

# **Environmental and Social Impact Assessment**

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**Project: ADB TA-9530 TAJ**  
**July 2019**

## **Central Asia Regional Economic Cooperation Corridors 2, 3, and 5 (Obigarm-Nurobod) Road Project**

### **Environmental and Social Impact Assessment**

Prepared by the Ministry of Transport.

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REPUBLIC OF TAJIKISTAN



MINISTRY OF TRANSPORT



Looking towards Bridge #8 at Km36 (looking from Tunnel 2 north portal) (August 2018)



Snowfall, Kandak, Obigarm looking north. Alignment mid picture (November 2018)

**Environmental and Social Impact Assessment  
OBIGARM-NUROBOD ROAD  
Dushanbe, July 2019**

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## GLOSSARY

<b>Hukumat</b>	District administration in Tajikistan
<b>Jamoat</b>	A sub-district level administration
<b>Land Acquisition</b>	Refers to the process whereby an individual, household, firm or private institution is compelled by a public agency to alienate all or part of the land/assets for public purposes in return for in-kind replacement or compensation at replacement costs.
<b>Land Acquisition and Resettlement Plan (LARP)</b>	A time-bound action plan with budget setting out compensation for affected land/assets and resettlement strategies, objectives, entitlement, actions, responsibilities, monitoring and evaluation.
<b>Non-titled</b>	Means those who have no recognizable rights or claims to the land that they are occupying.
<b>Resettlement</b>	This includes all measures taken to mitigate all adverse impacts of the Project on DP's property and/or livelihood. It includes compensation, relocation (where relevant), and rehabilitation as needed.

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## *Non-Technical Summary*

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### **INTRODUCTION**

The Project Implementation Unit for Road Rehabilitation (PIURR) of the Ministry of Transport (MoT) of Tajikistan is proposing to construct a replacement 76-km road for the M-41 in the mountain range to the north of the Vahdat River Valley. The new road will include 3 new tunnels and 17 bridges, through a combination of: repairs, upgrades and the construction of new bridges.

### **WHAT IS THE PURPOSE OF THE NON-TECHNICAL SUMMARY?**

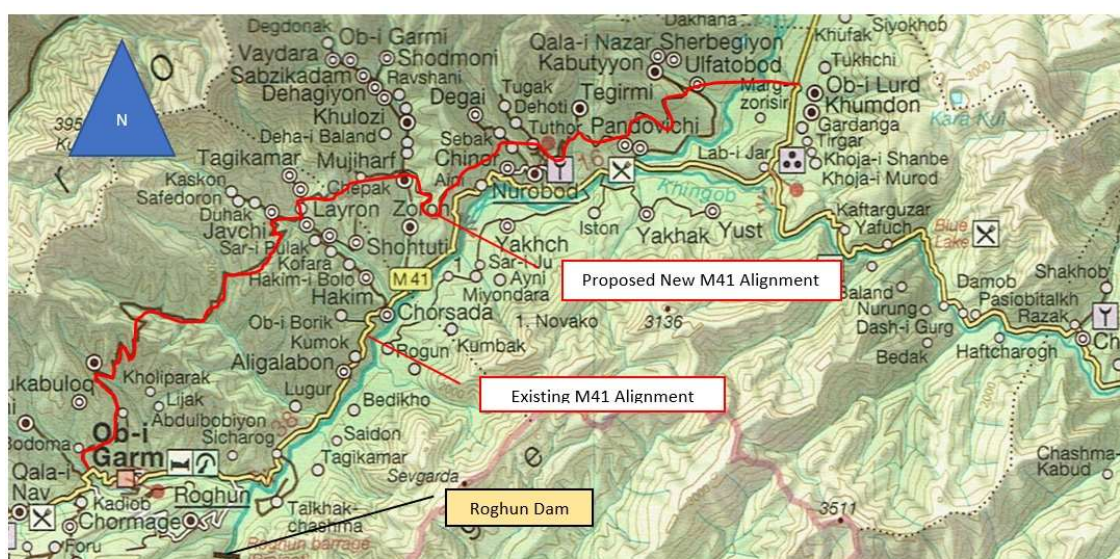
This Non-Technical Summary (NTS) provides an easy to understand summary of the information that is provided in the Environment and Social Impact Assessment (ESIA) Report. The purpose of the NTS is to help the public to understand: the project background, project description, the ESIA process, the potential adverse environmental and social impacts of the project, and the mitigation measures proposed to enhance the benefits and reduce any adverse effects associated with the project.

