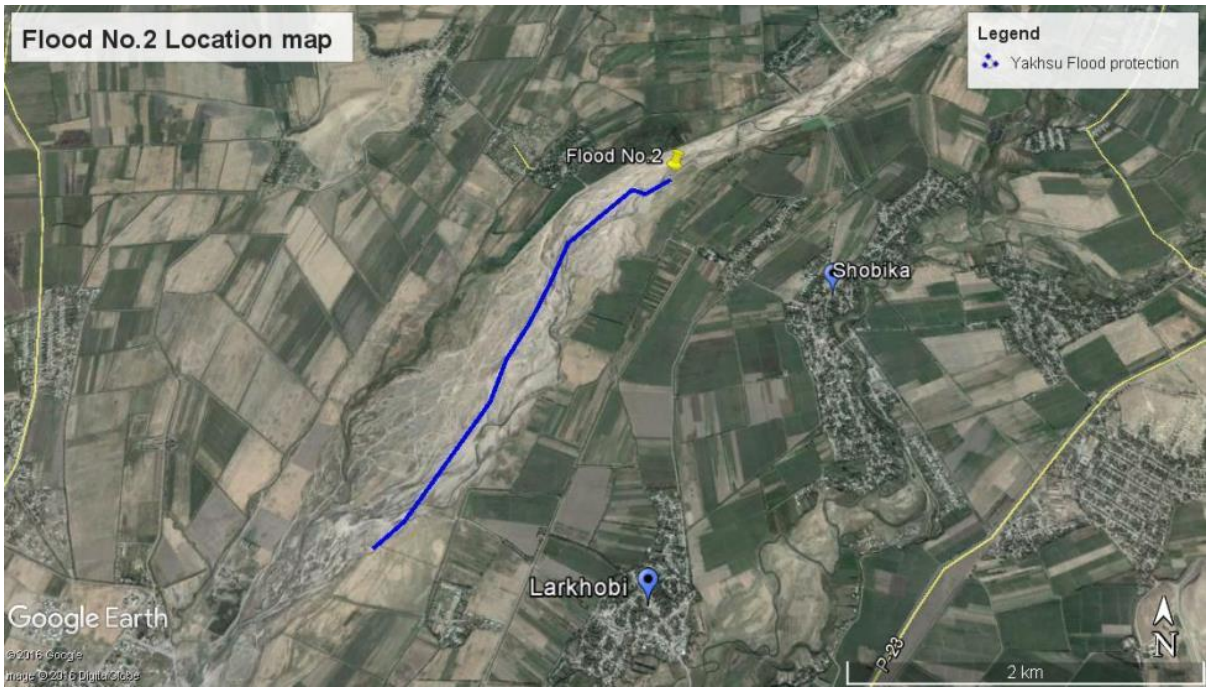


Figure 5 Location map of Flood No2

Photo 11 Damaged left bank of Yakhsu River

Current state: The river has been protected with levees on both banks between the cities of Vose and Kulob. A section of levee on the left bank of the river approximately 3.5 km long has been damaged, primarily during the 2010 flood event. Since then, erosion of the left bank has been progressing at the significant rate of up to 20 m per year, as estimated from multitemporal satellite images. The majority of the land lost from the migration of the river has been agricultural fields.

Proposed action:

Reconstruction of a damaged 3,500m long leveewith possible downstream extension. There will be no increase or decrease in the flow velocity.

Potential Impacts:

Temporary worsening of water quality in construction stage

Dusting

Noise

III. Flood protection measures in the place of confluence of Kzilsu and Yakhsu rivers, Vose district, length - 1 km

Location:

The site, Flood Protection Structure No. 6, is a damaged flood levees on the left bank of Kizilsu River near the confluence to Yakhsu, with a total length of 680m and right bank of Surkhob river, downstream of confluence of Kizilsu River, with a total length of 320m. The site's coordinates are 37°46'33.82"N, 69°33'37.81"E. The site is located in Vose District, Khatlon Region.

The site is located in the confluence of the Kizilsu and Yakhsu Rivers, making Surkhob River. The catchment is non-glacial, but does have seasonal snow cover. Figure 7 presents a location plan of Flood Protection Structure No. 6.

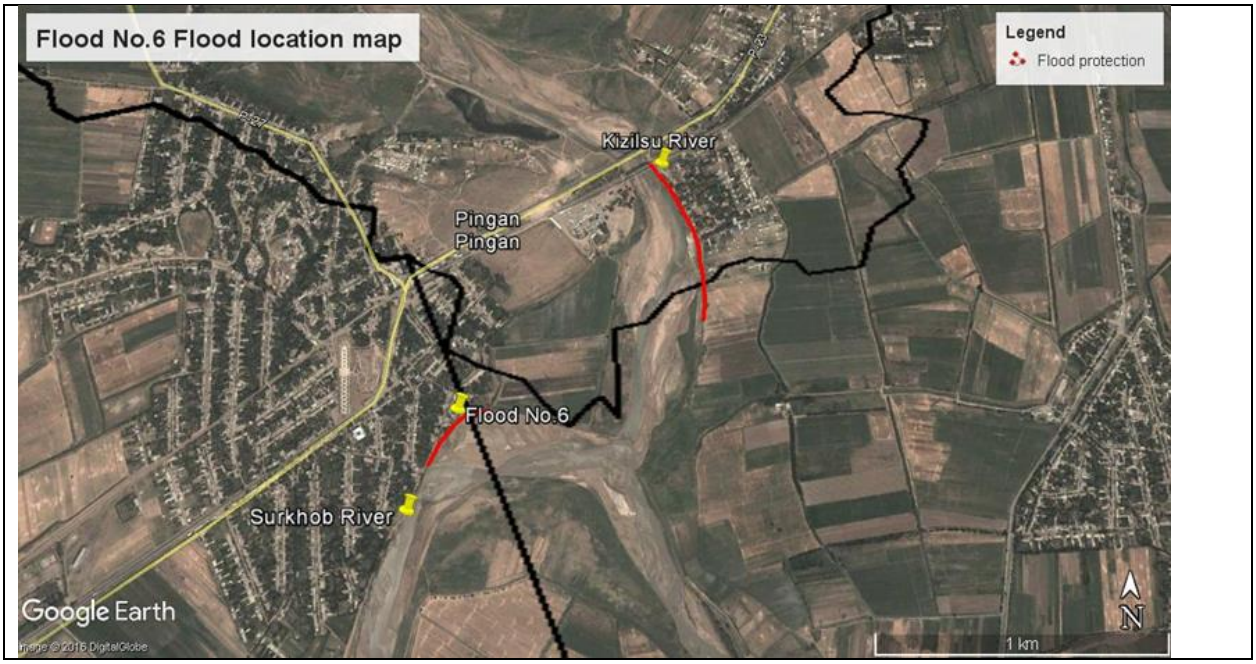


Figure 6 Location Map of Flood No 6 at Kizilsu River

Photo 12 Damaged left bank of Kizilsu river

Rivers have been protected with the levees on both banks at the confluence. Sections of levees approximately 1.0 km long in total have been damaged, primarily during the 2010 flood event. Erosion of banks has been progressing.

Proposed action:

It is proposed to reconstruct damaged levees, total length 1,000m. There will be no increase or decrease in the flow velocity.

Potential Impacts:

Temporary worsening of water quality in construction stage

Dusting

Noise

IV. River bank protection works along the right bank of Kofarnihon River in the area of main water intake of Shohadi canal, Shaartuz district, length 400m

Location:

Flood Protection No. 5 is a river bank protection works along the right bank of Kofarnihon river in the area of main water intake of Shohadi canal, Shaartuz district, length of 400m The site's coordinates are 37°10'33.26"N, 68° 9'9.52"E.

The site is located in the most downstream part of Kafernigan River, south of Shaartuz town. Catchment area is 10,480 km², principally pluvial and snow melt.

Kafarniganriver main water regulation dam (GVS) is 44km upstream of Flood No.5 and controls flows.

Figure 10 presents a location plan of Flood Protection Structure No. 5.

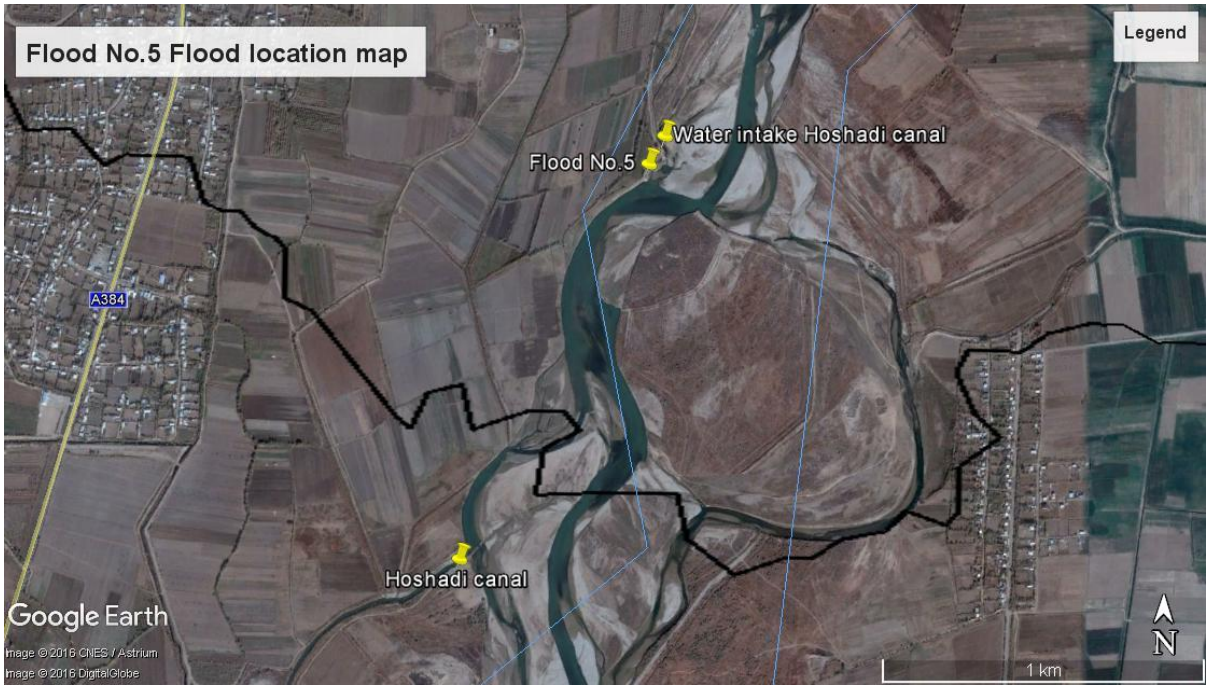


Figure 7 Location map of Flood No. 5 Hoshadi canal, Kafernigan River

Current state:

After the flood in 2010 embankment of the water intake canal has been damaged. The river flow has bypassed water intake and eroded existing irrigation canal downstream of water intake facility. Further development of river flow over the coming years, due to meandering,

further disturbed the irrigation canal, causing that water supply to the canal is exclusively dependent on hydrological conditions. Works on maintenance of irrigation canal took place in a manner that in very simple way divert water from the river into the channel. Water intake is discussed.

Photo 13 Damaged right bank of Kafernigan River

Proposed action:

Reinforcement of existing riverbanks with length of 400m, with possible extension of works that may include some other measures like rehabilitation of a water intake facility, irrigation canal downstream of water intake, temporary diverting of river flow.

Potential Impacts:

Cutting of riverside shrubs and bushes

The temporary worsening of the quality of water due to erosion and sedimentation during construction phase.

Noise

Dusting

V. River bank protection works on Kofarnihon river, Qubodiyon district, length 10,450 km;

Location:

The site, Flood Protection No. 4, is a damaged flood levees on the left bank of Kofernihan River in Qabodyan district with a total length of 10450m The site's coordinates are 37°25'42.38"N, 68° 9'8.93"E.

The site is located in the middle to down part of Kafernigan River, south of Shaartuz town. Catchment area is 10,480 km², principally pluvial and snow melt.

Kafarnigan river main water regulation dam (GVS) is approx 20 km upstream of Flood No.4 and controls flows.

Figure 10 presents a location plan of Flood No. 4.

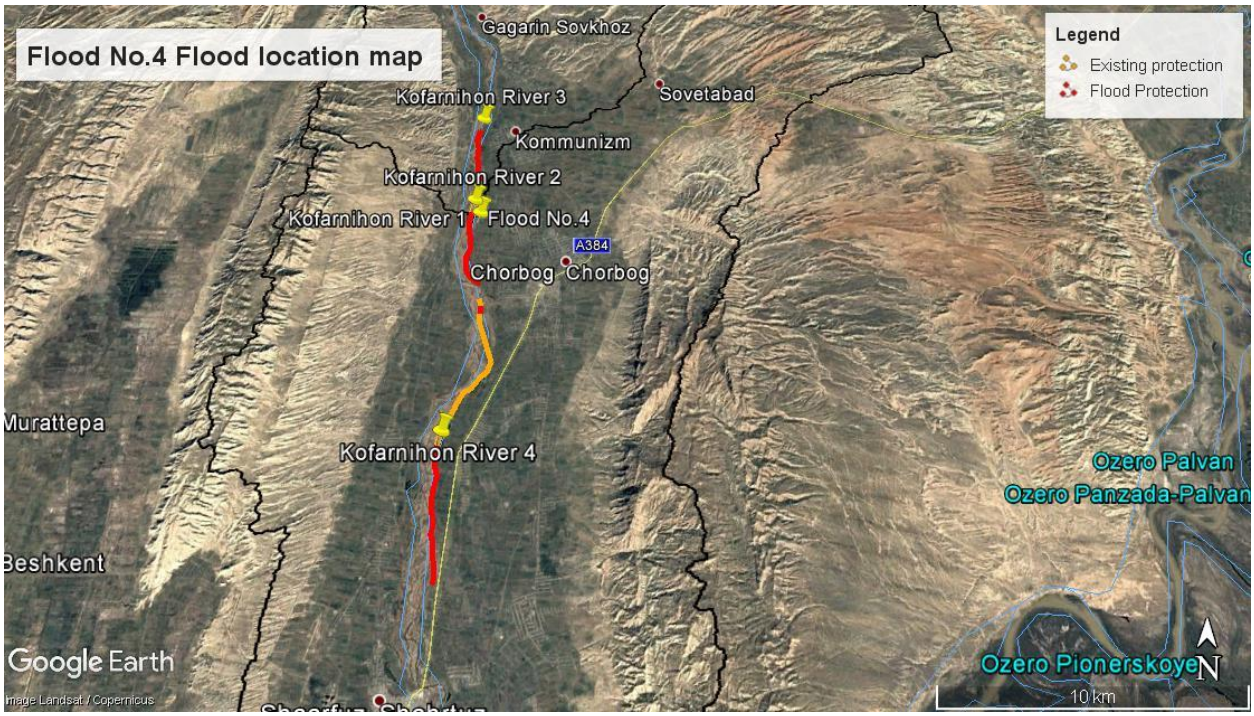


Figure 8 Location map of Flood No 4, Kafernigan River

Current state:

Erosion of fields after levee was washed away in 2010 and is present along the whole stretch. Some parts of previous protection system are still present, but jeopardized by the river flow.

There will be no increase or decrease of the flow velocity.

Photo 14 Flood No. 5 Hoshadi canal, Kafernigan River

Proposed actions:

Levees must be constructed in order to minimize natural river banks erosion and fields from flooding.

Potential impacts;

Cutting of trees and shrubs

Noise

Dust Generation

The temporary worsening of the quality of water due to erosion and sedimentation during construction phase.

4.4 Description of Alternatives Including no Action Alternative

The alternatives within the sub- projects such as the accurate location, type of bridges and possible changes of access road alignments will be considered at the feasibility study phase. The bridges, access roads and flood protection parameters will be optimized during detail design in terms of earthworks balance, cost and other aspects including environmental protection needs.

4.4.1 **No-action alternative**

The No-action alternative is intended to represent the most likely future expected in the absence of implementing an action alternative. No action alternative means that existent bridges which are already seriously damaged by the natural disasters will continue to deteriorate with reducing of load capacity. Eventually they will not be able to ensure safe river crossing even for pedestrians. The population of remote villages will lose communication links and access to the markets, education and health services. Supplies of goods and services will be limited. Eventually the river crossings will be completely

destroyed leaving the people in transport isolation from the district center and the rest of country. Population will become more dependent from local resources, especially wood that will cause their further depletion.

The denial from the rehabilitation of the bridge in Rushan district will worsen the capacity of the strategic Dushanbe-Chorog- Murgab road, which connects GBAO with the southern regions of Tajikistan, including Dushanbe and provides access to the International markets. The road ensures reliable and economic transport of goods and passengers across Tajikistan.

For sub-component 2 under the no-action alternative, existing activities, programs, and trends in both river basins would continue. Because the no-action alternative does not involve a coordinated and integrated approach, benefits are likely to be localized and minimal throughout both basins.

Continued flooding could result in the following effects to the built environment under the no-action alternative:

Land Use

- Increased impacts on structures and agriculture due to increased flooding and
- bank erosion

Transportation

- Increased flooding and bank erosion which would result in increased transportation closures, delays, or detours for facilities and transportation lines located near river flows
- low lying areas, as well as the facilities located in or near current floodplains

Historical and Cultural Preservation

- Potential increased impacts on cultural resources from increased flooding and bank erosion

Public Services and Utilities

- Increased flooding impacts on public service and utility facilities located within the floodplain

Environmental Health and Safety

- Impacts on emergency response services might continue during the floods due to closures of local roads that are impassible during major floods.

No-action alternative means that already seriously damaged protection system by the natural disasters (flooding, mudflow, earthquakes and landslides) in two independent river basins will continue to deteriorate and enable flows to further jeopardize settlements, infrastructure, and industry and erode agricultural lands.

Therefore, the denial from the Project is an unacceptable alternative both from socio-economics and environmental standpoints.

5 Description of Environment

This section briefly describes the existent physical and social conditions in the project area.

5.1 Topography soils and geology

Regional: Mountains occupy 93% of the area of Tajikistan and comprise South Tian-Shan and Pamir mountain systems. Geographically, the Project region relates to Western Pamir where combination of geological and hydrological features formed exclusively irregular, rugged terrain with alternation of rocky steep mountainous and deep narrow valleys with prominent differences in true altitudes. The Pamir as a part of Himalayan mountain system formed by collision of the Indian and Eurasian continental tectonic plates. This process continues at an average rate of about 5 cm per year.

Photo 15 General view of Vanj valley

Project area: Geological structure of project area is complex due to location near the main thrust type tectonic border between the structures of Central and Northern Pamir. The proposed sites are located within Vanch-Yazgulem sub-zone of Central Pamir composed by various rocks ranging from deformed and metamorphosed Precambrian and Paleozoic schist, gneiss, marbles to detrital and carbonate rocks deposited in the shallow waters from Paleozoic to early Jurassic. The area also contains intrusive rocks including gabbro, gabbro-diorite etc.

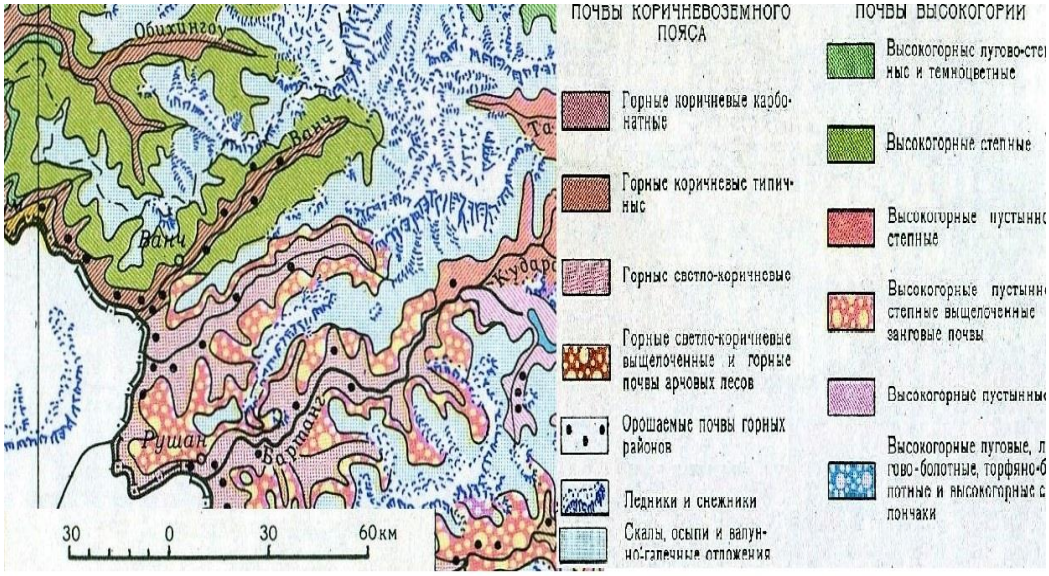


Figure 9 Types of soils in sub-project 1 region

The region is abundant with mineral resources including nickel, molybdenum, gold, iron, piezoquartz, marble however the lack of investments and poor infrastructure hinder development, there is only one marble mining enterprise in Vanch district. The remains of ancient iron ore mines and primitive smelters were found in one of nearby side valleys.

The topography of Khatlon province, where the flood protections are located, is mostly characterized by planes, undulating lands and foothills with moderate slopes and a weak inclination on the southwest side. with altitude range from 400m (Flood Nr.6) to 1,000m (Flood Nr.1) in Kulob and Vose districts, respectively and from 300m to 450m for flood protections in Qubodiyon and Shaartuz districts, respectively.

5.1.1 **Orographic features**

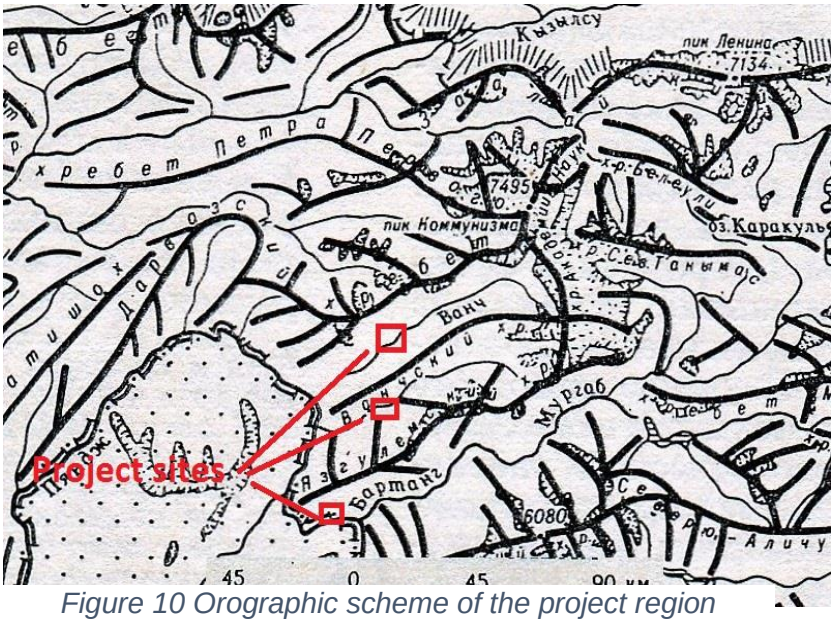


Figure 10 Orographic scheme of the project region

The core of the Pamir mountain system is the 108 km long roughly longitudinal Academy of Science range with the highest peak of Somonien with the 7,495m above the msl.

The central part hosts the Pamir ice plateau with ice thickness of up 150m. The Darvaz, Vanj and Yezgulem ranges located at the proposed Project area are south-western branches of the Academy of Science range.

(i) Darvaz range with the highest peak of Arnavad (6083m) limits the Vanj valley from the west
(ii) The exclusively steep Vanj range is a watershed between the Vanj and Yezgulem valleys

(iii) The Yezgulem range is the most southwestern branch separating Yezgulem and Bartang valleys. The highest point is a peak of Independence (6940m above msl)

The Project sites are located within the bottoms of U shaped valleys of Vanch and Pyanj rivers formed apparently by glaciers motions and relatively narrow V –shaped of Yazgulem. Most of bridges will be located on the terraces created by alluvial fans of side tributaries. The width of the Vanch valley in the project zone is 1.5-1.8 km, Pyanj river is about 2,5 km wide and Yezgulem river is from 300 to 600m wide.

The proposed bridges are located at the lower part of incisive valleys with significant difference in true altitudes. For example, bridge #8 location has an altitude of 1,969m while the adjacent mountain peak of Arnavad, within the Darvaz range has a true altitude of (6083) m above msl.

5.1.2 **Seismic hazards**

Tajikistan has generally a relatively high seismic potential due to the very active tectonic structure and its location within the thrusting tectonic border between Hindustan and Eurasian plates. As a result, it is the only part of continental Asia, which has earthquakes that originates deep below the earth's crust, as well as crustal earthquakes.

In accordance with seismic zoning, the regions of Tajikistan are divided into three seismic zones. The seismic zones are based on the high risk of earthquakes ranging from 7 to 9 points at the Medvedev-Sponheuer-Karnik scale (msk-64).

The project area relates to "9 points earthquake zone" which is the zone of the high risk of earthquakes of highest intensity in Tajikistan. The project sites are located within Vanj- Akbaital and Yezgulem seismogenic zones

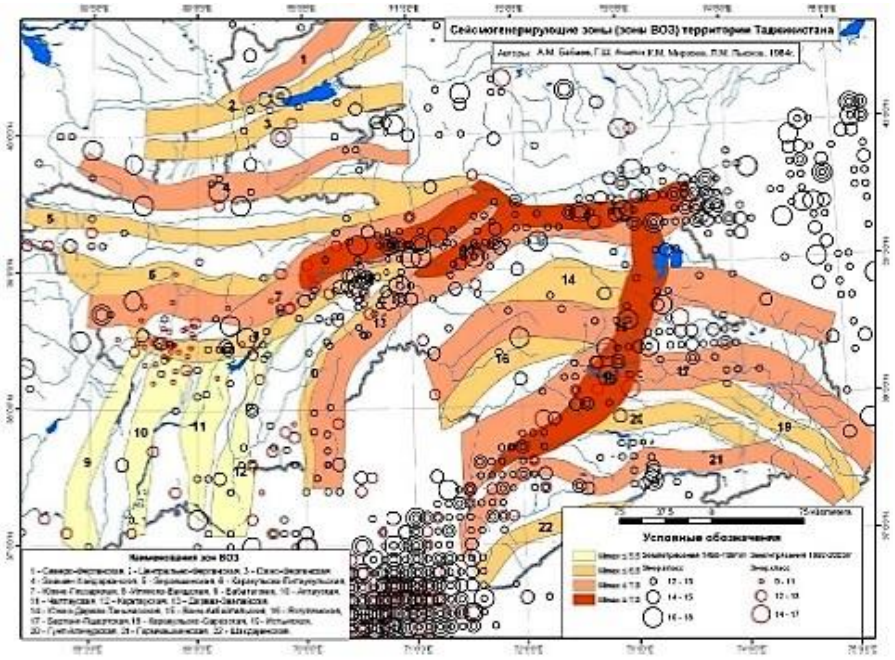


Figure 11 Seimogenic zones of Tajikistan. Source. Institute of seismology and seismic construction

with high risk of disastrous earthquakes (9 points by MSK-64 scale). According to historical data, earthquakes with magnitudes of up to 7.5 occurred in the area including Sarez earthquakes in 1911, which triggered the collapse of rock and creation of Sarez Lake in 100km from project area. The strong earthquake with intensity of 5.5 points (MSK-64) took place in Vanj district in January 2015. The fatalities were not reported, but over a thousand of houses were damaged.

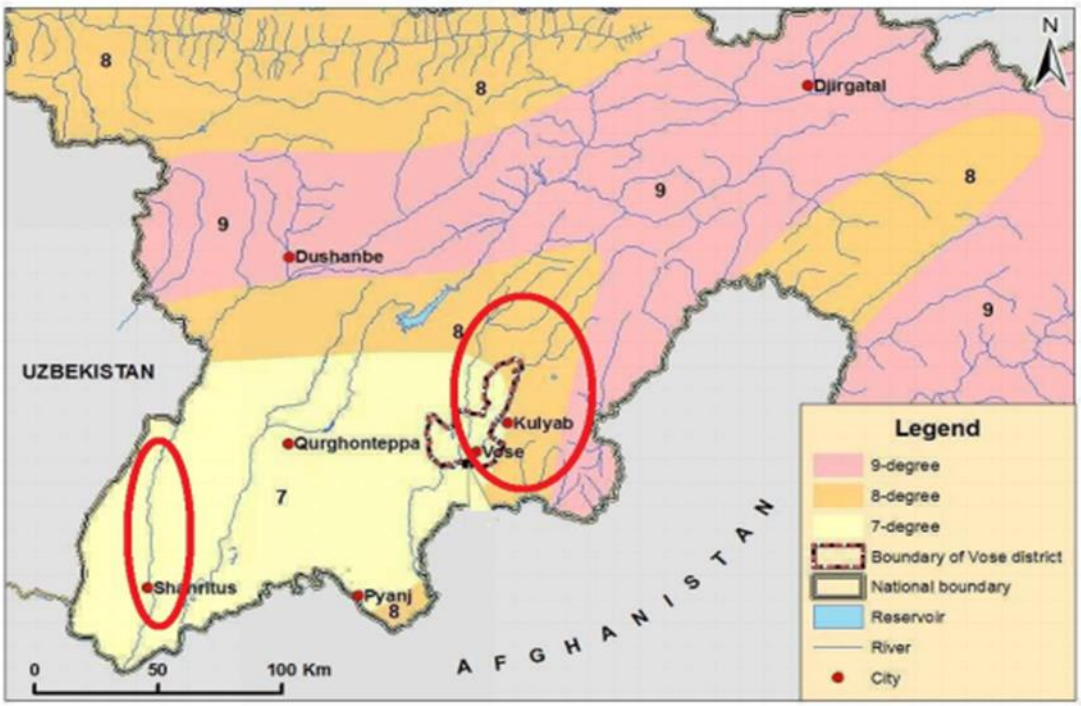


Figure 12 Seismic map of Tajikistan with flood locations in Kulob and Vose districts (right), Qubodiyon and Shaartuz districts (left) districts marked in red

From the seismological point of view locations in Vose, Qubodiyon and Shaartuz districts are located in an 7-degree seismic zone (relatively less dangerous seismic areas where earthquake intensity is unlikely to exceed 7 degrees), according to the MSK-64 scale, but locations Nr.1 and 2 upstream of Kulob city are in an 8-degree seismic zone (earthquake intensity is unlikely to exceed 8 degrees).

The flood protection locations Nr.4, 5 and 6 are situated in a low hilly land with a watershed smoothed surface, while locations Nr.1 and 2 are in mountainous hilly land.

5.1.3 **Soils**

Soils in the project area primarily consist of sediments eroded from the mountains and comprise alternating layers of gravels, sands, silts and clays. Adjacent to the mountains, the sediments are dominated by coarse deposits such as gravels and pebbles, deposited by the runoff water from the mountains. Further, away from the mountains, the deposits would be expected to become increasingly dominated by finer sediments such as fine sands/silts.

According to Tajikistan's classification, agricultural soils in the Project region belong to two principle types:

1. Mid-altitude mountainous typical brown soils
2. Mountainous light brown soils

The first type evolves in the areas covered by trees and bush vegetation with relatively high precipitation up to 800 mm and widespread within the bed Vanj valley at altitudes from 1600 to 2600m. This type is characteristic with high soil fertility compared to other brown soils. The soil profile includes humus layer about 40 cm thick with humus content of 5-10%.

The mountainous light brown carbonate soils are found at the agricultural lands of Yezgulem and Pyanj valleys with the lower levels of precipitation and less density of vegetation cover. The humus is strata is about 30-35cm with humus content of 3-5%. This type of soil normally contains many of rocky particles.

Soil profiles in the sub-component 2 area are typically loess, loamy sands and loamy soils, occasionally bench gravel of the upper quaternary age, classically formed through wind deposition over arid or semi-arid areas. Soils are brown-gray, light gray, gray (Kulob and Vose *districts) and brown-gray, light gray and meadow grey (Qubodiyon and Shaartuz distrcits).*

The humus layer of the loess and loamy sands is fairly fertile and agriculture is possible. For these soils to be converted into agricultural use, they require irrigation and the mineral fertilizers. The general overview of soil types in Tajikistan is presented in Figure 14.

5.2 Climate

Generally, Tajikistan's climate is continental, subtropical and semi-arid however, the climate conditions are diverse depending on the altitude and other geographical factors. By climatic conditions, Tajikistan is divided into several climatic belts (Figure 6). The locations of project sites within the deep valleys mainly relate to the areas with Western Asian insufficiently humid climate with warm summer and moderately cold winter. The surrounding mountainous territories of Western Pamir relate to the belt with dry climate, moderately warm summer and moderately severe winter.

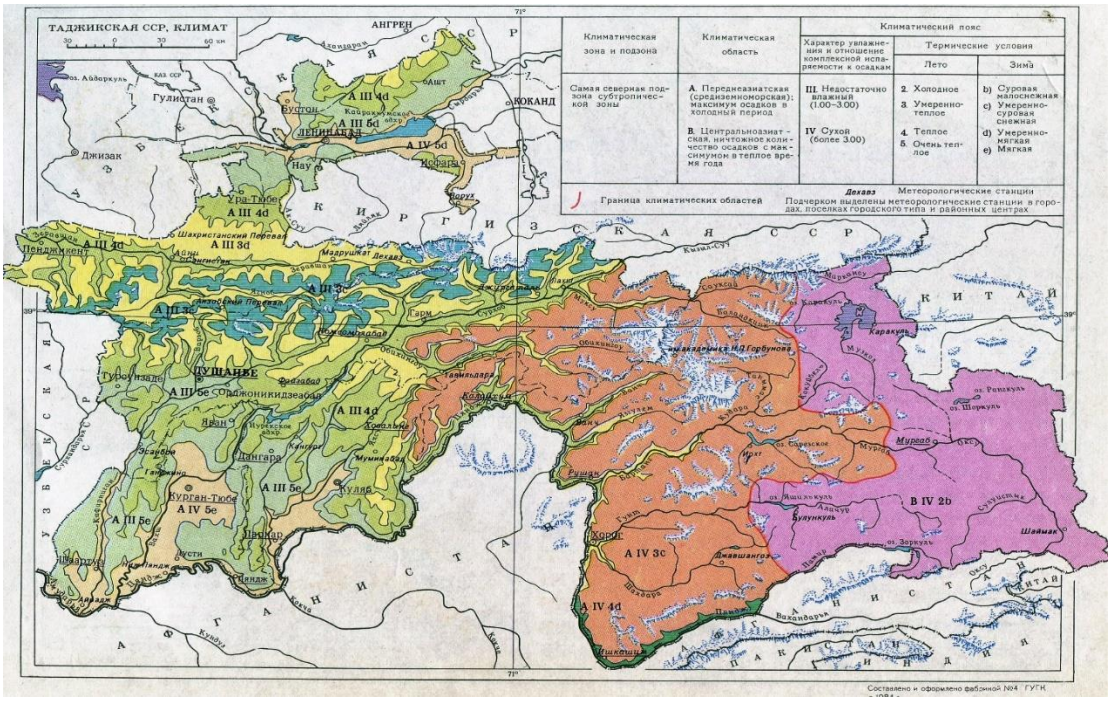


Figure 13 Map of Climatic Zones of Tajikistan

Most of precipitation in the valleys falls in the form of rain and snow during the wintery-spring season. The total annual precipitation in Vanj valley depends on the altitude ranging from 800-1200mm in the area of Medvezhy glacier to 180-200mm at the weather station Hamrogy at the lower part of valley close to the junction of Vanj and Pyanj rivers At the area of proposed bridges within Vanj valley, an annual precipitation reaches 450-500mm. The snow cover remains on the soil for up to 90 days in year at altitudes above 2000m above msl. The minimal wintery temperature may reach -30°C with maximal summer temperatures about +40°C. For 12 years of observations from 2005 to 2017 the maximal temperature for Rushan weather station +36.6°C was recorded in July 2013, the minimal temperature -20.5°C in January 2012 (www.gr5.ru).

The climate of the Khatlon region is continental. Among other areas of Tajikistan's Khatlon is considered the hottest place in Tajikistan in particular areas in Shahrituz and Beshkent. Winter in the plains of the Khatlon region is quite mild and the temperature reaches at least -20 degrees Celsius and -35 in the mountains. Summer in the plains is very harsh and the air temperature is up to +50 Celsius. Precipitation is less than the central areas of the country and is mainly rain from October to March.

The flood protection locations in Khatlon province are in the arid and semi-arid zones with very low precipitations, hot dry summer climate and moderate as well as relatively dry winter periods. This climatically condition determines the conditions for agricultural land use, which is very limited and dependent on irrigation and fertilization.

Most of precipitation in the valleys falls in the form of rain and snow during the wintery-spring season. The total average annual precipitation at Shaartuz weather station is approximately 155mm, while at Hovalin on upper part of Kizilsu River is approximately 950mm.

Downstream of the Shaartuz city is situated Flood Nr.5 where the climate is characterized as a zone with a dry climate. The average annual precipitation100-200mm in most of the area and can reach 400mm at the upstream part of the Kofernihan River at the location of Flood Nr.4. On Yakhsy/Kizilsu rivers locations average annual precipitation is approximately 400-800mm.

The precipitation consists mainly of rain and wet snow. Snow cover is rarely more than 10 cm deep and melts very quickly. The period from June to October is the driest. Snowfall occurs mostly between mid-December and mid-February; rainfall from March to mid-May.

Figure below illustrates precipitation levels in Tajikistan and clearly shows that the lowest amounts of rainfall are in the large river valleys, in the plains in the north and south west and in the very east of the country. Therefore, the flood protection locations are situated on average in disadvantaged areas for agricultural activities.