### **WHAT DOES THE PROJECT INVOLVE?**

The Obigarm - Nurobod Road Project involves the construction of a 76-km road in Tajikistan, between Obigarm in the west and Nurobod in the East. It will replace the existing M-41 road, which will be inundated /flooded by a reservoir, as part of the Rogun Dam HPP project. The new route of the M41 will be located, approximately 1 km north, and parallel to, the existing M-41 road alignment. It will be located within the mountain range to the north of the Vahdat River Valley at an elevation of between 1,305 and 1,890 m above sea level.

A previous project to relocate the existing M41 to a higher elevation, commenced construction in 1984. This road project was mainly on the same alignment as the alignment proposed for this project, although the design was to a lower specification than is currently proposed. The construction was undertaken between 1984 and up to 1992, and road foundation and several bridges were completed, however, the works were suspended during the collapse of the Soviet Union. The current alignment is discontinuous and has not been maintained in the intervening years since construction. The location of the Project is shown below in Figure.

Figure A1: Existing and Proposed M41 road replacement (The Project)



Source: Southern Tajikistan – Tourist Map, Gecko Maps. [www.geckomaps.com](http://www.geckomaps.com)

The Project is divided into three packages:

- Package 1: the Obigarm-Tagikamar section is about 30 km long and includes 2 tunnels of 1.6 km and 1.7 km and local access roads of approximately 30 km in total;
- Package 2: the Tagikamar-Nurobod section is about 44 km long. It includes 1 tunnel of 2.6 km and 1 long temporary bridge local access roads of approximately 40 km; and
- Package 3: includes a bridge that is approximately 760 m long and its access roads.

This NTS covers Package 1 and 2 from Obigarm to Nurobod, which are at an advanced stage of design. A separate assessment of Package 3 will be undertaken in the future when the design for this package has been prepared.

There are other works associated with the project, in addition to the construction of the road, these include:

- Borrow areas (quarry sites);
- Storage and disposal areas for spoil - re-engineering of slopes and embankments will generate excess spoil and the tunnel sections will generate rock material;
- Manufacturing/ processing areas for concrete, asphalt (used for road resurfacing) and rock crushing;
- Construction camps (offices, storage, maintenance and worker accommodation);
- Construction of temporary site access routes to bring materials onto site; and
- Construction of village access roads to provide permanent access to the operational alignment from villages.

The project alignment will be located near to seventeen villages. Three villages will be bisected by the new road alignment, three will be crossed by existing bridge structures, and the remaining villages will be bypassed by the road.

Construction is expected to commence in Q1 2020.

## **WHY IS THE PROJECT BEING BUILT?**

The Rogun Hydro Power Project (HPP), located approximately 100 km east of Dushanbe, is being built to harness the hydropower potential of the Vahdat River. When the dam is constructed, and the reservoir reaches its impounded level, it will cover the existing M-41 road that runs from



Dushanbe to the border with the Kyrgyzstan Republic at Karamyk. Full inundation or flooding of the existing M-41 road is expected in 2025.

The project is required to prevent the impairment of access within the region, particularly to urban centres, employment, education and services, when the existing M41 is inundated by the Rogun Dam reservoir.

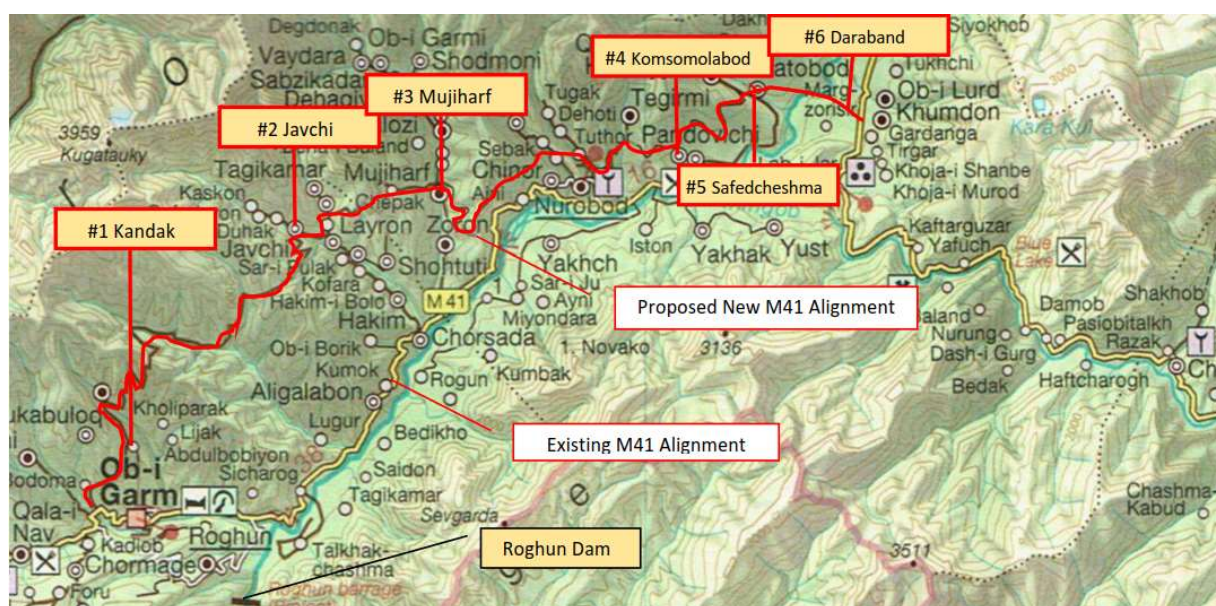
## **HAS STAKEHOLDER ENGAGEMENT TAKEN PLACE?**