Table 3 Main Characteristics of the climate in flood area of Khatlon province

Ambient Temperature (Outdoors)	Minimum:	-25° C and more
	Maximum:	+45° C and more
	Daily Average:	35° C and more – July
	Annual mean:	16-17°C
Relative Humidity:	January – 80%, July – 40%, very dry	
Average Rainfall:	From 100-200mm and from 400 to 800 mm	
Number of days with rain/mist:	about 100 days	
Maximum solar radiation:	From 2,800 to 3,000 hours and more	
Maximum soil temperature:	More than 36°C	
Surface:	From 32°C to 36°C and can be more (July)	
Elevation (masl):	Up to 1000m	
Wind speed:	Up to 2.1 m/sec	

5.3 Hydrology and water resources

Hydrographic network of Tajikistan is made from more than 25 thousand rivers with a total length of 69,200km, out of these, 947 rivers have a length from 10 to 100km,16 rivers from 100 to 500km, and 4 rivers are longer than 500km. According to the geographical status of Tajikistan's river network, the country is divided into the following major river basins -- Zaravshon, Surhandarya (Karatag & Sherkent rivers), Kofarnihon, Vakhsh, and Pyanj, (Gunt, Bartang, Yazgulem, Vanj, Southern Kizilsu) - Figure 18.

The project region is a part of Amu Darya basin, which in the past was the major fresh water contributor to the currently shrunk Aral Sea. Project locations belong to the largest in Tajikistan Pyanj river sub-basin covering an area of over a hundred thousand square km with about 1.3 million population. Pyanj river is a main water artery of GBAO which serves as a natural border between Tajikistan and Afghanistan. The sub-component 1 sites relate to different watershed separated by Vanj and Yezgulem mountain ranges areas of 2,070km^2 and 1970km^2 respectively. Vanch and Yezgulem rivers are major right tributaries of Pyanj river.

Table 4 Parameters of the main watersheds in the project area

Gauge name	Area of basin, km2	Date		Total run off million Km a3	Duration of flood days	Maximal flow rate m3/cek
		Beginning of flood season	End of flood season			
Yezgulem river-Motravi	1970	21.04	13.10	924	177	167
Vanj river-Bicharv	2070	01.04	19.10	1400	188	268

The hydrological gauges operate at the downstream parts of these rivers with regular measuring of flow rates and level of water. The average historical flow rate data by month are shown at table 3

Table 5 Flow rates at the Vanj and Yezgulem rivers

Gauge name	Average monthly flow rates , м3/sec												Average annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Yezgulem river-Motravi	11.4	10.6	10.6	13.8	27.8	64.3	104	94.1	47.5	21.8	15.3	12.7	36.2
Vanj river-Bicharv	13.4	12.4	12.6	18.3	39.4	95.4	148	138	72.0	31.7	19.5	15.5	51.1

The glaciers and permanent snow are the main sources of feed for rivers. Headwater areas of Vanj and Yezgulem valleys located at slopes of the Academy of Science range host as many as 139 of glaciers with the total area of 1,134km^2 :

- Fedchenko glacier with a length of 77km and total area of 696km^2
- Garmo glacier with a length of 30.4 km and total area of 114km^2
- Geographic society glacier with a length of 24.2 km and total area of 64.4 km^2
- Grum-Grzhimailo glacier with a length of 37km and total area of 142.9km^2
- Ragzob Glacier with a length of 17.4 km and area of 47.29km^2.

Vanj and Rushan districts comprise several other glaciers of smaller size. The prominent Bear glacier is located in the valley of the Abducagor stream, left tributary of Vanj. The length of glacier is 15,8km with the total area 25.3km^2. Periodically the surges of the glacier block the valley and form lakes at down reaches of Abducagor. The pooling of glacier meltwater may cause the failure of snow-bridge and lead to the surges with disastrous consequences in Vanj Valley.

Sub-component 2 is implemented on the Kizilsu, Yakhsu and Kofernihan rivers.

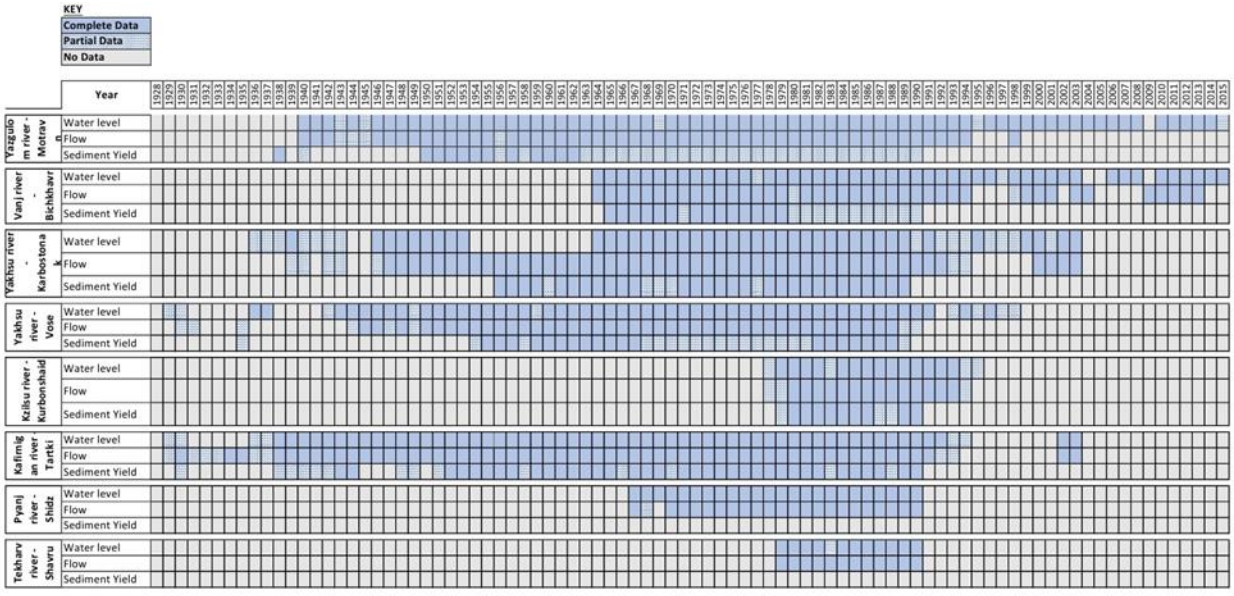
The hydrological observing network has been reduced since mid-1980s. Most equipment has exhausted its service life and is obsolete; spare parts are nonexistent or limited. Nowadays, 5 stations are in operation and collects water levels in Kizilsu/Yakhsu basin and on in Kofernihan basin.

Table 6 List of relevant HMS on Kizilsu/Yakhsu and Kofernihan basins

No.	HMS	River	Area of basin (km^2)
1.	Babahanshaid	Kizilsu	1790
2.	Kurbanshaid	Kizilsu	2911
3.	Samanchi	Kizilsu	6200
4.	Karbaztonak	Yakhsu	1440
5.	Vose	Yakhsu	2636
6.	Tartki	Kofernihan	9780

Information on data collected and availability is presented below.

Table 7 Data availability on a HM stations network on both stations



5.4 Groundwater

The combination of geological and hydrological conditions created localized groundwater aquifers including sources of mineral water of various composition. The hydrogeological map of districts shows different types of groundwater.

All flood protection structures are along the river banks of rivers in Yakhsu/Kizilsu and Kafernihan basins, where groundwater is observed mostly at the depths of 1 - 10 m.

5.5 Air Quality

The country's annual environmental reports prepared by CEP indicate zero or negligible levels of discharges of harmful substances to atmosphere air in GBAO. Data on instrumental measurements of air quality are not available for the site locations. However, due to lack of industries and the low transport traffic the air quality is estimated to be within the established tolerance limits. The visibility is normally very clear as dusty storms which common at the south areas of Tajikistan normally do not reach the Vanch and Rushan districts. There are no existing significant sources of air pollution in the Project area, and accordingly the existing air quality is excellent.

Noise levels within the Project affected areas are generally low, especially in the mountainous areas where traffic volumes are lowest.

5.6 Biodiversity

Tajikistan is distinguished with a rich biodiversity. Its biological richness is equivalent to nearby countries 20 times its size, with a wonderfully diverse array of fauna and flora, including a globally significant population of snow leopard. The country is recognized as a part of the 'Mountains of Central Asia' Biodiversity Hotspot.

However, its natural heritage is under severe threat from habitat fragmentation and degradation. 90 per cent of the forests have disappeared in the past 100 years, causing massive soil erosion and increased risk of landslides.

The country has ratified a UN convention on protection and sustainable use of biodiversity and has prepared a National Strategy and Action Plan to preserve priority species and habitats. It has been reported that over 25,000 types of species are present in Tajikistan. Many of these species are included in the IUSN Red List, under the endangered and critically endangered categories, inhabiting or once inhabited Tajikistan.

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5.6.1 **Flora**

Regional: The western Pamir valleys have long history of human settlement and agricultural development. Due to the lack of land suitable for agriculture, most of forested areas have been converted to agricultural lands.

Photo 16 Silverberry fruits under snow near the bridge 6

The remained natural vegetation cover at the project area belong to sub-alpine type (up to 3500m msl). Tugai are mainly shrub communities that occur along riversides and around springs at the altitudes up to 3500m. In the past the tugai forest of Vanj river flood plains was included in the list of Natural Heritage Sights of Western Pamir. Currently only scarce remaining fragments of tugai forests grow on the flood plains of Vanch and Yazgulem rivers. The dominant species are birch (Betula Pamirica), pulpous (Populus Pamirica), Within flood plains of Vanj river, there are stands of common sea buckthorn (Hipophae rhamnoides) and Beberis integerrima are preserved. Most of natural forest has been cut by the local population in 1990-s to provide fuel wood due to lack of a reliable power supply during the severe winters. The rare archa (Juniper) trees grow on the steep, rocky slopes of the Vanj and Yezgulem ranges.

Nearby the Project bridges there are small bush associations of willow (Salix turanica, Salix shunganica) and common sea buckthorn (Hipophae rhamnoides). Common sea buckthorn has some commercial value and local people harvest the berries for production of oil. The small silverberry (Elaeagnus) tree grows near bridge 8.

Sub-Component 2: In early spring the valleys and foothills are covered with a bright carpet of flowers: poppies, buttercups, and bluebells. Saksaul (haloxylon), wormwood, artemisia, camelsthorn (alhagi camelorum), and numerous types of saltwort (salsola) add their green to the picture.

River flood-plains are filled with dense bushes composed of tamarisk, reed, thorny of Central Asian oleaster, and Asian poplar. Delights to the eye include the deep-green crowns of pistachio trees hawthorn, wild almond, maple, walnut, and juniper. Such valuable trees as wild pomegranate and fig can also be found occasionally

5.6.2 **Fauna**

Regional: Tajikistan has diverse fauna and the Western Pamir hosts many its representative, including rare and endangered species.

Mammalia: The most prominent species - Urial (Ovis orientals), Snow Leopard (Uncia uncia), Tian- Shan Brown Bear (Ursus arctos), Eurasian Otter (Lutra lutra) are included

both in the IUCN list and Red Data Book of Tajikistan. According to Navruzshoev et al, dhole (Cuon alpinus), the Turkestan Lynx(Felix lynx isabellinus), Least Weasel Mustela altai) inhabiting the Tajik National Park are also included in IUCN list.

Birds: Bearded Vulture (Gypaetus barbatus) is listed in Red Data Book of Tajikistan and IUCN list while Himalayan Griffon (Gyps himalayensis) is listed in IUCN as near Threatened and Egyptian Vulture ((Neophron percnopterus) and Saker Falcon (Falco cherrug milvipes) as endangered species.

The reptiles include lizards (Asymblepharus alaicus), and Turan Blunt Nosed Viper (Macrovipera lebetina turanica).

The natural habitats of these species are located outside of the zone of project influence. The locally interviewed people mentioned about the accidental meetings of bears and wolves, and even complained about losses of cattle and damage to gardens from wild animals. However it happened at the significant distances from the proposed bridges location, mainly in the upper parts of Vanj valley.

Territories adjacent to the Sub-component 2 sites, where flood protection structure will be reconstructed, are inhabited withfoxes and hares, eagles, small rodents, etc.. According to the Department of Environmental Protection, there are no rare or endangered species on the site.

Fish, Fisheries and Aquatic Biology: It is observed that fish does not contribute much to local economics. Fishing in rivers and streams at the project sites are found to be very limited, and information on the number of fishermen, fish species captures, yields and total catch does not exist. The fish species Schizothorax which is genus of cyprinid fish dominates in the major rivers. No fish species in this area are classified into endangered status.

5.6.3 **Natural Protected Area**

Project bridges are located outside of protected natural areas. The closest protected area is a Tajik National Park, which occupies area of 26,000 km^2 or 18% of the area of Tajikistan and located within GBAO as well as Jirgital and Sangvor Districts of Republican Subordination (DRS). In surroundings of project area the National Park includes watershed areas of Vanch and Yezgulem mountain ranges and wedges in upper part of Vanch valley approximately in 40 km from the project sites.

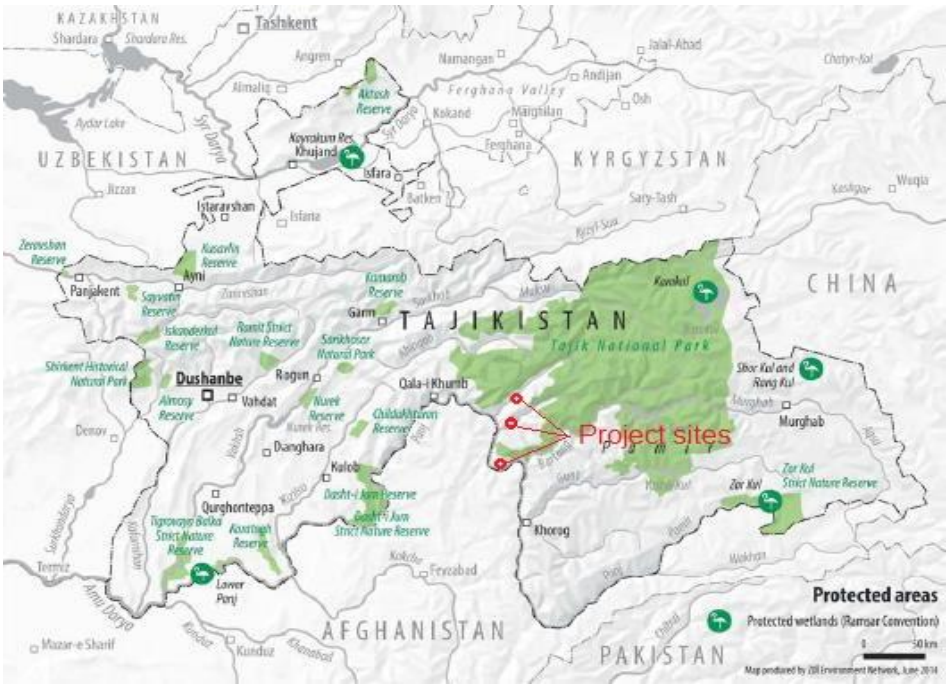


Figure 14. Natural Protected Areas of Tajikistan (Source: Center for preservation of Biodiversity

It is unlikely that the project activities will directly affect any habitat or species within the Park.

5.7 Socio- economics and cultural resources

The detailed description of socio-economics characteristics of project areas and affected communities provided in Social Assessment Report prepared on the basis of communication activities including survey and awareness campaign, undertaken in November -December, 2016. This sub-section provides brief information mainly regarding the natural resources used by local communities and environmental concerns associated with the Project.

5.7.1 **General profile**

The Vanj and Rushan are rural districts with total population of 34,267 and 26,652 respectively and very few enterprises operating. The project is implemented in three remote jamoats of Vanj district (Jovidon, Teharv, Yezgulem) and in Jamoat N. Dodhudoev of Rushan district. The population of these jamoats represents affected communities and main beneficiaries of the Project. Most of public communication activities were associated with these communities. By the location and natural conditions, the Project may be divided in three clusters:

1) Bridge 1,2,3 – are located in the Yezgulem valley
2) Bridge 4,5,6,7,8- The upper part of Vanj valley
3) Bridge 9 – Panj river valley

Economic activities: All proposed bridges are located in rural areas and most of the population is engaged in agriculture, which in many of cases is subsidiary farming with only small part of production for sale. However, it should be mentioned that a number of farmers are sufficiently success and sell significant amount of potato and fruits to the markets outside of their districts.

The agricultural lands are mainly gravitationally irrigated with small channels and plastic pipes. The seasonal mud-flows, avalanches and other natural phenomena often destroy the water supply facilities built by the local communities. As a result of mud-flow in July 2015 as many as 39 ha of irrigated land was flooded and damaged in Jamoat of N. Dodhudoev in Rushon district.

Photo 17 Collection of bushes as fire wood at mountain slopes ***(Yesgulem valley)***

People grow potato, tomato, beet, pumpkin, grains including wheat, barley beans. Apple and pear trees dominate in fruit gardens. All families keep a limited amount of cattle and graze it jointly by community's shepherds during warm seasons. The lack of fodder and severe winter conditions restricts development of stock rising. By agreement with forestry people harvest buckthorn, walnuts, medicine plants and fire-wood. Due to lack of trees, people often have to collect the dry grasses and small shrubs at the mountainous slopes together with roots (photo11). A very small percentage of people from affected communities have a job paid by the government. These are school teachers, health workers, forestry, jamoat's administration etc. Remittances from the family members working abroad, mainly in Russian Federation account for the major part of the family income in all interviewed communities .

Sub-component 2 covers two independent basins, Kizilsu/Yakhsu and Kafernihan. Floods No.1, 2 and 6 are situated in Kizilsu/Yakhsu basin and Floods No. 4 and 5 in Kafernihan basin.

Population in Vose and Kulob districts are mainly engaged in agriculture and trade. The total number of inhabitants in Vose and Kulob districts is 200,500 and 196,800, respectively.

Land use: The land use in project area may be divided into the several categories: (i) residential lands, (ii) agricultural lands, including gardens, forestry, and (iii) grazing areas . The major part of suitable land in the target jamoats is cultivated agricultural lands with about the half of lands occupied by gardens.

Table 8 The dominate types of Land in target jamoats of Vanj district

Type of use	Jovidon	Teharv	Yezgulem
	Occupied area ha		
Shrubs	67	74	14
Tugai forest	6	12	65
Crop land	168	570	2540
Gardens	152	147	80

Population in Vose and Kulob districts are mainly engaged in agriculture and trade. The total number of inhabitants in Vose and Kulob districts is 200,500 and 196,800, respectively.

The area of the Kulob district is 120,000 km^2. The main part of the region's lands consists of the floodplain lands of the Yakhsu River. Residential and industrial facilities are surrounded by the agricultural land on the area of 10,588 hectares.

Irrigated land – 8,255 ha, out of where are pastures – 2,333 ha

Industry is mainly based on cotton processing and light industry.

The area of the Vose district is 76,592 hectares. The main part of the region's lands consists of the floodplain lands of the Kizilsu and Yakhsu Rivers. Residential and industrial facilities are surrounded by the agricultural land on the area of 23,009 hectares.

Irrigated land – 19,379 hectares out of where are pastures 29,552 hectares.

Industry is mainly based on cotton processing and light industry.

Population in Qabodiyon and Shaartuz is mainly engaged in agriculture and trade. The total number of inhabitants in Qabodiyon and Shaartuz districts is 166,125 and 107,700, respectively.

The area of the Qabodiyon district is 108583.0 hectares. The main part of the district's lands is formed by the floodplain lands of the Kafirnihan River. Residential and industrial facilities are surrounded by the agricultural land including pastures on the area of 108,583 hectares.

Irrigated lands – 23,961ha, out of where are legumes (corn) - 4617ha, cotton -7,145ha, potato - 552 hectares, vegetables-1,486ha, gardens - 600ha, vineyards -760 hectares, fodder-1,030ha.

Industry is mainly based on cotton processing, light industry and lime production.