The Transaction Technical Assistance (TRTA) consultant and the PIURR have conducted six consultation events along the project alignment between August and November 2018, with the affected households and wider communities. They also undertook seven consultation activities with Hukumats and Jamoats authorities (local officials) and four female focus groups.

In total, 163 persons (131 men and 32 women) participated in the consultations conducted in September and November 2018. The location of the public consultations (August/October 2018) are shown in Figure.

The census identified 157 households that could be affected by the project. The total population of these households is 1,395. Additionally, 17,057 m<sup>2</sup> of Dekhan farm land and 55,584 m<sup>2</sup> of Jamoat land is likely to be affected.

*FigureA2: Locations for Public consultations (August / October 2018)*



Source: Southern Tajikistan – Tourist Map, Gecko Maps. [www.geckomaps.com](http://www.geckomaps.com)

## **HOW HAS THE PROJECT BEEN ASSESSED?**

The European Bank for Reconstruction and Development (EBRD), as a signatory to the European Principles for the Environment is committed to promoting the adoption of EU environmental principles, practices and substantive standards by EBRD-financed projects, where these can be applied at the project level, regardless of their geographical location. Therefore, these principles, practices and standards have all been considered in the assessment.

The Project has been assessed in relation to EU substantive environmental standards, including (but not limited to) Directive 2014/52/EU of the European Parliament and of the Council amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment (the EIA Directive).

When host country regulations differ from EU substantive environmental standards, the Project has been expected to meet whichever is the more stringent.

### **EBRD AND ADB REQUIREMENTS**

The ESIA has been prepared following the guidance contained in the Asian Development Bank Safeguards Policy Statement<sup>1</sup> (SPS 2009) and the EBRD Environmental and Social Policy 2014<sup>2</sup> (ESP 2014).

Specifically, the project has been structured to meet the EBRD's Environmental and Social Policy (ESP) and Performance Requirements (PRs) 2014, which are as follows:

- PR1: Environmental and social appraisal and management;
- PR2: Labour and working conditions;
- PR3: Pollution prevention and abatement;
- PR4: Community health, safety and security;
- PR5: Land acquisition, involuntary resettlement and economic displacement;
- PR6: Biodiversity conservation and sustainable management of living natural resources;
- PR7: Indigenous (N/A – none present in the project area)
- PR8: Cultural heritage;
- PR9: Financial intermediaries (N/A); and
- PR10: Information disclosure and stakeholder engagement.

The Project includes all reasonable measures to avoid, minimise or mitigate any adverse changes in environmental and social conditions, and impacts on public health and safety, especially with respect to any disproportionate impacts on any group of people as a result of their gender, age, ethnicity, disability, socio-economic status and/or other personal characteristics.

It takes into account relevant international conventions and protocols relating to environmental and social issues, as transposed into national legislation.

The ADB Safeguards Policy Statement (SPS) describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy.

The SPS builds upon three previous safeguard policies on:

- the environment;
- involuntary resettlement; and
- indigenous peoples,

It brings the three safeguards policies into one single policy that enhances consistency and coherence, and more comprehensively addresses environmental and social impacts and risks.

The SPS aims to promote sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts by:

- avoiding adverse impacts of projects on the environment and affected people, where possible;
- minimising, mitigating, and/or compensating for adverse project impacts on the environment and affected people when avoidance is not possible; and
- helping borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

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<sup>1</sup> <https://www.adb.org/documents/safeguard-policy-statement>

<sup>2</sup> <https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html>

An Annex to Appendix 1 of the SPS sets out a framework for Environmental Impact Assessment reporting and this document follows the format.

## **HAVE ALTERNATIVES BEEN CONSIDERED?**

The flooding of the existing M-41 will remove all access to the towns of Nurobod and Obigarm, affecting a population of approximately 73,000 people. Therefore, the 'no project scenario' would have major social consequences, and has not been considered further due to the severity of the adverse consequences.

As part of the overall project design, alternative corridors have not been considered, because they would require long diversion through adjacent valleys, and would not reinstate access to the towns of Nurobod and Obigarm, and other villages along the existing alignment, when the M-41 is flooded.

Alternative alignment options within the northern part of the Vahdat River Valley are limited, due to the increasingly complex topography (mountainous) and geological conditions to the north, and the severance effect of the Rogun dam impoundment and reservoir to the south.

The proposed alignment was fixed during the Soviet era, and generally protected from development. The previous works included vegetation clearance and earthworks, which changed the physical condition and land use of the road. It is reasonable to assume that the adverse environmental and social effects associated with any alternative alignment, is likely to be greater than the established alignment, as this would introduce disturbance to a new location. Therefore, the assessment of alternatives has focused on the fixed alignment, and the options for modification to this alignment that were considered during the design stage.

That said, a number of micro-realignments of the proposed route (e.g. small changes to the alignment with the proposed corridor) have been made, including:

- Slight realignment to avoid a cemetery;
- Modifications to cut slopes and road curvatures;
- Modification / reconstruction of bridges; and
- The addition of Tunnel 3 to eliminate a stretch of winding road, improving journey times and road safety.

A number of design amendments have been made to improve road safety on the alignment, as a response to community consultations and a road safety audit conducted in November 2018, as follows:

- advisory 40 km/h speed limit in villages will be applied.
- Protected pedestrian crossing locations in villages;
- Crossing points moved away from the path of turning traffic to reduce the potential for accidents;
- Warning signs at all pedestrian crossings;
- Improvements to road markings and signage;

A number of alternative materials and construction techniques have been considered during the design process. This has included the removal of asbestos from the designs to comply with EBRD requirements.

## **WHAT ARE THE LIKELY EFFECTS OF THE PROJECT?**

### **AIR QUALITY**

The project road crosses a relatively mountainous landscape, with small villages along the road. The project corridor does not have any industrial sources of pollution; therefore, the main source of air pollution in the region is the burning of fossil fuels for heating and cooking. The second most common source of emissions into the atmosphere is exhaust emissions from motor vehicles and dust raised by motor vehicles. Site observations in August and September revealed few motorized vehicle movements on the alignment. Foot traffic and donkey carts were observed to be the favoured mode of moving on the alignment at this time.

#### **Construction**

The construction activities associated with the project have the potential to result in adverse air quality impacts. These include:

- Emissions as a result of vehicles and machinery
- Vehicles causing dust when traversing unsealed roads;
- Dust emissions from the demolition and construction works;
- Smoke arising from road construction works during bitumen works;
- Welding works can cause welding aerosol and manganese monoxide emissions; and
- Concrete work for bridge can result in cement dust emissions;

Dust can prove to be a problem for a variety of reasons:

- Emissions from vehicles and plant can have an adverse impact on human health.
- Increase dust levels can affect human health, by irritating eyes and worsening the health of people with bronchial conditions (e.g. asthma);
- Inconvenience to local people - dust can contaminate food left in open air homes;
- Dust can damage crops;
- Within the construction site, dust can cause mechanical or electrical problems in sensitive equipment, such as computers.
- It can also increase abrasion of moving parts in equipment and clog air filters.

Without adequate mitigation measures, these effects can impact the local population as well as site workers.

#### **Operation**

Operation of the road will bring vehicles into an environment where there were previously no vehicle movements. There will therefore be an increase in emissions as a result of increased traffic. However, due to the improved road surfacing, it is considered that traffic will move more freely and so emissions will not be worsened.

#### **Mitigation**

During the construction phase, the following mitigation measures will be implemented:

- Loose materials will be in closed/ covered trucks for transportation to prevent the release of dust;
- All vehicles and equipment will be in a good state of repair and working efficiently;
- Active dust suppressing in the form of water trucks on roads will be used to reduce dust;
- Asphalt plants, stockpiles and concrete mixing sites will be located in isolated areas (at least 500m from sensitive receptors);
- Provision of wheel washing facilities at construction camps, tunnel portals and at bridge construction sites, to prevent truck out of mud and dust;
- Training staff in construction best practice; and

- Speed limits when moving through residential areas which will reduce dust emissions.