The area of Shaartuz district is 152,537.0 hectares. The main part of the region's lands consists of the floodplain lands of the Kafirnihan River. Residential and industrial facilities are surrounded by the agricultural land including pastures on the area of 108,583 hectares.

Irrigated land - 18,470 hectares, out which are leguminous (corn) crops - 5,140 hectares, cotton – 5,200 hectares, potatoes - 442 hectares, vegetables – 1,236 hectares, gardens - 72 hectares, vineyards - 55.8 hectares, fodder - 351 hectares.

Industry is mainly based on cotton processing and light industry.

The agricultural lands are mainly gravitationally irrigated with small channels and plastic pipes.

The money transfers from family members working abroad mainly in Russia provide most of family income in all surveyed jamoats of the project area.

Languages: Tajik is an official language in Tajikistan and a native language of all inhabitants of Vanj valley. All communities in the project area have a good command of Tajik. The communities of Yazgulam valley and Rushan district also have their native languages, - Yazgulemi and Rushani respectively. However, the writing system for these languages is not developed and they are currently being used only for domestic communication.

Religious: All population of the project area are Muslims. Residents of Vanj District are Sunni Muslims while population of Rushan District mainly relate to Shia Ismaili branch.

6 Anticipated Project Impacts and Mitigation Measures

This section discusses the potential environmental and social impacts that may occur as result of project implementation and proposes mitigation measures. It also describes the developed mitigation measures that aim at mitigating the identified impacts to the technically feasible minimum. The text distinguishes between the different project stages, the design, construction and operational phase of the Project.

Ultimately, all proposed measures for impact avoidance or mitigation that relate to construction will be incorporated into the bidding or contract documents thereby becoming binding elements of the construction and construction supervision contracts.

6.1 Screening Environmental Impacts and mitigation measures

Environmental impacts from the project can broadly be classified as those taking place during design, construction and further operation. The anticipated impacts are analyzed depending on type, scale and location, the sensitivity of the environment and the magnitude of the impacts.

By magnitude they may be divided into minor, and significant both positive and negative environmental impacts. An impact is significant if the project has the potential to affect an environmental component. Direct impacts are caused by a project activity, and occur at the same time and place and can be created during both project construction and operation. Direct impacts will be limited in this Project because the work is to be concentrated within the area of existing bridges and the alignments of the access roads. Indirect impacts, which may include growth-inducing impacts, are caused by a project activity, or the overall Project, and while they are later in time or farther removed in distance, they are still reasonably foreseeable.

Short-term impacts, like the noise and fumes associated with heavy equipment occur during road construction and are usually without long-lasting effects. Long-term impacts, on the other hand, could affect regional land use and development patterns and even mobility and migration.

Mitigation is recommended through strategic avoidance combined with monitoring. Site Specific EMP (SSEMP) will be required and prepared PSC. The detailed requirements for SSEMP content provided in sub-section 7.2.1.

The potential direct and indirect environmental adverse impacts associated with the proposed road projects are relatively minor in comparison with the benefits resulting from the construction. Identified environmental impacts from the Project during construction and operation stages are described in the following sections.

6.2 Pre-construction Impacts

The potential environmental impacts from the design studies will be associated with topographical, geotechnical, geological surveys and trial pits studies. Due to small scale of field works the impacts to environmental anticipated be negligible. The surveyor should however exercise extreme care when carrying out investigations in villages or close to cemeteries and should hold briefing discussions with the communities before initiating any works.

Mitigation: A design approach based on environmentally sound technical designs intended to reduce the physical impacts of potential works was adopted, specifically:

1. Minimizing the take of productive lands
2. Development of appropriate engineering solutions for drainage works
3. Slope stabilization as required by geological conditions
4. Appropriate embankment and river crossing designs
5. Definition and design of safety features appropriate to the mountainous terrain

Moreover, it is necessary to ensure that the designs prepared are efficient and appropriate to local conditions. Design should also consider:

a. Lining of downstream channels with rip rap, or other protective works.
b. Protection of bridges and stream channels for as far downstream as is necessary to ensure their safety;
c. Placing of drain outlets to avoid the cascade effect;

Generally the impacts to the environment during the design at the site will be minor, temporary and are reversible in nature.

6.3 Constructional impacts and mitigation

The impacts occurring as result of the construction activities and appropriate mitigation measures are discussed by environmental sectors as follows:

- Impacts to Landscapes
- Temporary Land Take and Loss of Production Areas
- Water pollution
- Erosion and Sedimentation
- Air Pollution and Dust
- Geological impacts
- Solid Waste Pollution
- Biological Diversity
- Noise and Vibration

- Destruction of Habitat
- Resources Use
- Cultural Resources
- Disruption of Utilities
- Safety

6.3.1 Impacts to landscape

The bridges areas are mainly mountainous, rural landscapes interspersed with small villages linked to the mountainous slopes, or located near the main rivers and at the alluvial fans of side tributaries. The main features of landscape are river channels with banks and temporary islands covered by diverse vegetation, gardens, agricultural lands, and hills with grazing areas. The high steep, rocky mountains covered by permanent snow and ice capes are well seen from any location. Natural landscape is a valuable factor in the inhabitant's perception and an important part of the ecological balance.

The existing bridges and the access roads are in bad condition, and generally do not contribute to the improvement of landscape. However, the construction of new bridges and access roads with demolition of old bridges may to some extent adversely disturb the existing landscape. The natural view may be damaged by the site cleaning, cutting of vegetation, earthworks, piling of excavated surplus material, rerouting of river channel and improper waste management. The erosion caused by improper earthworks, channel alteration and top soil storage may lead to gully formation.

Natural landscape is a valuable factor in the inhabitant's perception and an important part of the ecological balance. Therefore, the need of inclusion of the new bridges into the natural landscape is of great importance. A good integration of the access roads and bridges into the landscape provides psychological clearness of the road for drivers, while change of landscapes will promote traffic safety.

The design of the new bridges will improve landscape of the locations. Plantation of trees and bushes alongside the access roads will be an adequate mitigation measure. The Contractor shall avoid the disposal of surplus close to the access road alignment to protect landscape and nature.

Destruction of any crops, pastures, orchards and any other productive land will be avoided where possible.

6.3.2 Impacts on land use

Construction of new bridges and re-alignment of the access roads will require permanent acquisition of land. Some temporary land take will be required for various purposes during the construction phase, such as borrow bits (quarries) spoil heaps, stockpiles, construction yards, and construction camps. The duration of the take will vary depending on the required purpose but would in some cases be relatively short term, less than 6 months in others possibly over the full duration of the construction, 2 years. Table 5 shows preliminary estimate of lands to be acquired for different purposes.

Table 9 Estimated Land Take for the Project sub-component 1

Bidge No	The nearest settlements	Permanent Land take, ha				The temporary land take, ha		
		bridges	access roads	bank enforcement	Total	Construction site	Camps and facilities	Total
1	Andarbak	0,04	0,48	0,05	0,57	0,06	0,50	0,56
2	Andarbak	0,02	0,36	0,05	0,43	0,06		0,06
3	Vishharv	0,04	0,36	0,06	0,46	0,06		0,06
4	Udob	0,03	0,24	0,16	0,43	0,06	1,00	1,06
5	Chihoh	0,02	0,12	0,16	0,30	0,06		0,06
6	Teharv and Chihoh	0,05	0,3	0,3	0,65	0,06		0,06
7	Sed	0,04	0,25	0,1	0,39	0,06		0,06
8	Ardabak	0,02	0,24	0,12	0,38	0,06		0,06
Sub-total for Vanj district		0,26	2,35	1,00	3,61	0,48	1,50	1,98
9	Barrushon	0,02	0,72	0,2	0,94	0,06	0,50	0,56
Sub-total for Rushan district		0,02	0,72	0,2	0,94	0,06	0,50	0,56
Total		0,28	3,07	1,20	4,55	0,54	2,00	2,54

The land needed for the bridges construction will be identified and presented amongst the design documents as drawings. The impact on potential land use and current land use will be due to following project activities:

Construction of flood protection structures will not require permanent acquisition of land. Some temporary land take will be required for various purposes during the construction phase, such as borrow bits (quarries).The duration of the take will vary depending on the required purpose but would in some cases be relatively short term, less than 6 months in others possibly over the full duration of the construction, 2 years. Table 5 shows preliminary estimate of lands to be acquired for different purposes.

Flood protection structures will be reconstructed/rehabilitated on the places where they already exist or follow the lines where they were performed protection in the past. Land is not agricultural.

Table 10 Estimated Land Take for the Project sub-component 2

Flood No.	District	Permanent Land take, ha	The temporary land take, ha		
		Embankment	Construction site	Camps and facilities	Total
1	Kulob	1.70	0	0.50	2.20
2	Vose	2.10	0		2.60
3	Vose	0.60	0		1.10
4	Shaartuz	0,24	0	0.50	0.74
5	Kafernihon	6.20	0		6.70
Total		10,84	0	1.00	11,84

- Site clearing and grubbing;
- Sourcing of natural material for construction, i.e., borrow and quarry operations;
- Sitting of base camp and construction camps;
- Disposal of construction debris; and construction operations, i.e. movement of construction vehicles and equipment;
- Compaction of soil by movement of construction vehicles and equipment;
- Soil contamination at construction campsites and loss of productive soil.

The land required for ancillary activities as mentioned above would be quite small. Therefore, the magnitude of direct impact would be negligible. The affected land is not ecologically sensitive. Overall, there will be minor impact on potential land use and current land use.

No borrow area, construction camps, debris disposal sites will be located on productive or agriculture land. Movement of construction machinery and vehicles will be limited to construction and designated areas only, as far as possible. If the equipment and machinery are operating on temporarily leased land, barren land will be used and no productive or agriculture land will be used. Construction waste (debris) will be managed so as not to pollute land and water.

Upon completion base camp, construction campsites, and borrow areas could be reinstated to original condition on completion of the project. The access road alignments will be designed to minimize the requirement for additional land.

6.3.3 Quarries (Borrow pits)

Quarry sites will be identified during the design stage. In order to reduce impacts associated with quarry activities and borrow pits, contract documents will specify only licensed quarrying operations to be used for material sources. If licensed quarries are not available, the contractors will be responsible for setting up dedicated crusher plants at quarry sites approved by the PIU. Barren areas or areas of low productivity value will be sought during the design phase to ensure the preservation of valuable land. Further, for all borrow sites, contractors will ensure that they acquire appropriate environmental permits from CEP before sourcing the material.

The contractors will be required to prepare a plan to identify the sources of materials for the construction. The plan will be agreed with PSC and submitted to PIU, which will ensure that the plan is implemented.

The materials and spoil plan should show the location of any borrow pits to be used and the measures to be taken to rehabilitate these pits upon finalization of the Project. PIU will approve and monitor implementation of the plan. Prior to the start of the construction, the contractor should also prepare a borrow area operation plan indicating the borrow area, access and departure road, proposed area for extraction of material, and geological cross section.

The following good practices for excavation, material storage and transportation are recommended:

- top soil must be stored separately, covered and used for re-vegetation of borrow area or slopes at the construction site;
- material has to be excavated only in designated areas in coordination with PSC;
- excavated material has to be stored at designated areas in coordination with PSC;
- excavated material should not be stored in the vicinity of open water courses to prevent siltation or obstruction of water ways;
- the contractor has to wet unpaved routes which go next to settlements to suppress dust; pollution when hauling material from borrow pits;
- fine material (sand) has to be covered with tarpaulin to prevent dust generation and contamination of transport roads;
- aggregate load has to be wetted by the contractor to reduce potential dust emissions; trucks must not be overloaded to prevent road accidents
- the safe slope angle of the borrow pit should not exceed 45° with the ratio of height to founding of 1:1

In addition, Contractors should ensure that quarries and crusher plants are:

• located at least 300 meters from residential areas to prevent noise and dust impacts;
• located outside of agricultural land; and

• where possible located on the lands which are not currently in use.

To mitigate the impacts from quarry sites and borrow pits, it is recommended that in addition to the preparation of the materials and spoil plan, that bid and contract documents specify that (i) pit restoration will follow the completion of works in full compliance all applicable standards and specifications; (ii) arrangements for opening and using material borrow pits will contain enforceable provisions; (iii) the excavation and restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the project supervision consultant (PSC).

Site supervision by PSC will be required before final acceptance and payment under the terms of contracts; (iv) topsoil from borrow pit areas will be saved and reused in re-vegetating the pits to the satisfaction of the PSC. Extraction of construction material from the riverbed should be avoided to prevent erosion and destruction of the river banks including alongside infrastructure (roads, settlements).

6.3.4 **Impacts to surface water and hydrology**

The project bridges cross a number of rivers and could affect the surficial runoff flow pattern. The proposed crossings comprise two large rivers Vanch and Yezgulem, six of their smaller tributaries and a small tributary Pyanj river, requiring the construction of 9 bridges and some other drainage features. These works will incorporate a variety of other actions that may affect surface water hydrology, including short lengths of river training and channelization, scour protection, channel lining, apron provision, etc.

The project has the potential to create some short-term and minor adverse impacts on water quality including, (i) an increase in silt loads at bridge sites; (ii) construction materials such as gravel, sand, and fill being washed out into local streams and rivers during rain; (iii) hydro-carbon leakage and/or spills at storage and mixing plant locations; and (iv) discharge of waste water and sewage from work camps to local streams and rivers, or percolation through seepage and contamination of the local water table

The potential locations of water sources for construction works will be determined at the design phase.

The primary probable types and sources of water pollutants are:

- Fuel and oil spills from vehicles, storage tanks, and machinery;
- Suspended sediment from earthworks in catchments of water courses;
- Wash waters from rock crushing plant;
- Human wastes from construction camps, and indiscriminate sanitation practices;
- Indiscriminate dumping of domestic and construction wastes;
- Chemical wastes from use and storage of chemicals during construction activities, or solvent washdown of equipment (asphalt batching plant);
- Wash waters containing oil or detergents from cleaning equipment

The most damaging single event could however be a rockslide or landslip caused by construction works that either partially or completely blocks a river course. As noted earlier the dumping of excess fill material, blast debris, etc in a watercourse may also cause localized flooding.

Contractor shall not discharge any matter into any waters except with the permission of the PSC and regulatory authorities.

Contractor shall ensure that all existing stream courses and drains are kept free from debris and materials arising from the works and shall protect watercourses, waterways, ditches, canals, drains, etc. from pollution, silting, flooding, or erosion as a result of the execution of the works.

- Water courses, rivers, streams, drains, canals and ditches within and adjacent to project works sites will be protected from pollution, silting, flooding or erosion as a result of project activities;
- Streams, rivers and watercourses (including drains) within and adjacent to the work sites will be kept free from debris and any material or waste arising from project works;
- Sediment controls such as silt fences, cofferdams and silt barriers and other devices will be included in the engineering design to prevent both siltation and silt migration during project activities in the vicinity of rivers and streams;
- Discharge of sediment laden construction water or material (including dredged spoil) directly into surface waters will not be permitted. All such construction water will be discharged to settling ponds or tanks prior to final discharge;
- Water used for dust suppression purposes will be discharged to specially constructed settlement tanks allowing for sedimentation of particulates. After settlement the water may be re-used for dust suppression and rinsing of vehicles and equipment;
- Spoil and material stock piles will not be located near waterways, rivers or streams;
- All storm drainage will be adequately contoured, sized, and lined where necessary;
- Construction and work camps will be equipped with sanitary latrines that do not pollute surface waters. A waste management plan, covering all liquid and solid waste, will be prepared by the contractor and submitted to the PIG;
- Discharge or deposit any material or waste into any waters except without the approval from the relevant regulatory authorities will not be permitted; and
- All water, waste-water and other liquids used or generated in execution of project works and activities will be collected and disposed in an approved manner in an approved location and will not cause either pollution or nuisance

Interference with natural water flow in rivers, water courses or streams within or adjacent to work sites, and also prevention of abstraction from, and pollution of, water resources in the project sites will not be permitted;

All temporary works not required for the operation phase of the project, such as stream diversions, shall be returned to their previous state or better, as soon as possible after

completion of the works. In the event that flooding or other damage is caused by the Contractors activities, the Contractor would be required to carry out remedial measures to restore the affected area to its previous state, or better.

The condition of the rivers, tributaries, temporary stream diversions and surrounds should be monitored, particularly during and after rainfall storm events, to ensure that unexpected changes, or flooding has not occurred.

6.3.5 Construction activities in drinking water catchments

Construction activities carried out in the stream flow or catchments of drinking water sources shall consider to the following mitigation measures:

- Informing the affected population that works will be carried out, and that water quality may be affected;
- Taking all possible steps to prevent the entrance of pollutants into the drinking water source;
- Terminating the water supply at the collection point at times when pollution is inevitable, to prevent consumption of polluted water.

6.3.6 Fuel and Chemical Storage and Handling

The project implementation may require application of various chemicals that could impact water and air quality and consequently human health in the case of leak or improper handling. Hydrocarbons, petroleum products to be used in bitumen mixes, and other chemicals will be stored in secure and impermeable containers or tanks located away from surface waters, the storage areas will require a concrete base or other forms of containment that will allow any spills to be contained and immediately cleaned up.

Fuel transport, storage and handling shall be in accordance with the Republic or International Standards. At minimum, the following safety measures should be adapted:

- Impermeable bunds for fuel storage tanks, with storage capacity greater than 110% of the storage tank volume;
- Well maintained tanks, and fuel transport vehicles, with regular inspections and maintenance as required;
- Daily inspections, and reconciliation of volumes on a daily basis;
- Emergency fuel spill containment and recovery equipment;
- Training and drills in fuel spill containment and recovery
- Fuel storage tanks shall be located away from rivers and streams. Re-fuelling operations shall take place away from streams and rivers.
- Chemical storage will be bunded, away from streams and rivers, and housed in an appropriate building;
- Correct firefighting apparatus will be provided for each chemical stored;
- Material Safety Data Sheets shall be kept at the storage areas, and the site office;

- Containers must be clearly labelled.

6.4 Waste management

The project implementation will cause a generation of a certain amount of different types of waste. The improper waste management can contribute to air, water and soil pollution, accelerate erosion and damage natural habitats. The waste generated by the Project implementation may be divided in the following categories:

a. Inert construction material;
b. Domestic waste;
c. Hazardous and toxic waste

6.4.1 **Inert Constructional Materials**

Inert construction materials include surplus soil (tips) and aggregate and other materials stockpiles. Surplus and construction material stockpiles will be susceptible to erosion, particularly during the rains and re-suspension of dust during the dry seasons.
Inert natural materials may (e.g. soil, rocks) be disposed of in the project area at the discretion of the PSC, and with due regard to all protection measures relating to solid waste. In such cases the materials disposed of should match the existing material, and should not cause any adverse environmental impacts.

Disposal or storage of solid materials is not permitted in or close to the following areas:

- Villages and residential areas;
- Cemeteries;
- River/stream beds, banks or slopes directly above river/stream beds;
- Cultivated lands;
- Pastures;
- Native fauna, including trees, shrubs and grasslands.