In addition, the contractor will develop an Air Quality Management Plan. This plan will provide all additional mitigation measures to minimize impacts to sensitive receptors during the construction phase. A Traffic Management Plan, Emergency Response Plan, Asphalt Plant Management Plan, Concrete Batching Management Plan and Occupational and Community Health and Safety Plan will also be developed, and used to help manage impacts to air quality.

No additional mitigation has been identified for the operational phase. The road will undergo routing maintenance and inspection. If excessive dust is found, measures will be put in place to reduce it.

## **BIODIVERSITY AND LIVING NATURAL RESOURCES**

The project is located within an area characterized by habitats that exhibit varying degrees of human influence. Much of this is due to long-term grazing pressure and tree-clearance (which has resulted in soil destabilisation and subsequent erosion).

In areas where grazing pressure is reduced, more diverse habitats exist, including meadows native woodland, and vegetated hillsides.

### **Terrestrial Flora**

The project area falls under the lowlands habitat. The area is warm, and broad-leaved forests, shrubs, with areas of steppes and forest-steppe are dominant.

The most abundant flora across the project and wider area are perennial / short grasses which are indicative of ongoing grazing practice in the region. In areas where grazing pressure is less pronounced, grasses are intermixed with herbs and shrubs.

### **Terrestrial Fauna**

Faunal diversity across the project area (and wider area) is diverse, with numerous animal groups represented. The presence of faunal species conservation concern will vary through the year depending upon prevailing weather conditions, as well as other influences such as local livestock movement.

- Amphibians. In Tajikistan, there are 2 species of amphibians - the green toad (*Bufo viridis*) and the lake frog (*Pelophylax ridibundus*). Both species play an important role in maintaining the ecological balance and feed on invertebrates.
- Reptiles. Around 47 species of reptiles are considered likely to inhabit the project area, including snakes, lizards, and a single tortoise species.
- Birds. The bird fauna is extremely rich in the project area. Of the 400 species of birds in Tajikistan, about 150 species can be found here, of which 56 species nest in the area.
- Mammals. There are 84 species of them in Tajikistan. And many of them live in the area of the project.
- Bats. There are eight bat species present in Tajikistan, and many of these will likely be present within the project area at times. Roosting opportunities exist within built structures (e.g. houses/barns) and cliff/rock cavities, while an ample foraging resource is also present.
- Fish. The rivers Surkhob and Vakhsh are home to 3-4 species of freshwater fish, of which rainbow trout is of particular importance to the local population.

### **Species of Concern**

There are seven rare and endangered plant species listed in the Red Book of the Republic of Tajikistan (2015 and 2017 editions) and protected by the state (list 1) that grow in the project area, albeit on the slopes of ridges, scree, in the steppe or meadow zones, and generally outside the immediate project footprint. These species are as follows:

- *Cousinia corymbosa*
- *Alium Rosenbachianum*
- *Alium spititatinum*
- *Alium Suworovi*
- *Tulipa praestans*
- *Anemone bucharica*
- *Iris Haoliana*

Further to the above, there is also the potential for ancient fruit trees to be present across the project area. These include species such as pear (*Pyrus spp.*) and cherry (*Prunus spp.*).

### **Protected Areas (Formal / Informal)**

No protected areas are situated within the zone of influence of the project. The closest such example is the Romit State Nature Reserve, which lies c. 25km to the north-west of the project. This area was previously recognised by IUCN as a major biodiversity site, but has lost this status due to the value of the Reserve having been compromised by unregulated grazing, wood gathering, and illegal hunting<sup>3</sup>.

The next closest area is the Sari Khosor National Park, which lies approximately 30 km to the south of the project.

### **Construction**

Limited impacts on biodiversity are expected due to the road being developed within an already disturbed alignment, and situated within a landscape that has been subject to human pressures for many years (in particular livestock grazing).

### **Operation**

Operational impacts will comprise increased risk of wildlife road traffic accidents, and increased pressure from hunting/collecting due to better access to the project area provided by the new road.

### **Mitigation**

Although impacts to biodiversity are considered to be limited, there are still a number of mitigation measures that should be adopted. A Biodiversity Management Plan (BMP) will be prepared and implemented during the construction phase. This will set out measures including (but are not limited to):

- Appointment of an Ecological Clerk of Works to carry out additional preconstruction surveys that focus on flora and fauna of conservation importance;
- Good site practice to ensure habitats are not unnecessarily affected by the works
- Programme of education/awareness-raising of the local population and workforce to prevent hunting/poaching/collecting of rare seeds; and
- Operational monitoring of wildlife road traffic accidents.

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<sup>3</sup> Ning, Wu; Rawat, GS; Joshi, S; Ismail, M; Sharma, E. 2013. High-altitude rangelands and their interfaces in the Hindu Kush Himalayas. Kathmandu: ICIMOD

With mitigation in place the residual effect to biodiversity is considered not to be significant.

## **CLIMATE CHANGE - GREENHOUSE GAS EMISSIONS**

Greenhouse Gases (GHG) are natural and man-made gases occurring in the atmosphere which absorb and emit infrared radiation thereby maintaining the Sun's energy within the Earth's atmosphere. There is a scientific consensus that the major increase in the concentration of GHGs from man-made sources is contributing to global warming and climate change.

From the late 1990s to the present, agriculture has been the main source of greenhouse gas emissions in Tajikistan. Given the low level of mechanization, under-feeding of livestock, as well as the limited use of fertilizers, emissions from the agricultural sector of Tajikistan are lower than in other Asian and European countries. The potential for any significant reduction in agricultural carbon emissions is therefore limited, while other measures of economic sub-industries are promising, especially in energy and industry. The transport sector therefore needs to ensure that greenhouse gas emissions are kept to a minimum where possible.

### **Construction**

None of the potential emissions sources during the construction are expected to be large in magnitude. Medium magnitude emissions during construction are likely to come from:

- Emissions associated with extraction and manufacturing of the required raw materials;
- Emissions from fuel and electricity used in vehicles transporting materials to the site, and away from the site; and
- Emissions from fuel and electricity used in plant and equipment on site.

### **Operation**

During operation is anticipated that there will be no adverse GHG effects as a result of the Project. The increase in vehicle numbers is anticipated to be offset by the reduced journey lengths if the project was not present.

### **Mitigation**

As with air quality and noise and vibration, the Contractor will ensure that all equipment used is fit for purpose and working efficiently.

Opportunities will be sought to minimise the use of materials where possible to help reduce the amount of embodied carbon within building materials.

## **CLIMATE CHANGE VULNERABILITY**

As with many countries, the climate of Tajikistan is changing as a result of climate change. The key climatic changes are anticipated to be:

- Temperature – increased temperature fluctuations (highs and lows)
- Intense precipitation – resulting in mudslides, landslides, floods and mudflows
- Glaciers and snow melt
- Wind – stronger winds and storms

This could affect the project in the following ways:

- Increased erosion of the road surface and concrete structures
- Increased pressure on the drainage system
- Increased risk of mudflows affecting in-river structures such as bridges
- Increased risk to high sided vehicles
- Increased dust

### **Mitigation**

During detailed design and construction, a Climate Resilience Construction Management Plan will be prepared. This will ensure that the temporary construction works do not affect the resilience of the permanent elements of the project. For example, temporary roads will not be allowed to undermine sections of permanent road infrastructure.

The Climate Resilience Construction Management Plan will ensure that the ensure appropriate design measures, materials specification and mechanisms for management of climate resilience risk are used, including:

- drainage system has sufficient capacity for intense rainfall events.
- road is protected against slope instabilities
- surfacing materials are adequately specified
- elements can be replaced at a later date but more resilience components
- bridges allow for high wind loading

During operation, infrastructure will be regularly inspected, especially after intense rainfall events and flash flooding to ensure that there is no damage the bridges. Any damage will be repaired as soon as possible to ensure that the bridges are structurally sound.

An operational complaints mechanism (Grievance Redress Mechanism - GRM) will be put in place to allow observation from the public to feedback to the maintenance contractors.

## **CULTURAL HERITAGE**

### **Construction**

No archaeological or cultural resources are expected to be encountered during project implementation since major works are on a corridor where excavations have been conducted before and no findings have been reported.

### **Operation**

No significant cultural heritage effects are foreseen during the operational phase.

### **Mitigation**

In accordance with EBRD Performance Requirement 8, a Chance Find procedure will be put into place. A Cultural Heritage Management Plan (CHMP) will be prepared and implemented to mitigate construction impacts (such as dust and vibration) on heritage resources.

## **NATURAL HAZARDS**

### **Seismic Conditions**

Tajikistan has a relatively high seismic (e.g. earthquake) potential, experiencing nine earthquakes with magnitude 4 or above recorded in Q1-Q2 2019 alone. The area of the project is also categorized as having a very high seismic hazard risk.