Topsoil and fill stockpiles shall be located in areas identified as suitable by the PSC. Stockpiles shall be made with stable side slopes to prevent excessive erosion of material during heavy rains. Stockpile surfaces shall be compacted to prevent erosion during heavy rains. The Engineer may require the construction of compacted earth bunds around stockpiles to contain eroded materials.
Surplus material originating from earth works has to be disposed properly without adverse impact on landscape and nature. Basically, this material could be used for noise protection walls and stabilization of slopes or as embankment material if suitable. It is also suggested to use surplus material as fill material for re-cultivation of mine galleries or open pit mines. Reuse for the access road construction should also be taken into consideration if the material is suitable.
Disposal sites and haul routes will be identified and coordinated with local officials. Disposal on existing landfills would not be recommended if the volume of the excavated material will exceed existing capacities.

6.4.2 Disposal of construction camp and other domestic wastes

Operation of construction camps and other facilities may generate significant quantities of liquid and solid domestic wastes. Improper handling and disposal of domestic waste may cause health problems, odor, air and water pollution.

The Contractor should provide adequate numbers of clearly labeled bins or skips for collection of wastes in the construction camps, and construction yards. Domestic and construction wastes shall be removed from the site and disposed of to a licensed sanitary landfill, or a similar landfill approved by the PSC.

6.4.3 Disposal and Transportation of Hazardous Waste

It is not expected that project implementation will generate significant quantities of hazardous or toxic waste. However, construction staff will be trained and informed of the hazards of the chemicals stored, as well as trained and drilled in the handling of emergency spills, fires, and incidents.

Reactive or hazardous materials (if any) shall be disposed of by the Contractor in accordance with the laws, regulations and guidelines currently in force in Tajikistan. If no such laws are available, the Contractor will dispose of these materials in accordance with international standards (ISO) or as directed by the Engineer.

Transport of hazardous chemicals / fuel shall be in accordance with the National or International Standards. At minimum, the following safety measures should be adapted:

- Well maintained transport vehicles
- Emergency fuel spill containment and recovery equipment on board vehicles;
- Regular inspections and maintenance as required;
- Daily inspections of transport vehicles and their tankers, and reconciliation of on a daily basis;
- Reporting of spills, within a reasonable time frame

6.5 Erosion and Sedimentation

Soil erosion and landslides are significant problems in Tajikistan. Erosion is a widespread natural phenomenon due to the relief and climate of the country accelerated by poor land management practices, such as the cultivation of land on steep slopes; excessive cuttings of forests, shrubs and bushes including wind shelters; overgrazing; and improper irrigation.

The Project may have potential for soil erosion and increased sedimentation. During construction there are a number of potential sources of erosion and sedimentation and activities that may result in increased run-off and could lead the loss of soil. Those include:

I. Site clearance and work on unprotected surfaces;

This will include removal of old bridges structures, boulders and rocks and in some cases vegetation, soils and surplus cut material. Site clearance not only exposes bare soils in the cleared area to erosion but also prompts the formation of new erosive channels and gullies that will have the capacity to cause damage (by erosion and possibly land movement) to lands outside of the cleared area. Excessive steepness of cut slopes and modification of water flows can result in landslides. Whereas side tipping of spoil material from road cuttings can kill vegetation and add to erosion and slope stability problems. Erosion might result in pollution and sedimentation of the river.

II. River diversion

It may be necessary in a number of cases for temporary stream diversions with modification of water flows to be put in place during the construction activities. Such temporary redirection of flows, or changes to drainage, can result in flooding of adjacent lands, and destruction of property, crops, and the natural environment if badly engineered.

The erosion may accelerate (i) instability of spoil stockpiles; (ii) slope overloading and resultant failure; and (iii) alteration of drainage pattern. However, soil erosion and sedimentation will be limited to carrying out activities at and near bridge locations.

Proposed mitigation: In areas where productive lands may be directly or indirectly threatened, the Contractor shall implement erosion protection measures, particularly on vulnerable soils, as soon as is practically possible following disturbance of the earth. Erosion protection measures may include silt fences, hay bundles, temporary drainage channels, temporary energy dissipation measures, etc.

Where temporary stream diversions for the construction of new bridges are required they shall be carried out so that no additional erosion takes place. It is necessary to ensure that the designs prepared are efficient and appropriate to local conditions. Measures proposed include:

- Lining of downstream channels with rip rap, or other protective works.
- Protection of bridges and stream channels for as far downstream as is necessary to ensure their safety;
- Placing of drain outlets to avoid the cascade effect;

The Contractor shall repair any damage occurring as a result of erosion and sedimentation that is related to the construction of the Project. The Contractor shall minimize damage to existing vegetation, particularly in steep areas, or on vulnerable soils.

Stockpiles of erodeable materials shall be built and maintained to prevent erosion during heavy rains. This may include covering, low slopes on the sides of the stockpiles, and compacting of the surface of the stockpiles. Sediment control devices such as silt fences, earth bunds, lined drainage channels, hay bales, etc shall be employed to control runoff, erosion and sedimentation.

Environmentally sound disposal of cut material and reuse. Any trees removed as part of the construction of the bridges and access road will be replaced. Additional trees may be planted as part of the business development along the road such as a nursery or fruit tree farm to provide additional food for the communities or as a commercial product for sale to other communities.

With care taken for sediment and erosion control, topsoil should be minimally affected.

6.6 Air Pollution and Dust

Air quality impacts will be short term in specific locations, as the proposed project works, quarries and borrow pits are generally intermittent. These sites can however be selected and be placed in an area where it can cause the least impact on human and ecologic receptors. Site conditions are such that dust is unlikely to be blown long distances, and will settle quickly, resulting in only localized zones of impact.

Significant impacts will occur therefore only if stationary point sources such as stockpiles, crushing, concrete batching are located adjacent to sensitive sites and in the event that that large volumes of construction traffic or machinery operate continuously in close vicinity to sensitive areas. During construction, trucks and heavy equipment may disturb the topsoil, which could pose dust problems for the workers and nearby residents.

Proposed mitigation: In operating equipment, the Contractor shall utilize all practical methods and devices as are reasonably available to control, prevent and otherwise minimize atmospheric emissions or the discharge of air contaminants. Equipment and vehicles that show excessive emissions of particulates due to poor engine adjustment or other inefficient operating conditions shall not be operated unless corrective measures are taken.

The Contractors methods of handling cement powder shall include means of eliminating atmospheric discharges.

Burning of waste materials resulting from the clearance of trees, bushes and combustible materials shall not be permitted within the vicinity of any sensitive areas. No burning of debris or other materials will occur on the site without permission of the Engineer.

Storage, use and disposal of organic solvents shall be carried out in manner to minimize emissions of the solvents. Solvents shall be recycled where possible. This particularly applies to the pavement batching plant, and all machinery and tools used for handling bitumen.

Exhaust emissions - No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the PSC. Construction equipment shall be maintained to a good standard and fitted with pollution control devices regularly monitored by the Contractor and PSC

Dust abatement: During the works the Contractor shall carry out reasonable and practical measures, wherever and as often as necessary, to prevent dust that has originated from his operations from damaging any natural habitats, affecting the health of any persons, or creating a traffic hazard in the vicinity of operations. The Contractor shall maintain and operate all plants, machinery and vehicles in manner to minimize fugitive dust emissions. This specifically applies to batching plants, quarries, rock crushing and screening plants.

Construction site access roads shall be maintained in such a way as to minimize fugitive dust emissions. Water shall be lightly sprayed on exposed ground during dry and windy periods, or as necessary. Speed restrictions shall be enforced for construction vehicles operating on unsealed roads.

The Contractor shall ensure and that material stockpiles shall be located in sheltered areas and be covered with tarpaulins or other such suitable covering to prevent material becoming airborne. In addition, there should be effective control of fugitive dust during delivery of materials and collection of waste.

The location of stationary sources of dust will be away from sensitive sites (preferably to the leeward of the prevailing winds), so that dust does not impact the sensitive sites. Plants and habitats smothered by dust shall be washed down.

All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s). Hard surfaces will be required in construction areas with regular movements of vehicles.

The Contractor will be liable for any damages resulting from dust originating from his operations.

6.7 Impacts on biodiversity

Construction work will directly cause minor degradation of the local ecology through the clearance of small areas of vegetation (ground cover) at major work sites and ancillary sites. A short-term impact on ecology along is likely to occur in and around the quarry sites, material stockpiling areas and worksites during the construction period due to minor vegetation clearance (not trees). A permanent but relatively minor impact on ecology is likely to occur due to the realignment of the access road sections.

Mitigation Measures: The contractor is required to minimise, where practicable, the overall impact from clearing vegetation for construction, proposed by:

- Avoiding all vegetated areas;
- Implementing remedial measures including replanting of native or food producing plants following completion of all construction works.

Vegetative cover stripped from the locations described above will be kept for landslide and slope protection. Contractors will be responsible for putting new vegetation in removal sites. Construction vehicles should use temporary roads constructed for the purpose to minimize

damage to agricultural land and local access roads. Where local roads are used, they will be repaired to their original condition after the completion of work. Compaction around trees will be performed carefully to avoid the damage of tree “drip-line”. Workers will be trained regarding nature protection and the need to avoid falling trees during construction. Native species should be used where possible for bio-engineering slope protection measures, as this would ensure their ongoing survival, and avoid the potential problems of introduced species.

Contractors will be responsible supplying appropriate fuel in the work camps to prevent fuel-wood collection.

6.7.1 Fauna

The potential impacts from construction worker camps are poaching of animals and edible birds of the locality in spite of prohibitions.

The contractors’ environmental health and safety manager will be responsible for providing adequate knowledge to the workers regarding the protection of fauna. Worker’s contract agreement will include the provisions of prohibiting poaching animals as well as penalties for any incident against this agreement.

6.7.2 Fish, Fisheries, and Aquatic Biology

The main potential impacts to aquatic flora and fauna in the watercourses from the proposed project are increased suspended solids from earthworks erosion and bridge construction, sanitary discharge from work camps and hydrocarbon spills. Bridge construction will be scheduled in such a way to avoid adverse impact on fishery and aquatic biology.

6.7.3 Noise and Vibration

Noise and vibration can disturb sleep and relaxation, interfere with an individual‘s ability to perform complicated tasks, be a source of annoyance, influence mood and stress levels, and otherwise detract from the quality of life. Economic effects of noise include impacts to property values, impaired health, and lowered working efficiency. Noise levels within the Project corridor are generally low, especially in the mountainous areas where traffic volumes are lowest.

The construction of the bridges and access roads will result in generation of noise and ground borne vibration due to work of construction equipment, especially heavy machinery and blasting of rocks. Blasting events will have the most dramatic impact they are usually infrequent and of a very short duration. Noise from construction equipment is usually more problematic.

Construction noise is generally intermittent, attenuates quickly with distance, and depends on the type of operation and location and function of equipment. The most sensitive areas within the project area are schools, medical centers and housing areas.

Vibration during the construction period will also be a significant consideration, particularly vibratory rolling of the granular pavement layers, or blasting, or diversion of abnormal

amounts of public traffic onto usually slightly trafficked side roads. Some of the existing structures close to the road are of mud-bound construction or otherwise of poor quality, and may be damaged by vibration.

All reasonable measures should be taken to limit noise generation to the Tajikistan's and World Bank Group tolerance limits. Construction machinery shall be fitted with muffling, and other noise control devices. It is similarly expected that all machinery will be maintained to ensure that there is minimal noise generation under normal operation. Machinery that is not in use, shall be shut down, or throttled down to prevent excessive noise. Use of construction equipment and vehicles should be limited to acceptable time when they have the least impact. Construction vehicle speeds near and within villages will be limited to < 20 km/h;

Noise barriers should be installed if construction (or operation) noise levels exceed the national standards or cause nuisance or interfere with school or health service provision activities. Generators shall be housed in appropriate buildings and located away from sensitive sites, such as villages. According to EHS Guidelines of the World Bank Group which the sensitive receptors such as residential, institutional, and educational areas should have noise level of 55 dB(A) from 7AM to 10PM (daytime) and no greater than 45 dB(A) from 10PM to 7AM (nighttime).

Vibration :Where possible, the Contractor shall limit the use of vibration compaction in villages, and use alternate methods where possible to meet the specifications;

Blasting: The blasting is not anticipated to be widely applied during the project implementation. However, it may be required in the need of excavation of rocky material at some of the construction sites for bridge or access road construction.

The Contractor shall implement safety measures to prevent the injury of the general public and his workers. This includes measures for the proper storage and handling of explosives, advance warning of blasts, evacuation of danger zones, provision of protective equipment to workers etc. The Contractor shall employ any suitable blasting techniques such as pre-shear and others as specified to reduce the impacts of bulk blasting. This includes measures to limit the amount of the fly rock during blasting process. The Contractor shall coordinate the timing of blasts with local villages to determine the most appropriate times for blasts.

During any blasting activities, local community will be informed in advance on detonation schedule. Blasting will be held only during day time and should be carried out not using high powered explosives. Use of low volume charges will reduce the potential for vibration induced damage to structures. In the event of damage proven to be due to the contractor's activities, owners of structures will be fully compensated. Blasting close to the villages should be avoided as much as possible.

6.7.4 **Geological Impacts**

In some circumstances activities such as blasting, compaction, excavations, cuts and embankments can promote adverse effects, including rockslides and landslides. Landslides and other slope failures are expensive to correct, and may result in road closure over extended periods and cause significant damage and drainage related problems beyond the site limits. In most cases, slope failures result from a combination of poor design and poor construction practice.

The project will use local geological resources such as suitable rocky material and sand. However, impact to geological resources is anticipated to be insignificant due to abundance of these resources in project area.

Mitigation measures:

It was therefore imperative that the design minimizes such risks. The design concept adopted should be based on three approaches:

(i) Reducing the potential for erosion and destabilization of materials by avoiding concentration of runoff whenever possible. Effective management of construction activities that will avoid disturbance of natural ground outside the area to be used for construction and prevent runoff discharging to unprotected natural ground other than into the river will also be required.

(ii) Protection of cut and embankment slopes as required

Specific examples of erosion protection measures for cut slopes that are proposed include:

- Trimming of slopes to remove irregularities;
- Removal of loose materials and if necessary removal of disturbed materials and their replacement with rip rap;
- Removal of unstable rock masses;
- Use of secure gabions or bitumenized jute netting with grass planting to secure the slopes as required and where possible;

(ii) Provision of slope stabilization measures in areas prone to slope failure.

The different types of stabilizing measures proposed are:

- Rock bolting and anchoring
- Rock nailing
- Galvanized netting
- Galvanized netting and shotcreting
- Reinforcing and replacing by shotcrete or cyclopean concrete

It should be noted however that some aspects of the road design cannot be finalized until construction, i.e. following exposure of the earth/rock. Accordingly, it is imperative that the

PSC and the Contractor have suitable qualifications and experience of constructing roads in difficult terrain.

6.8 Resource Use

There are a range of resources that will be required for the construction of the bridges and access roads. The extraction, processing and transport of these resources to the site can have impacts on the project area and can affect its regional availability depending on the scarcity of the resource.

- Rock and aggregates: Rock and aggregates of sufficient quality are locally available. Finer aggregates however, are not readily available, and will need to be manufactured (crushed) from course aggregates. While there is no shortage of suitable rock, the gaining and processing of the rock to design standards may incur potentially significant noise, dust, and water pollution impacts, that may require management.
- Cement and Bitumen: It is understood that cement and bitumen will be imported to the Region and transported to the site in bulk by heavy vehicles. Therefore, impacts would mostly be associated with transportation. Steel and bridge parts; and other components will also be imported to the site from outside the region.
- Water: It is expected that the Contractor shall obtain water supplies from the side rivers, or from the Vanj and Yezgulem, Dakhana, Yakhsu or Kafernihan rivers as required. It is considered unlikely that rates of uptake will affect the flow rates of the rivers but the Contractor should take care not to gain water from tributaries or rivers with low flows. He will need in particular to ensure that no adverse impacts are imposed on village water supplies, or other water users.
- Food;:Food supplies in the project area are already scarce. Additional food requirements to support construction crews could exacerbate winter food shortages in the villages. Clearly this situation would be unacceptable, and may be necessary for Contractor to import to the site sufficient food to supply workers under his employ

Mitigation: The Contractor shall prepare and submit to the PSC, Environmental Management Plans providing provisions for quarry sites, rock crushing, productions of fines, batching plants, washing plants etc., including details of the following:

- Approximate throughput required of each resource;
- Activities to occur at each plant/site, e.g. operations, storage, etc;
- Types and volumes of product at each plant or quarry;
- The planned treatment, handling and disposal of all waste types;
- Plans for rehabilitation of the quarry sites, or plant sites following use.

Water

Water use should be agreed on with the relevant authority; the Vanj River, Yezgulem river, Dakhana, Yakhsu or Kafernihan Rivers and other tributary rivers should be an adequate source, but care should be taken not to interfere with local supply. Where interference with local supply is unavoidable, consultation with affected parties and communities should be undertaken to ensure their needs and requirements, with regard to water supply, are met and to prevent significant detrimental effects impacting upon the resource.

6.9 Impacts to Cultural Resources

There is no evidence of existing cultural sites, apart of cemeteries. The reallocation of several graves may be required for construction of Bridges No 2 and No 3.

Mitigation: Should any unaccounted graveyards or burial sites be found, religious authorities will be contacted immediately. Should any archeological or valuable cultural resources sites be located during the survey, an archeological inspector (s) will be present during the construction phase to ensure adherence to Chance Find Procedures and other limitations. This will probably require a suitably qualified person and professional equipment, vehicle and driver for the duration of the construction period; community involvement is also necessary.

Excavations and other activities prescribed by the Chance Find Procedures developed for the project, will be carried out by the construction Contractor under a contract variation. The Contractor will supply his own resources in this instance.

6.9.1 **Occupational Safety and Health**

Construction sites are potentially dangerous, and serious accidents frequently occur, particularly if safety procedures are not implemented. The construction of the bridges will involve a number of activities that are particularly high risk, such as blasting; use of heavy machinery; earthworks on steep potentially unstable slopes and construction traffic. This is a particular concern due to the remoteness of some of construction sites from hospital facilities at Vanj, Kulob, Vose, Shaartuz and Qubodiyon .

The project's construction phase can cause a range of health and safety impacts.

The main impacts on health and safety are associated with (i) risks from construction work (noise, risk of injury), (ii) facilitation of transmission of communicable disease; (iii) contamination of local water supplies; and (iv) traffic safety issues.

The Contractor shall comply with the Occupational Health and Safety (OH&S) laws of RT, or/and the Contract shall include OH&S specifications and conditions based on international standards. The Contractor shall be responsible for any safety risk to the public, and may be held liable for any injuries caused as a result of his negligence to any member of the public.

The Contractor shall employ trained first aid staff. The numbers of these staff, and levels of training will be detailed in the Contract. The Contractor shall ensure, and be responsible for the adequate training of all personnel in the safe use of equipment and techniques.

A Health and Safety Plan shall be prepared by the Contractor to manage worker safety.

The Plan shall include the following items:

(i) Safety Training Program.

A Safety Training Program is required and shall consist of (i) Initial Safety Induction Course. All workmen shall be required to attend a safety induction course within their first week on Site.

Periodic Safety Training Courses.

Periodic safety course shall be conducted not less than once every six months. All Subcontractor employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the contract works. Training courses shall be delivered for all workmen on the Site and at all levels of supervision and management.

(ii) Safety Meetings.

Regular safety meetings will be conducted on a monthly basis and shall require attendance by the safety representatives of subcontractors unless otherwise agreed by the PSC. The Engineer will be notified of all safety meetings in advance. The Engineer may attend in person or by representative at his discretion. The minutes of all safety meetings will be taken and sent to the Engineer within seven (7) days of the meeting.