### **Landslides, Mudflows and Floods**

In Tajikistan, floods and associated debris flows are caused by intense rainfall events. Debris flows most commonly occur in mountainous regions and foothills at altitudes usually up to 2,000 m. Debris flows are caused by intense rainfall events and as a result of snow/glacier melt. Debris flows as a result of ice melt have a shorter duration but cause greater damage.

In the 1990s, about 50,000 landslides were recorded throughout the country, including seismically hazardous and non-hazardous areas, with the highest concentration occurring in the western and central parts of the country.



Geology Surveys indicate that landslides of various types occur in the Project area. Landslides in bedrock are generally shallow but can cover a large area.

Mudflows form as a result of:

- steep-sided terrain with large slopes next to rivers;
- large reserves of loose material on the slopes and river beds; and
- significant rainfall.

Mudflows are associated with the following rivers in the project area:

- Kandak/ Guliston River
- The Hakimi River
- Tagikamar River
- Chepakdara River
- Mujikharv River
- The Tegermi River

### **Mitigation**

During construction, measures will be put in place to ensure emergency preparedness for a wide range of hazards such as landslides, mudflows, earthquakes and flooding.

All new infrastructure will be regularly inspected during intense rainfall periods to ensure that it has not been damaged as a result of flash floods and mudflows. If damage has occurred, it will be repaired to ensure that it does not degrade and remains safe to use.

As outlined in the Geology and Soils section below, slope stabilisation works will form part of the Project which will reduce the risk of landslides and will improve safety along the project alignment.

## **GEOLOGY AND SOILS**

The majority of the new road is underlain by granite and aggregates. Due to the topography there is limited soil. No ground investigations have been conducted in the vicinity of the alignment but, given the generally remote and undeveloped location, the potential for existing contamination is considered to be low. There is potential for residual contamination (e.g. from fuels and hydrocarbons) associated with the original works for construction of the alignment in the 1980s.

Soil erosion in the Project area has had a significant impact on the alignment. The two main factors underlying soil degradation in the project area are from water flowing over slopes creating gullies that accelerate the erosion process. Anthropogenic or human factors also increase the development of erosion through intensive agricultural development on road slopes and unsustainable crop cultivation practices.

In the Project area, erosion effects are managed at a local level in all Jamoats.

### **Construction**

The risk from the potential sources of contamination would be the adoption of good site practices which will be detailed in the Construction Environmental Management Plan. All workers will be provided with personal protection equipment to reduce the risk of contact with hazardous contaminants.

### **Operation**

During operation, the nature of the road construction will act as a barrier to potentially contaminated soils underlying the road alignment.

### **Mitigation**

Any hazardous material found during construction works will be disposed of via licenced waste contractors.

The potential for contamination to occur as a result of construction works (spills and release of contaminated waters) will be managed through specific construction management plans including Spill Management Plan, Water Resourced Management Plan and Camp Management Plans.

The project will ensure that slope stabilisation works take place to reduce the potential for landslides adjacent to the road.

## **LANDSCAPE AND VISUAL**

The relief of this region is typically mountainous, with access to the sub-Alpine and Alpine zones in the upper part of the ridge, with steep peaks and small glaciers. Almost every gorge has rough streams and rivers. On the steep slopes there are rocks and numerous stone scree (or loose rock/gravel) deposits.

### **Construction**

During construction, landscape and visual impacts will occur due to the use of construction machinery, construction works, and importation of materials. This will also cause increases in noise, dust and activity along the Project.

Construction activities have the potential to have significant effects on site vegetation, local landscape character and local visual receptors

### **Operation**

The project will also the local landscape character of the immediate area by introducing new hard-surfaced areas and built infrastructure.

With the exception of local visual receptors surrounding the Project, particularly isolated properties, it is not anticipated that the Project would have significant adverse effects on local landscape character or visual receptors following the implementation of mitigation measures.

### **Mitigation**

During the detailed design and construction phase a Landscape and Visual Management Plan will be implemented, including revegetation efforts. This will ensure that construction phase landscape impacts are kept to a minimal and will also outline the materials to use to ensure that the new infrastructure fits into the landscape.

## **MATERIAL RESOURCES AND WASTE**

### **Construction**

The consumption of materials and generation of waste will occur as part of the Project. During construction materials are likely to comprise asphalt, sub-base materials (aggregate), concrete, bituminous materials, concrete, metal and plastics. Inert waste will also include green waste accumulated during site clearance.

The hazardous waste expected during pre-construction and construction works may contain asbestos.