(iii) Safety Inspections

Safety Inspections. The Contractor shall regularly inspect, test and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, shall be repaired or replaced immediately.

(iv) Safety Equipment and Clothing.

Safety equipment and protective clothing are required to be available on the sites at all material times and measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing, and all construction plant and equipment used on or around the Site shall be fitted with appropriate safety devices. These shall include but not be limited to:

1. Effective safety catches for crane hooks and other lifting devices, and

2. Functioning automatic warning devices and, where applicable, an

(iii) Valid test certificate, for cranes and hoists.

To avoid health and safety impacts the Contractor shall conform to the following:

Due precautions shall be taken by the Contractor to ensure the safety and security of his staff and labor to ensure that medical staff, first aid equipment and stores, sick bay and suitable ambulance service are available at the camps, housing, and on the Site at all times

throughout the period of the Contract and that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

The Contractor shall report to the PSC details of any accident or incident pertaining to the security of its personnel, equipment, the site, its camp or the completed Works as soon as possible after its occurrence. The report shall be based on a detailed investigation by the Contractor of the event and provide particulars of what occurred (with explanatory sketch as necessary), who was involved (including names, and affiliations of such persons), what caused the incident, when the incident occurred (time and date), where the incident occurred and why the incident occurred. In addition, the report shall fully describe what means and measures the Contractor shall take to prevent the future occurrence of such incidents.

In the case of any fatality or serious injury, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means.

The Contractor shall at all times take the necessary precautions to protect all staff and labor employed on the Site from insect nuisance, rats, and other pests and reduce the dangers to health and the general nuisance caused by the same. The Contractor shall provide his staff and labor with suitable prophylactics for the prevention of malaria and shall take steps to prevent the formation of stagnant pools of water. He shall comply with all the regulations of the local health authorities in these respects and shall in particular arrange to spray thoroughly with approved insecticide all buildings erected on the Site.

Such treatment shall be carried out at least once a year or as instructed by the Engineer. The Contractor shall warn his staff and labor of the dangers of bilharzia and wild animals. In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders, and requirements as may be made by the government or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

The Contractor shall also be responsible, to the extent required by the local regulations, for making any arrangements with regard to burial of any of his local employees who may die while engaged upon the Works. The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of his staff and labor. Save insofar as the Contract otherwise provides, the Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labor, employed for the purposes of or, in connection with the Contract, including all fencing, water supply (both for drinking and other purposes), electricity supply, sanitation, cookhouses, fire prevention and fire-fighting equipment, air conditioning, cookers, refrigerators, furniture and other requirements in connection with such accommodation or amenities. On completion of the Contract, unless otherwise agreed with the Employer, the temporary camps/housing provided by the Contractor shall be removed and the site reinstated to its original condition, all to the approval of the Engineer

The Contractor shall supply all safety materials, protective clothing (including provision of protective masks to workforce in all areas where fugitive emissions are potentially significant), and emergency vehicles, etc. for the project.

The contractor will ensure that proper temporary road signs and markings will be employed when required, e.g. during road diversions. Footpaths and roads will be kept free of debris, spoil and other material at all times.

6.10 Operational Phase

The predominant operational issues concern maintenance of bridges, and accidents (spills of hazardous chemicals / fuel structures damage and erosion of flood protection infrastructure and river bed erosion) road safety, maintenance of flood protection).

Vehicle emissions: The existing high air quality of the project area, together with the relatively low volume of traffic expected on the road section suggest that vehicle emissions as well as will not be a significant issue in the foreseeable future.

Upon the completion of the main construction activities, the Contractor will have a defects liability period/phase on site during which maintenance of the road will become very important. During this period, the PIU representative on site and a responsible from PSC will be in charge of maintaining the implementation of the EMP. The Head Office of the PSC will keep on advising on critical issues upon the requests from Site during the defects liability period. It is expected that during the close coordination and studies in the construction period Clients representative will have gained experience and knowledge to monitor the EMP progress at a later stage.

It is anticipated that routine maintenance, could include the following activities:

- Maintenance of the pavement surface, road signs, painted lines, and other road furnishings;
- Cleaning bridges and channels of litter and other solid waste
- Maintaining cuts and embankments including rehabilitation earthworks;
- Maintaining planted vegetation, and other slope protection works.
- Generation of Solid Waste (Solid waste from any of these activities shall be disposed of appropriately).

6.11 Road Safety

Traffic safety of the project bridges and access roads will be improved. Conflicts between different forms of transport will be reduced by the improvement of shoulders and improved signage will be provided at intersections and bridges.

The improved access provided by the completion of the new bridges between could potentially affect the public health of the villagers, as well as visitors to the area, through traffic related accidents and the spread of communicable diseases. Road traffic incidents such as spillage of toxic chemicals or fuels may have significant impacts on local villages, as well as villages located downstream of the project area

Road Kills: While livestock are more visible and more likely avoided during daylight hours, stray animals will not be easily seen at night. On unlit roads livestock represent an additional hazard to road users. They are also a significant economic asset to their owners and communities. Associated impacts may also result in casualties in the vehicles.

Mitigation Measures: Injuries or loss of life have major social and economic consequences for affected families and communities. All practical measures are therefore required to minimize loss of life and injury from road traffic accidents.

Proposed measures include:

- Speed control and traffic calming, such as speed bumps, through villages;
- Speed control and signage, railings etc at dangerous sections of roads, e.g. bends, bridges etc.
- Safety barriers and verge widening in some sections.
- Measures are required to minimize road kills of domestic (and native) animals on the road include:
- Proposed speed limitations in areas where animals graze;
- Caution signs for livestock crossings;
- Training of drivers and drills in fuel spill containment and recovery.

Road safety aspects have been incorporated into the road design. They include:
Speed control and traffic calming, such as speed bumps, through villages;
Speed control and signage, railings etc at dangerous sections of roads, e.g. bends, bridges etc.
Safety barriers and verge widening in some sections.
Given the anticipated low volumes of traffic on the road, the above road safety measures are considered appropriate. In the event of serious accidents on the road resulting in physical damage to any parts of the road safety network, repairs should be undertaken with immediate effect.

7 Public Communication

7.1 Public Hearing

Public Communication activities as part of IEE process started from the early stages of the project and included stakeholder participation and consultations to help EA achieve public acceptance of the Project. Stakeholder consultations were performed in the district governor's offices and a number of small settlements nearby the proposed bridges. Representatives of PIU including Environmental Specialist attended the project area and conducted public meetings with focus groups in all affected communities (Table 6). Focus groups of about 50 people each in general proportionally represented the population of villages by gender, age and occupation.

Photo 18 Public Consultations in Jovidon jamoat

Table 11 The project sub-component 1 affected communities

	Affected community				
Nearby Bridge No	District	Jamoat	Village	Households	People
8	Vanj	Jovidon	Bunai	222	2021
8			Ardobak	13	152
7		Teharv	Sed		378
4,5,6,7			Shabru		233
4,5,6,7			Udob		977
5,6			Teharv		747
5,6			Chihoh		639
5,6			Ravgada		250
2,3		Yazgulam	Vishharv	98	735
2,3			Andarbak	128	1052
1,2,3			Jamak	155	1258
9	Rushan	N. Dodhudoev	Barrushon	458	2541

The questions on dependence of population on natural resources and their vulnerability were included in questionnaires. These questions included: the (i) sources of potable water used by population; (ii) the sources of energy for heating of houses and cooking, interaction with fauna and flora and their commercial use by population.

Table 12 The project sub-component 2 affected communities

	Affected community				
Flood #	District	Jamoat	Village	Households	Population
1	Kulob	Dahana	Yoksuchiyon	270	1927
1		Dahana	Zarkala	328	2834
1		Ziraki	Khoja Iskhok	251	2178
2	Vose	Tugarak	Larkhobi	180	1811
2		Tugarak	Shobika	345	3301
6		A. Avazov	Sari Parom	349	3353
6		Guliston	Kurbonshahid	738	6832
4	Qabodiyon	N. Khusrav	Okcha	510	4820
4		U. Nazarov	Boshkala	510	4500
4		I. Niyazov	Ziraki	632	5315
4		20-solagii Istiqlol	Sangoba	683	5988
5	Shaartuz	T. Sadriddinov	Hoshadi	963	4693

Photo 19 Interview with chief of CEP in Rushan district

Along with assessment of their social and economic status, participants were informed in details about the proposed project, including anticipated environmental implications. The expected adverse environmental consequences such as noise, vibration, construction camps and temporary worsening of water and air quality were openly discussed. Participants welcomed the project and shared the concerns about current environmental and health issues.

Suggestions and recommendations of stakeholders were taken into account in the process of development of Environmental Management Plan, which is an integral part of this document. Draft Document will be published at the web-site of EA, open for public access. At the next stage at the zone of project influence the public hearing will be undertaken where project safeguards documents will be presented for direct acquaintance and discussion with stakeholders. During discussion the gaps and shortcomings of the project will be revealed, that later may allow improving the document considering the real situation and stakeholders' interests. The discussion results will be taken into account during the preparation of site-specific environmental Management Plans(SSEMPs).

7.2 Grievance Procedure

Complaints and suggestions from communities in the zone of direct project influence will be directed to the parties responsible for issues associated with the environmental management at the construction site, through local authorities and other representatives of the stakeholders. Complaints on minor which should be addressed immediately will be examined at the spot and solved by representatives by PIU at the site. The complaints on significant issues will be forwarded to the central PIU office for examination and following making decision. All complaints and relating issues will be included in quaternary and annual reports prepared for PIU. Information about grievance procedure will be disseminated during public hearing.

8 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

This section outlines the environmental management system that will be implemented during the construction works and operation to minimize deleterious effects and implement enhancement measures. It has following components: Institutional arrangement; coordination meetings; mitigation plan; monitoring program.

8.1 Introduction

The objective of the EMP is to provide a framework for the management and monitoring of the environmental aspects and issues of the project during detailed design and construction of the bridges. The EMP also embraces environmental management issues following the bridges construction including operation and maintenance to maximize the beneficial effects of the Project, and detect and ameliorate adverse long-term effects. The EMP is based on the anticipated environmental impacts and mitigation measures identified in the process of IEA, and will be further developed and updated together with the contractors' subsequent site specific EMPs.

The EMP provides an organizational framework that assigns roles and responsibilities to all parties involved for environmental monitoring and management. EMP entails the procedural framework to ensure that all mitigation measures and monitoring requirements specified in the assessment of environmental impacts will be carried out in the subsequent project stages. The cost associated with its implementation has been prepared on a preliminary basis.

Most of the proposed mitigation activities will be assured under provisions in the construction contracts, engineering supervision contract and as necessary by agreement with the communities.

The basic objectives are to:

(i) define a recommended plan of action and a means of testing this plan to meet existing and projected environmental needs and problems;
(ii) identify potential environmental impacts;
(iii) recommend mitigation measures for the negative impacts;
(iv) identify opportunities for enhancement measures; and
(v) establish a supervision, monitoring, auditing, and reporting framework.

The EMP will thus ensure implementation of recommended corrective actions aimed for environment protection, mitigation, and its enhancement.

8.2 Implementation arrangements for the environmental safeguards

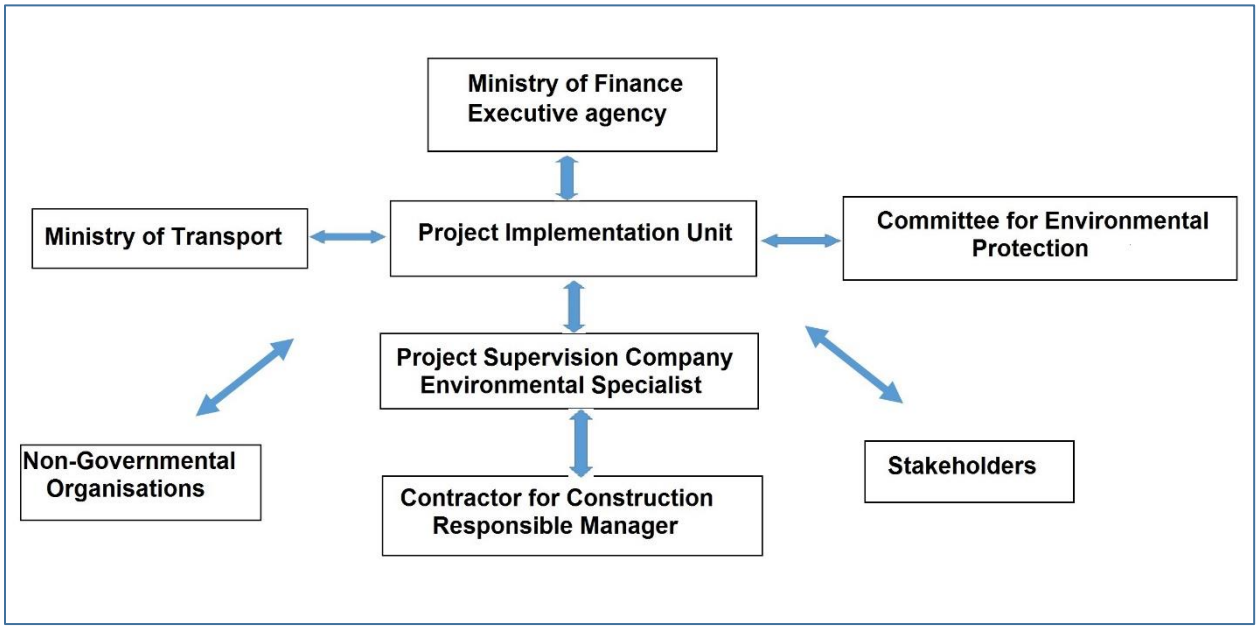
The recommended institutional arrangement for the implementation of the works prescribed in the EMP scheme are set out to be largely independent of vested interests in the projects, open and transparent, with reporting and accountability to the laws of the RT.

The institutions to be involved in the environmental management of the sub-project are the following:

- Government of the Tajik Republic
- Ministry of Finance through Project Implementation Unit (PIU)
- Ministry of Transport (MoT)
- Agency for Melioration and Irrigation
- World Bank
- Committee of Environmental Protection under the Government of the Republic of Tajikistan
- Project Supervision (Consultant)
- PIU – Environmental staff
- Contractor
- Regional and local administration
- Non-Governmental Organizations
- Affected communities

The figure 6 shows the main parties that would be involved in the project, and the recommended communication links between the parties. The focus of this arrangement is the assignment of a responsible engineer from the Supervision Company and Contractor's side besides dealing with other relevant tasks for the project. Those persons will be responsible for all environmental matters, and will report to the PIU consequently.

Figure 15 Diagram for Institutional Arrangements for Environmental Management



The primary responsibility for environmental management lies with EA. However, the parties involved have important roles and responsibilities for the efficient implementation of the EMP in order to avoid, minimize, and mitigate adverse impacts and effectuate planned enhancements. The main roles of the different parties are summarized below.

Responsibility for environmental management will rest on mainly;

(i) Project Implementation Unit (PIU)

(ii) Supervision Company

(iii) Contractor

The PIU will coordinate with the Ministry of Transport and Committee for Environmental Protection during the construction period for any necessary liaisons. The PIU within the Ministry of Finance has involved three people who will bear the responsibility for the implementation of the environmental safeguards. They are as follows:

1) The PIU project coordinator is responsible for the overall safeguards implementation;

2) The PIU environmental specialist responsible for environmental safeguards implementation in rehabilitation of infrastructure critical links (Component 2.1); and

3) PIU environmental specialist responsible for safeguards implementation in rehabilitation of flood protection (Component 2).

These three people have developed a comprehensive EMF document that covers all components of the project. In addition, the feasibility study and detailed design consultants have provided their inputs to the EMF as specified in their terms of reference.

The EMF describes the requirements for the site-specific EMPs. According to the project design and the implementation timeline, the site specific EMPs for the construction works will be developed by detailed design consultants in parallel with the detailed design study. The site-specific EMPs will be included in the bidding documents for construction contractors. The site supervision will be implemented by the Contractors' responsible people on-site and during the site supervision visits of the PIU environmental specialists.

A Supervision Company shall assign a senior engineer responsible for Environmental aspects. This Engineer will supervise the Contractor`s implementation of EMP and will be co-responsible for the timely and sound execution of works and activities in sequence under the project. The Contractor`s Engineer responsible for environmental issues will have the overall responsibility for ensuring that the design and assessment of the physical work options in accordance with Tajikistan environmental norms, regulations and requirements.

Project Implementation Unit`s representative on site will be the monitoring agency for the success of approved EMP. Contractors will be responsible for the implementation of any upgrading / rehabilitation works in accordance with the environmental requirements specified in the bidding documents.

The table below shows the distribution of environmental responsibilities between the involved stakeholders during the project implementation.

Table 13 Distribution of Roles in Environmental Management

Participant	Activity	Supporting Documentation
Construction Contractor, site specific	• Allocates adequate budget for environmental mitigation during the bidding process based on the EMP. • Assigns person responsible for environment health and safety at every site • Ensures the implementation of the site specific EMP • Obtains clearance from authorized body or local executive authority if required • Obtains required permits/licenses • Reports regularly (once a month) to supervision contractor and PIU environmental specialists on the implementation of the mitigation measures and immediately in case of incidents. • Ensures that complains by the public are recorded and taken care of	• Inclusion of the EMP into the tender documents • Copies of the regular reports • Copies of permits, licenses • Clearance statements from the supervision contractor and the PIU environmental specialists • Periodic reports and sub-project completion report • EMPs/ EMP Checklists • Decision on the need for EIA from the authorized body or local executive authority (if applicable)

	following the grievance redress mechanism (GRM)	• GRM instructions and log on-site.
Supervision contractor	• Ensures the implementation of the site specific EMP by regular (weekly) supervision visits to the construction site • Ensures that Construction Contractor reports regularly on mitigation measures and monitoring • Checks the quality of the environmental reports • Ensures that Contractor obtains all required permits/licenses • Ensures that Contractor implements the GRM • Organize training for Construction Contractor staff on environmental safeguards requirements	• Clearance statements from the supervision contractor • Copies of regular reports • Copies of permits/ licenses
Feasibility study and detailed design contractors	• Develops site specific environmental management plans (EMPs) as per requirements specified in the national regulations, the World Bank requirements and ToR specified in the EMF • Presents site specific EMP at the public consultation meetings	• EMPs or EMP checklist (where relevant) • Minutes of the Public consultation meetings
PIU environmental specialists	• Provide input to site-specific EMPs • Ensure the quality of site-specific EMPs • Conduct regular site supervision (no less than once a month) • Provide quarterly reports to the World Bank on Environmental Mitigation and Monitoring	• Inputs to the EMPs or EMP Checklists • Site supervision reports • Quarterly reports to the World Bank • Environmental screening and

	• Review project design and other documentation in the application package for required environmental documentation and licenses/permits from the authorized body or local executive authority • Maintain complete files of environmental documentation for review by the World Bank • Monitor compliance with mitigation plans (if necessary) • Conduct environmental screening when the emergency response (Component 3) is triggered • Prepare EIA and EMP documentation for emergency response activities in Component 3 (if required)	categorization forms for Component 3 • Prepare EIA and EMP documentation for emergency response activities
World Bank	• Organize training for PIU staff on environmental safeguards requirements • Identify problems/ issues and propose of solution • Review and clear EMF document • Review and clear selective site specific EMPs. • Review and clear EIA and EMP documentation for emergency response activities in Component 3 (if required)	• Document status of project implementation in Implementation Status and Results reports and the mission Aide-Memoires • Training records

8.2.1 **Site specific Environmental Management Plans**

SEMP should describe how the EMP will be implemented in the conditions of particular construction site, and ensure compliance with the requirements for mitigation and monitoring. SSEMPs should include the following:

Environmental management staff organizational structure, which should identify the personnel to be engaged environmental protection and the responsibilities of the participants;

Criteria for appointment of principal staff;

Proposed interaction and communication procedures between the Contractor's construction personnel and the environmental protection staff, including proposals for communication facilities.

SEMP should contain specific provisions (Management Plans), relating to the following aspects:

- Career Management
- Responding to the occurrence of disaster
- Air quality
- Water quality
- Noise levels
- Waste control and management
- Dust Levels
- Construction camp
- Health and safety
- Traffic Safety
- Handling complaints
- Storage of liquid, toxic and dust creating materials
- Waste control and management
- Materials Handling
- Erosion Prevention
- Temporary drainage

The SSEMP should define: (i) Frequency, coverage and intent of environmental management meetings together with the rational for attendance; (ii) Frequency, coverage and intent of regular environmental reports; (iii) Methods of promoting an awareness of environmental protection and amongst all persons directly or indirectly associated with the Works.

The powers vested in the environmental management staff which would enable them to take urgent, appropriate and direct action to prevent and/or correct disruption to the environment. The means by which environmental management matters and requirements will be communicated to Subcontractors of all tiers.

The means by which environmental management systems will be supervised, monitored and audited to ensure due compliance with the principles and objectives of the environmental management Plan at all levels of construction.

Records to be prepared and maintained by environmental management staff and communication procedures to be adopted such that the, Engineer and others associated with the Works (e.g. Subcontractor) are kept fully informed on matters relating to environmental management regulations throughout the period of the Contract; and

Proposals to ensure that construction methods do not compromise the Contractor's commitment to environmental management.

The Contractor shall submit regular environmental reports to the Engineer as a requirement of its environmental management plan. A summary report shall be submitted as part of the monthly progress report. Prior to submission, the Contractor's project manager shall endorse the report. Reports shall comprehensively address all relevant aspects of environmental requirements and, in particular, report on all environmental audits undertaken during the period covered by the report

All locations (including but not limited, construction areas, sites areas, plant and equipment areas and Contractor staff office and accommodations) that are directly or indirectly associated with the Contract shall be regularly inspected for compliance with environmental requirements. Specific issues include but not be necessary limited to:

(i) dust control;
(ii) waste handling and disposal;
(iii) oil and diesel handling and storage
(iv) prevention of materials encroaching outside the right of way ;
(v) temporary drainage;
(vi) water quality;

8.3 Environmental Mitigation

The Environmental Mitigation Plan includes summary of measures to mitigate potential negative project effects and enhance its positive impacts during the different phases of the project implementation and the normal operation of the bridges and access road. The proposed measures are summarized in Tables 6 and described in details in Section 5. This tables provide a "checklist" for those responsible for implementation and monitoring of the EMP. These are the specific measures required of the Contractor to reduce the potential impacts of physical works and also the proposals for monitoring Contractor compliance/performance during construction. These measures will be detailed during construction phase according to:

The specific contract clauses proposed are detailed below. However, existing local environmental regulations & codes will also be included to mandate the use of formal health and safety measures to minimize accidents and avoid fatalities during the construction process.

Table 14 Matrix for Environmental Impacts and mitigation

Potential Impact/ Issue	**Mitigation Measures**	**Responsibility**	**Supervision**	**Estimated Cost**
1	2	3	4	5
Environmentally sound design	In preparing of the Design documents, Bidding documents and Bill of Quantity, environmental issues should be incorporated into the design activities including survey	PSC,	PIU	Part of design cost

Loss of trees	The design should avoid or otherwise minimize need in tree cutting. During the field work use the natural brushes for staking if appropriate and minimize size and duration of cleared areas	PSC,	PIU	Part of design cost
Seismic Risks	The seismic characteristics of the potentially affected area should be taken into account during the Detailed Design phase of the Project. Earthquake loading should be applied to the design of structures, to ensure that seismic events do not have negative impacts during the operational phase of the Project.	PSC,	PIU	Part of design cost
Hydrology	Design should include prevention of flooding during closing of rivers and canals. Side drainage structures will be incorporated in designs to divert the stream water at construction sites. Cofferdams, silt fences, sediment barriers etc., will be included in the design to prevent siltation in the bridge construction sites	PSC	PIU	Part of design cost
Historical and Cultural resources	Design should ensure no or minimal encroachment to cultural or historical sites, including cemeteries. The compensation cost should be included in BOQ.	PSC	PIU	Part of design cost
Construction Phase				
Air Quality				
Burning	The Contractor should ensure that there is no burning of debris or other materials on the site without permission of PSC.	- Contractor	PSC	Part of supervision cost
Fuel emissions	No furnaces, boilers or other similar equipment using any fuel that may produce air pollutants will be installed without prior written consent of PSC.	Contractor, PSC	PSC, PIU	
Exhaust (CO, NOx, SOx, etc)	Construction equipment should be equipped to a good standard and fitted with pollution control devices. The equipment (including the pollution control devices) will be checked at regular intervals by the PSC to ensure they are maintained in working order and the checks will be recorded by the Contractor & PSC as part of environmental monitoring. Contractor should prevent or minimize idling of engines and prohibit the use of equipment and machinery that causes excessive pollution (i.e. visible smoke) at project work sites;		PIU	Part of Construction cost
Dust Generation	Implement dust suppression measures including watering of exposed surfaces. All trucks used for transporting materials to and from the sites will be equipped by tailboards and covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s);	Contractor	PIU PSC	Part of Construction cost

Impacts to surface and ground water	Install sediment fences and/or sediment traps to collect sediment before it enters watercourses.	Contractor	PSC	Part of construction cost
	Construction materials containing fine particles, should be stored in an enclosure such that sediment laden water does not drain into nearby watercourses, but rather percolates slowly into the soil.			
	Along rivers and streams, earth and stones will be properly disposed of so that they do not block rivers resulting in adverse impact on water quality and flow regime.	Contractor	PSC, PIU	
	All necessary measures will be taken to prevent earthworks and stone works from impeding cross drainage at rivers/streams and or existing irrigation and drainage systems.		PSC. PIU	Part of construction cost
	Discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water should be discharged into settling lagoons or tanks prior to final discharge.	Contractor	PSC, PIU	
	Dewatering and cleaning of cofferdams will be performed to prevent siltation by pumping from cofferdams to a settling basin or a containment unit		PSC, PIU	Part of construction cost
	In bridge demolition sites, efforts will be made to avoid "dropping the bridge" into rivers/streams. This will be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections away, or alternatively by construction of a platform onto which the bridge could be dropped	Contractor	PSC. PIU	
	Bitumen will not be allowed to enter either running or dry rivers beds nor shall it be disposed of in ditches or small waste disposal sites prepared by the contractor.		PSC, PIU	
Impact to soil				
Loss of soil fertility	The topsoil (about 15cm) will be kept and re-used after excavation is over to minimize the impact on productive lands.	Contractor	P*SC*	Part of Construction cost
Erosion or sedimentation caused during clearing, earthworks or rock fall	Undertake progressive re-vegetation of cleared areas. Avoid clearing activities during heavy rain where possible. Embankments in areas of steep slopes to be stepped. Re-use excavated material wherever possible		PSC, PIU	
Disposal of surplus soil, excavated material	Disposal at designated site (borrow pits, mining galleries); storage of top soil to be used for re-vegetation, reuse of surplus material for road construction	Contractor	PSC, PIU	

Degradation of borrow areas	Borrow pits and quarries will be redeveloped as per standard procedure. Rehabilitation of quarries and borrow sites will be undertaken immediately after excavation to prevent soil erosion. Redevelopment will include: (i) regarding slopes to minimize erosion, (ii) replacing stockpiled soil cover, (iii) replanting grass, shrubs and trees. Scraping and tamping of the borrowed areas will be carried out to minimize localized depressions and render a smooth profile.	Contractor	PSC, PIU	Part of Construction cost
Impact on trees close to construction site	Removal of vegetation and cutting of trees will be done judiciously and limited to minimum possible extent.	PSC, Contract	PIU	
Disruption of existing infrastructure (telecom, electricity, water, waste water)	Research of underground cables and pipes should be undertaken at the design stage.	PSC	PIU	Part of design cost
Impact to vegetation	Undertake progressive re-vegetation of cleared areas with fast-growing, native species. Avoid the felling of road-side trees wherever possible. Felling trees that are not required to be cleared or removed by the project within the project areas will be forbidden Contractor will impose sanctions on any worker for felling trees unnecessary for the project.	Contractor/ PSC,	PIU, Forestry	Part of supervision cost
Impact to fauna	Hunting and fishing will be strictly prohibited. Bridge construction will be scheduled in dry season to avoid adverse impact on fishery, birds and river water quality.			
Noise and vibration from construction machinery and equipment	Ensure all construction vehicles and equipment are well maintained. Inform nearby community of schedule and duration of construction works. As far as possible limit noisy construction activities to day time hours in the vicinity of houses and hospitals and to night time hours in the vicinity of schools; construction activities from 7.00 am to 7.00 pm to be discussed with local stakeholders. Crushing and concrete mixing stations must not be located nearby residential areas, schools and hospitals. Provide workers with noise abatement equipment (ear-plugs)	Contractor, PSC	PIU, CEP	Part of construction cost
Interference with commercial activities on roadside	Contractor should inform nearby community of schedule and duration of construction works not less than in two weeks in advance of works. Install temporary access to affected properties. Rebuild good quality permanent access to affected properties on completion of construction works	Contractor, PSC	PIU	Part of construction

Changes to road safety / traffic movements, property access	Install signage and lighting in vicinity of works on public roads	Contractor	PIU, police Traffic	
Visual and landscape impacts	Cutting back of roadside vegetation	Contractor	PIU	
Discovery of physical/ heritage resources	Stop activity and call expert in archeology from Institute of History. "chance find procedures	Contractor, PSC	PIU, Ministry of Culture	Part of supervision cost
Construction camp				
Soil contamination from spillage of oil or other chemical substances	Ensure construction plant is maintained in good condition and any leaks are quickly repaired and soil spills remediated. Store chemicals, fuel and oil products in secure area / compound, with concrete floor and weatherproof roof or on other non-penetrable bund	Contractor	PSC, PIU	Part of construction costs
Storage of Hazardous substances	Storage of hazardous substances at minimum distance of 100m from water courses. Bitumen storage and mixing areas must be protected against spills and all contaminated soils must be properly according to legal environmental requirements. Such storage areas must be contained so that any spills can be immediately contained and cleaned up.	Contractor	PIU, PSC	
Waste disposal problems from solid waste generated during construction activity or wastes generated in construction camps	Ensure construction camps are maintained in clean and hygienic conditions. Install waste collection and temporary storage facilities in construction camps. Remove waste regularly from site for disposal to licensed waste dump. Train construction workers in appropriate waste disposal methods. preparation of an emergency response plan	Contractor	PSC, PIU	

Discharge of waste water from contractor's camp	Installation of car washing chambers. Wastewater from construction camps must not discharge into water bodies, installation of latrines and environmentally friendly disposal of waste water	Contractor	PSC	Part of supervision
Social tensions	Consult with local authorities to plan housing arrangements for construction workers. Train workers on appropriate interactions with local community and set up awareness program about sanitation and communicable diseases. Secure construction site and restrict access by local community	Contractor, PSC	PIU	Part of construction
Risks to public or construction worker health or safety	Provide safety equipment to workers and train them in its use	Contractor	PIU	Part of construction
Operation Phase				
Changes to road safety	Installation of road safety/speed limit signage where accidents are likely to occur.	Contractor,	PSC, PIU Local authorities	Part of construction cost
	Work with local authorities to carry out enforcement of traffic regulations on upgraded roads			
Environmental damage from accidents involving spills of chemicals or other hazardous substances	Install speed limits and warning signs in areas of difficult driving conditions; development of emergency plan			
Changes in dust levels or air quality	Vehicle emissions must be monitored according to national standards. Implement landscaping along the roadside and in settlements to reduce dust impacts	Local transport authorities	MoT	Part of maintenance
Erosion at bridges	Implement stabilization and anti-scouring measures as required at bridges			

Costs of side-slope protection such as gabion baskets, erosion protection (fences etc) and retaining structures are considered to be standard engineering practices and requirements for road rehabilitation works and as such are not included as costs of environmental mitigation, these costs will be included in the detailed design costs.

The following costs during construction phase will also be part of the construction costs:

• building of storage compounds for hazardous substances in the contractor' camp
• dust suppression measures during construction phase
• re-vegetation measures
• air quality monitoring
• dust monitoring
• soil and erosion monitoring
• water quality monitoring
• social and community impact monitoring
• noise and vibration monitoring

8.4 Environmental Monitoring

The Environmental monitoring is a very important aspect of environmental management during construction and operating phase of the project to safeguard the environment. During project implementation environmental monitoring will ensure the protection of landslide, side slope, and embankment from potential soil erosions.

During construction, air, noise, and surface water quality monitoring of the construction sites, quarries, camps and facilities will be an important parameter of the monitoring program. The Environmental Monitoring Plan should be followed by a senior experienced engineer from the Supervision Company and PIU representative on site. These engineers will monitor application of environmental measures during the construction of the bridges and access roads. The results of the monitoring activities will be included as routine elements of reports prepared by the PSC.

The monitoring program will comprise site inspections to determine Contractor`s compliance or otherwise with the EMP and other applicable regulations and statutes. Monitoring programs are designed to provide quantitative assessments of environmental parameters under pre and post project conditions are not proposed.

It is expected that any project effects will be easily identified by site inspections and in discussions with local communities. Inspections (and complaints) will indicate whether further actions need be taken.

The proposed site inspections should be carried out on a regular basis but not necessarily to a structured pattern. However, as a minimum, the program outlined in Table 9 should be observed.

Table 15 Proposed quantity of Environmental Inspection to the site

Project Phase	Inspections
Pre-Construction	1 visit to each Borrow site, Camps/ Maintenance Facility and Materials storage sites. 1 visit to each defined water source.

Construction	2 visits to bridge site per month 1 visit to each of other sites per month
Post Construction	1 visit to each remediation site during remediation 1 visit to each remediation site 12-18 months after remediation

It is also anticipated that additional inspections will be required in response to complaints by local communities. In general terms it is expected that these will be confined to dust and noise nuisance but capacity may be required for other assessments. An additional 2 visits per quarter may be required. To facilitate inspections a checklist of items to be considered shall be drawn up. The checklist should be distributed to all parties concerned with construction who should also receive a briefing by the Engineer prior to initiation of construction works. In response to the environmental impacts identified during the study, an environmental monitoring plan has been developed and is presented in Tab.7. The contract documents will contain a list of all required mitigation measures and a time frame for the compliance monitoring of these activities. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction. The project supervision consultant in cooperation with PIU during project implementation will be required to:

The contractor will develop site-specific EMPs. The PSCs will use this monitoring plan as a basis for supervision of the Contractor's compliance with these EMPs. PSC will supervise the environmental monitoring regularly, and submit quarterly reports: the main parameters to be monitored are outlined in Tab. 9. Usually the PSC provides an Environmental Specialist as part of the PSC team.

Supervise the subproject roads regularly, and submit quarterly reports based on the monitoring data and laboratory analysis report. The main parameters to be monitored by the contractor are outlined in Tab. 9. The contractor and the supervising consultant will be responsible for subcontracting data collection of environmental monitoring to a recognized organization (e.g., CEP's Analytical Control Laboratory).

A lump sum budget is allocated to cover monitoring cost during construction phase of the project. PIG will hire a consultant for environmental monitoring and ensure that the road is monitored regularly during construction works.

The following measures will be taken to provide an environmental compliance monitoring program during project implementation:

• The tender and contract documents will clearly set out the contractor's obligations to undertake the environmental mitigation measures as set out in Chapter 6 of this EIA and to be appended to contract specifications;

• The recommended environmental mitigation cost should be included as an item in the Bills of Quantities. This will ensure that there is specific environmental mitigation budget

and will be implemented as required. During the procurement, contractors will be encouraged to include these costs in their rates and present the mitigation cost as a line item in the Bill of Quantities.

• The PIU environmental supervising consultant as part of the PSC team will supervise the contractor's environmental, safety and health performance.

Table 16 Framework for Environmental Monitoring

Parameter	**Location**	**Monitoring**	**Frequency**	**Responsibility**	**Cost**
Construction phase					
Landscape	Quarry site	Visual inspection to ensure quarry rehabilitation is conducted per EMP	Monthly	Contractor, PSC	Part of supervision cost
Material Storage Sites	Bridge sites	Visual inspection. Ensure vegetation clearance has been minimized	monthly	Contractor / PIU / PSC	Part of construction and supervising costs
Erosion and sedimentation	Access road	Visual inspection of prevention measures per EMP and occurrence of erosion	monthly	Contractor / PIU / PSC	Part of construction and supervising costs
Rock fall	Active rock fall sections	Visual inspection	monthly	Contractor / PIU / PSC	Part of construction and supervising costs
Soil spill		Visual inspection, soil sampling	During and after remediation	Contractor / PIU / PSC	Oil company
Storage of hazardous substances	Construction camp	Visual Inspection of storage facilities as per EMP and emergency	monthly	Contractor / PIU / PSC	Part of construction and supervising costs

Parameter	Location	Monitoring	Frequency	Responsibility	Cost
		response plan			
		containment of hazardous materials, oil spills, and work-site accidents	monthly	Contractor / PIU / PSC	Part of construction and supervising costs
Waste management	Construction camp	Visual inspection that solid waste is disposed properly	monthly	Contractor / PIU / PSC	Part of construction and supervising costs
Surface Water Quality	Bridge sites	Visual inspection of water management per EMP			
	Directly downstream of pollution event	DO, COD, SS, fecal coliform,conductivity, turbidity, pH, temperature; additional parameters to be defined	After pollution event	Contractor / PIU / PSC	To be paid by originator of spill
Air quality	Crashing plant	Visual inspection to ensure crushing plant is located >500 m from residential areas	monthly	Contractor / PIU / PSC	Part of construction or supervision costs
dust	Sensitive areas	Visual inspection to ensure dust suppression measures being implemented as per EMP	monthly	Contractor / PIU / PSC	Part of construction or supervision costs

Parameter	Location	Monitoring	Frequency	Responsibility	Cost
noise	Sensitive areas	dBA at sensitive areas as per EMP	monthly	Contractor / PIU / PSC	Part of construction costs
vibration	Sensitive areas	Ensure mitigation measures are being implemented as per EMP	monthly	Contractor / PIG / PSC	Part of construction or supervision costs
Re-vegetation	Bridges location	Monitoring of progress of revegetation activities as per EMP	Ongoing	PIU, PSC	Part of Construction and supervision cost
community	Access road	Consult with Local authorities and community Groups along the alignment to monitor environmental concerns	ongoing	Contractor / PIU / PSC	Part of construction and supervision costs
Operating Phase					
noise	Sensitive areas (densely settled areas, schools, hospitals)	dBA at sensitive areas as per EMP	Twice/year for 3 years or after complaint. Midterm monitoring	PIU, World Bank, MoT and regional road departments	Part of maintenance cost
Air quality	Sensitive areas (densely settled areas, schools, hospitals)	Particulate matter and smoke as per EMP	Twice/year for 3 years or after complaint. Midterm monitoring	PIU / World Bank, MoT and regional road departments	Part of maintenance cost
Erosion	Road subproject corridors	Visual assessment of erosion resulting from project	Twice/year for 3 years or after complaint. Midterm monitoring	PIU / World Bank, MoT and regional road departments	Part of maintenance cost

Parameter	Location	Monitoring	Frequency	Responsibility	Cost
Water quality	Road corridor	Visual assessment of increased suspended solids from areas of erosion	Twice/year for 3 years or after complaint. Midterm monitoring	PIU /World Bank, MoT and regional road departments	Part of maintenance cost
Road safety	Road corridor	Collect road accident data	Twice/year for 3 years or after complaint. Midterm monitoring	PIU /World Bank, MoT and regional road departments	Part of maintenance cost
Re-vegetation	Road corridor	Ongoing monitoring of revegetation as per EMP	Twice/year for 3 years or after complaint. Midterm monitoring	PIU / World Bank, MoT and regional road departments	Part of maintenance cost

8.5 Reporting and Supervision

Reporting: The Contractor should prepare monthly reports on the progress of EMP in each month using the developed check-lists.

PSC should comply inspection reports that identifies areas of Contractor`s non-compliance with the EMP and provide guiding remarks on actions to be taken. The significance of the non-compliance shall also be noted and reports shall be prepared by the PSC. Copies of these reports shall be reviewed by RE who shall forward them to the PIU.

Every three months the inspection reports shall be compiled into a quarterly environmental monitoring report that shall highlight any areas of persistent negligence by the Contractor. This document shall also contain records of any communications between the PSC, and the Contractor on matters relating to the environment.

The PSC will include in their routine reports a summary status of activities related to the EMP. As necessary, supplemental reports with greater details than the routine reports should also be prepared.

8.6 Co-ordination Meetings

Upon the PIU request, the selected Contractor will be required to attend co-ordination meeting(s) with the PSC & PIU at which specific details of measures will be further explained. The main aim of the Coordination Meetings between the Client representative, PSC and the Contractor is to make sure that,

- Contractor fully understands and be able to utilize the mitigations which was agreed as a written report at the beginning of the project.
- PSC and Client to provide any feedback to the implementation of the EMP including necessary revision,

To be able to schedule and have the local communities' feedback on the overall project

III COMPONENT EMERGENCY RESPONSE

9 Environmental Impacts Assessment in case of Emergencies

9.1 Introduction and general approach

The objective of this component is to improve Tajikistan's capacity to better respond to disasters. Following an adverse natural or man-made event that causes a major disaster; the Government of Tajikistan may request the Bank to re-allocate project funds to this component to partially cover emergency response and recovery costs. This component could also be used to channel additional funds should they become available as a result of the emergency.

Specific eligible expenditures under the category of Goods include: i) construction materials; water, land and air transport equipment, including supplies and spare parts; ii) school supplies and equipment; iii) medical supplies and equipment; iv) petroleum and fuel products; v) construction equipment and industrial machinery; vi) communications equipment; vii) seeds and fertilizer; and viii) food and water containers and any other items which may be acceptable to the Bank and agreed to by the Government and the Bank.

Specific eligible expenditures under the category of Works may include urgent infrastructure works (repairs, rehabilitation, construction, etc.) to mitigate the risks associated with the disaster for affected populations. Specific eligible expenditures under the category of Services may include urgent studies (either technical, social, environmental, etc.) necessary as a result of the effects of the disaster (identification of priority works, feasibility assessments, delivery of related analyses, etc.).

Component 3, a Contingent Emergency Response, will be triggered following paragraph 13 of the OP 10.00. Activities under this Component will cover both, natural and man-made disasters. This component will not have any positive or negative list of activities. Therefore, it would be very difficult to describe potential risks and mitigation measures associated with emergency response and likely vulnerable locations and/or groups in the current EMF. Thus, this special chapter of the EMF describes a screening process for the potential activities, the institutional arrangements for environmental and social due diligence and monitoring and required capacity-building measures. The screening process will allow indicating which kinds of emergency response actions can proceed with no additional environmental or social assessment, and which ones would require assessment (and at what level) prior to being initiated. Component 3 will not finance any activities that would be categorized as Category "A" according to the World Bank OP 4.01 or activities included in the IFC negative list of projects.

9.2 Generic Mitigation Measures for Component 3

• Adverse environmental and social impacts can be minimized through the adoption of an Environmental and Social Management Plan (ESMP) that details suitable mitigation and management measures.

• Avoid or minimize clearing of vegetation during preparation for rehabilitation and reconstruction works in the targeted areas, to reduce chances of soil erosion and the damage of natural habitats. This can be done by carrying out works in areas that have already been cleared, where infrastructure was existent prior to the disaster/ emergency, or by minimizing clearing vegetation where new areas have been identify because it has been deemed that the existent ones are not appropriate.

• Irrigation infrastructure needs to be designed to ensure that localized erosion does not occur. Construction activities generally expose soil to erosion. Therefore, careful design for the rehabilitation and reconstruction of irrigation schemes can avoid the occurrence of erosion problems.

• Following the completion of construction work, vegetation should be established around structures so that bare soil is not exposed to erosive forces.

• Proper asbestos disposal will be among the responsibilities of the contractors. Asbestos can be disposed safely in sealed plastic containers to be buried for example in municipal landfills

• Ensure availability of adequate sanitary facilities for the construction workers close the working sites, to avoid contamination of water and soils from human waste in the area of work and surrounding areas.

• Avoid reconstruction works and work site waste disposals close to waterways to ensure the protection of water resources.

• Construction sites and areas of work ought to have suitable waste management regime in place as informed by the WBG General Guidelines on Waste Management2 Guidelines which advocates establishment of waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and only then disposal. Among other things, this framework promotes avoiding or minimizing the generation of waste as far as practicable; where waste generation cannot be avoided, look to minimize, recover, and reuse; and where waste cannot be recovered or reused, consider treating, destroying and disposing of in an environmentally sound way.

9.3 Environmental review of the activities under Component 3

Should the component 3 be triggered, together with the application to finance the response and recovery activities, the initiator of the activity, i.e. the applicant, will have to fill in the Environmental Screening Form (Annex 3). The information in the Form will be used by the PMU environmental specialist to assess the scope of the activities in terms of their environmental impacts and required mitigation measures. The PMU environmental specialist will then have to fill in the Environmental Category Form (Annex 3) where they

will assign the sub-project safeguards category in accordance with the World Bank OP. 4.01 Environmental Assessment. They will also have to indicate which type of additional environmental assessment (EIA, EMP) is required to define the sub-project impacts and required mitigation measures. The PMU environmental specialist will have to submit both forms to the World Bank safeguards specialists for their clearance. No activities may be funded without the clearance of the environmental forms whereas the required environmental studies (EIA, EMP), as indicated in the Environmental Category Form, may be conducted simultaneously with the recovery/ response operations.

Annex 1. Environmental Management Checklist for Small-Scale Construction and Refurbishment Activities

General Guidelines for the use of EMP checklist:

The checklist is used during minor renovation and small-scale construction works. The checklist is designed to meet the "recommended practice" and is prepared for users to ensure project compliance with the requirements of the World Bank Safeguards Policies. The checklist covers the typical activities for mitigating the negative effects on the local environment of completed construction contracts.

The checklist consists of one introductory part and three main sections:

The introduction or preamble contains a description of the project, a definition of the environmental category, and a description of the principles for drafting a checklist for the EMP.

Part 1 is a description ("*technical passport of the site*") of the project specifics in terms of physical location of the site, organizational and legal aspects, a general description of the project including the need for capacity-building, and a description of the process for public hearings.

Part 2 consists of (a) an environmental and social screening in the form of simple (e.g., "Yes/No") questions, and (b) a description of measures to mitigate the negative environmental impact of this type of activity.

Part 3 represents a monitoring plan for activities carried out during construction and implementation. The plan is given in the same format as the EMP in the Annex 1. The purpose of drafting this checklist is inclusion of Part 2 and Part 3 into the tender documents for contractors.

CONTENTS

A) General Project and Site Information

B) Safeguards Information

C) Mitigation Measures

D) Monitoring Plan

Part A: General Project and Site Information

Site description		
Name of site		
Describe site location		Attachment 1. The site map []Y [ ] N
Who owns the land?		
Description of geographic, physical, biological, geological, hydrographic and socio-economic context		
Locations and distance for material sourcing, especially aggregates, water, stones?		
Legislation		
Identify national & local legislation & permits that apply to project activity		
Public Consultancies		
Identify when / where the public consultation process took place		
Institutional Capacity Building		
Will there be any capacity building?	[ ] N or [ ]Y if Yes, a separate Attachment shall include the capacity building program	

E) PART B: SAFEGUARDS INFORMATION

Review of environmental and social issues			
	Activity/Issue	**Status**	**Triggered Actions**
Will the site activity include/involve any of the following?	A) Building refurbishment	[ ] Yes [ ] No	See Section **A below**
	B) New construction	[ ] Yes [ ] No	See Section **A below**
	C) Individual wastewater treatment system	[ ] Yes [ ] No	See Section **B below**
	D) Historic building(s) and districts	[ ] Yes [ ] No	See Section **C below**
	E) Acquisition of land[1]	[ ] Yes [ ] No	See Section **D below**
	F) Hazardous or toxic materials[2]	[ ] Yes [ ] No	See Section **E below**
	G) Impacts on forests and/or protected areas	[ ] Yes [ ] No	See Section **F below**
	H) Handling / management of medical waste	[ ] Yes [ ] No	See Section **G below**
	I) Traffic and Pedestrian Safety	[ ] Yes [ ] No	See Section **H below**

1 Land acquisitions includes displacement of people, change of livelihood encroachment on private property this is to land that is purchased/transferred and affects people who are living and/or squatters and/or operate a business (kiosks) on land that is being acquired.

[2] Toxic / hazardous material includes but is not limited to asbestos, toxic paints, noxious solvents, removal of lead paint, etc.

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
A. General Conditions	Notification and Worker Safety	(a) The local construction and environment inspectorates and communities have been notified of upcoming activities (b) The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites (including the site of the works) (c) All legally required permits have been acquired for construction and/or rehabilitation (d) All work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment. (e) Workers' PPE will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots) (f) Appropriate signposting of the sites will inform workers of key rules and regulations to follow.
B. General Rehabilitation and /or Construction Activities	Air Quality	(a) During interior demolition use debris-chutes above the first floor (b) Keep demolition debris in controlled area and spray with water mist to reduce debris dust (c) Suppress dust during pneumatic drilling/wall destruction by ongoing water spraying and/or installing dust screen enclosures at site (d) Keep surrounding environment (sidewalks, roads) free of debris to minimize dust (e) There will be no open burning of construction / waste material at the site (f) There will be no excessive idling of construction vehicles at sites
	Noise	(a) Construction noise will be limited to restricted times agreed to in the permit (b) During operations the engine covers of generators, air compressors and other powered mechanical equipment should be closed, and equipment placed as far away from residential areas as possible
	Water Quality	(a) The site will establish appropriate erosion and sediment control measures such as e.g. hay bales and / or silt fences to prevent sediment from moving off site and causing excessive turbidity in nearby streams and rivers.
	Waste management	(a) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities. (b) Mineral construction and demolition wastes will be separated from general refuse, organic, liquid and chemical wastes by on-site sorting and stored in appropriate containers. (c) Construction waste will be collected and disposed properly by licensed collectors (d) The records of waste disposal will be maintained as proof for proper management as designed. (e) Whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos)
C. Individual wastewater	Water Quality	(a) The approach to handling sanitary wastes and wastewater from building sites (installation or reconstruction) must be approved by the local authorities

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
treatment system		(b) Before being discharged into receiving waters, effluents from individual wastewater systems must be treated in order to meet the minimal quality criteria set out by national guidelines on effluent quality and wastewater treatment (c) Monitoring of new wastewater systems (before/after) will be carried out
D. Historic building(s)	Cultural Heritage	(a) If the building is a designated historic structure, very close to such a structure, or located in a designated historic district, notify and obtain approval/permits from local authorities and address all construction activities in line with local and national legislation (b) Ensure that provisions are put in place so that artifacts or other possible "chance finds" encountered in excavation or construction are noted, officials contacted, and works activities delayed or modified to account for such finds.
E. Acquisition of land	Land Acquisition Plan/Framework	(a) If expropriation of land was not expected and is required, or if loss of access to income of legal or illegal users of land was not expected but may occur, that the bank task Team Leader is notified. Land acquisition is not allowed under the project.
F. Toxic Materials	Asbestos management	(a) If asbestos is located on the project site, mark clearly as hazardous material (b) When possible the asbestos will be appropriately contained and sealed to minimize exposure (c) The asbestos prior to removal (if removal is necessary) will be treated with a wetting agent to minimize asbestos dust (d) Asbestos will be handled and disposed by skilled & experienced professionals (e) If asbestos material is be stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately (f) The removed asbestos will not be reused
	Toxic / hazardous waste management	(a) Temporarily storage on site of all hazardous or toxic substances will be in safe containers labeled with details of composition, properties and handling information (b) The containers of hazardous substances should be placed in a leak-proof container to prevent spillage and leaching (c) The wastes are transported by specially licensed carriers and disposed in a licensed facility. (d) Paints with toxic ingredients or solvents or lead-based paints will not be used
G. Affects forests and/or protected areas	Protection	(a) All recognized natural habitats and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities. (b) For large trees in the vicinity of the activity, mark and cordon off with a fence large tress and protect root system and avoid any damage to the trees

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
		(c) Adjacent wetlands and streams will be protected, from construction site run-off, with appropriate erosion and sediment control feature to include by not limited to hay bales, silt fences (d) There will be no unlicensed borrow pits, quarries or waste dumps in adjacent areas, especially not in protected areas.
H. Disposal of medical waste (not applicable)	Infrastructure for medical waste management	(a) In compliance with national regulations the contractor will insure that newly constructed and/or rehabilitated health care facilities include sufficient infrastructure for medical waste handling and disposal; this includes and not limited to: ▪ Special facilities for segregated healthcare waste (including soiled instruments "sharps", and human tissue or fluids) from other waste disposal; and ▪ Appropriate storage facilities for medical waste are in place; and ▪ If the activity includes facility-based treatment, appropriate disposal options are in place and operational
I Traffic and Pedestrian Safety	Direct or indirect hazards to public traffic and pedestrians by construction activities	(a) In compliance with national regulations the contractor will insure that the construction site is properly secured and construction related traffic regulated. This includes but is not limited to ▪ Signposting, warning signs, barriers and traffic diversions: site will be clearly visible and the public warned of all potential hazards ▪ Traffic management system and staff training, especially for site access and near-site heavy traffic. Provision of safe passages and crossings for pedestrians where construction traffic interferes. ▪ Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement ▪ Active traffic management by trained and visible staff at the site, if required for safe and convenient passage for the public. ▪ Ensuring safe and continuous access to office facilities, shops and residences during renovation activities, if the buildings stay open for the public.

Part D: MONITORING PLAN

Activity	**What?** *(Is the parameter to be monitored?)*	**Where?** *(Is the parameter to be monitored?)*	**How?** *(Is the parameter to be monitored? (methods and tools)*	**When?** *(Define the frequency / or continuous?)*	**Why?** *(Is the parameter being monitored?)*
1. Type of activity					
2. Type of activity					
3. Type of activity					

Annex 2 Chance Find Procedure

Contracts for civil works involving excavations should normally incorporate procedures for dealing with situations in which buried physical cultural resources (PCR) are accidentally discovered or unexpectedly encountered. After chance find Contractor should immediately suspend physical works and report the discovery to PSC

Contractor is obliged to adhere to accepted international practice and all applicable historic and cultural preservation requirements of the Government of Tajikistan including all appropriate local government entities. In the event of unanticipated discoveries of cultural or historic artifacts (movable or immovable) in the course of the work, the Sub-Contractor shall take all necessary measures to protect the findings and shall notify the Contractor and provincial-level representatives of the Archaeological Committee and the Ministry of Youth and Culture. If continuation of the work would endanger the finding, project work shall be suspended until a solution for preservation of the artifacts is agreed upon.

Annex 3 Environmental Screening Form of the Emergency Response (to be filled in by the applicant)

Project title……..

Name of rayon/oblast for infrastructure rehabilitation/construction……

Name of Executing Agent……

Date: ……

Name of the Approving Authority ……

PART A: BRIEF DESCRIPTION OF THE PROPOSED ACTIVITIES

Please provide brief information on the type and scale of the response/ recovery activity (total area, required land, approximate size of floor area).

_____
_____
_____
_____

Please provide information regarding actions needed during the response/ recovery activities including support/ancillary structures and activities required to build them, e.g. need for borrow pits, energy and water pipes/lines installations, access road etc.

_____
_____
_____

Please describe how the response/recovery activities will be carried out step-by-step, including complementary activities and infrastructures and resources required e.g. roads, disposal site, water supply, energy requirement, human resource etc.

_____
_____
_____

PART B: BRIEF DESCRIPTION OF THE ENVIRONMENTAL SITUATION AND

IDENTIFICATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

Please describe the proposed infrastructures location, sitting; surroundings (include a map)

_____
_____
_____

Describe the land formation, topography, vegetation in/adjacent to the activity area

_____

_____
_____

Estimate and indicate where vegetation might need to be cleared.

References

1. Brian F. Windley. The Evolving Continents. 1995. Third edition. John Wiley & Sons Ltd. Chichester. England. Chapter 9. The Hymalaya and Cenozoic Deformation of Asia. p-p. 134-156.
2. Asimov, M et al.Таджикская Советская Энциклопедия.1984. Academy of Science of Tajikistan. Second Edition, p-p 10-50n
3. Red Data Book of Tajikistan. 1988. Publishing House " Donish" Dushanbe
4. Tina Lohr. A short story about the geological history of Pamir. University of Mining and Technology Freiberg. Institute of Geology, Department of Tectonophysics. February 2001.
5. Munir Oztruk, Khalid Rekhman Hakim, I Faridah-Hanum. Climate Changes Impacts on High Altitude Ecosystems. Springer. Switzerland. 2015
6. Наврузшоев Д и др, Редкие и исчезающие виды флоры и фауны Горно-Бадахшанской области Республики Таджикистан. Душанбе- Торис. 2013. 273 стр
7. A.M. Babaev, A.R. Ischuk, S.Kh. Negmatoullaev. Seismic Conditions of the Territory of Tajikistan. Edition by TIU, 2005. 93 pages.
8. Агентство по статистике при Призеденте РТ. Охрана Окружающей Среды в Республике Таджикистан (статический сборник). 2015
9. Committee of Emergency Situations & Civil Defense, ECHO and UNDP Tajikistan Project "Strengthened Disaster Risk Management in Tajikistan". Minutes of REACT group meeting, January 4, 2010. Accessed from: http://untj.net/files/Publications/DRMP/REACT_Minutes/REACT%20Dushanbe%20Meeting%20Minutes/REACT%20meeting%20minutes_04%20January_10_rus.pdf
10. Republic of Tajikistan. National Strategy and Action Plan on Conservation and Sustainable Use of Biodiversity. Dushanbe. 2003.