### **Operation**

The Project is anticipated to consume minimal quantities of materials and generate minimal volumes of waste during operation. Maintenance activities are considered likely to consume small quantities of specialist components (for example signage and lighting) as well as some bulk

products (asphalt), and generate small volumes of associated waste. Any materials required will impact on the consumption of natural resources resulting in the depletion of natural resources and local / regional stocks, resulting in an adverse, permanent and direct impact on the consumption of construction materials.

However, based on the project design and commitments, is considered unlikely that the operational waste effects will be significant.

#### **Mitigation**

A Waste Management Plan will be out in place during construction activities. With these mitigation measures implemented, impacts can be reduced to an acceptable level.

The precise mechanisms will be identified in the waste management plan created for project by the Contractor and forming part of the Contractor Site Specific Environmental Management Plan.

### **NOISE AND VIBRATION**

#### **Construction**

Noise and vibration can adversely impact sensitive receptors such as houses or local residents which are close to the works.

Temporary noise and vibration effects are defined as those that occur between the start of advance works (e.g. vegetation removal) and the end of the construction period. Where materials need to be transported to or from the site, the effects of the additional traffic along access routes are likely to extend beyond the immediate construction corridor.

The construction of the new tunnels will require blasting to take place which will cause significant levels of noise and vibration in close proximity to the works.

#### **Operation**

The Project will increase the levels of noise and vibration in comparison to the existing site conditions as traffic volumes on the current alignment are incredibly low. Mitigation measures will be required to ensure adverse effects are avoided.

#### **Mitigation**

Specific noise and vibration measures will be outlined in a Noise and Vibration Management Plan. These will include:

- The contractor will aim to minimise noise impact through the use of natural topographical barriers or by placing physical barriers between generating activities and sensitive uses and only work during daytime hours;
- All vehicles will be equipped with exhaust mufflers and will be regularly inspected to ensure they are operating efficiently;
- Blasting will not occur outside standard working hours. Affected residents will be informed of the date and time of blast well in advance.
- Blasting will be subject to a Blasting Management Plan.

An operational Noise and Vibration Plan will be implemented and will include mechanisms for addressing complaints during the operation of the scheme (the Grievance Redress mechanism).

## **WATER ENVIRONMENT**

The project crosses the following rivers:

- Kandak/ Guliston River
- Gazakiyon River
- Zuriyon River
- Sebnok River
- The Hakimi River
- Tagikamar River
- Chepakdara River
- Mujikharv River
- The Mirzosharifon River
- The Dashtiguron River
- The Tegermi River
- The Kalot River

All rivers in the project area have two distinct flow patterns; spring - summer high flows and autumn-winter low flows. The high flows start at slightly different times of the year depending on the altitude of the river. The spring season typically starts between February and March in the form of snow fall. The highest flows typically occur in April – May as a result of rainfall. During this period, the risk of mudflows is increased. The minimum flow of the river is determined by groundwater reserves in the river catchment area. On permanently operating water courses in the study area low flow rates vary between 0.20 and 1.0 m<sup>3</sup>/s.

Most potable water is obtained from groundwater sources. Village residents use narrow gauge plastic pipes (e.g. hose pipe) to bring water from the uphill locations to individual houses. When the water source is on the other side of the road, the pipes are run through culverts and other pipe structures beneath the existing road alignment.

### **Construction**

The construction of the Project could adversely affect the water environment in the following ways:

- Spills of contaminants (fuels/ concrete etc) entering surface and ground water
- Release of sewage/ untreated water from compounds and welfare construction related facilities
- Construction works utilising local water supplies, reducing the quantity available for local residents
- The removal of/ damage to water infrastructure used by the local community
- Contaminated run-off entering surface water bodies

### **Operation**

The increase in traffic along the Project could increase the risk of contaminants entering surface and groundwater through the new drainage structure.

There is the potential that water quality could be improved as a result of the Project as the road surface will potentially reduce the amount of sediment laden water entering surface water features.

### **Mitigation**

A Water Resources Management Plan will be prepared and implemented during the construction works to ensure that the water environment is not adversely affected by the construction of the

Project. This will include a Spill Management Plan which will help reduce the impacts of any spills as a result of the construction works.

The Water Resources Management Plan will also calculate the water requirements for the construction works to ensure that sufficient supply is available and that local resident's water supply is not affected.

The project will be designed to ensure that the infrastructure used by residents is not affected. The local residents will be consulted to agree new locations of piping and culverts to ensure their water supply is continuous.

The design of the drainage system will prevent contamination from spills entering surface and ground water.

## **SOCIAL**

The Project is located in two Districts, Rogun (Роғун) and Nurobod (Дарбанд). They form part of the Districts of Republican Subordination - DRS (Ноҳияҳои тобеи ҷумҳурий) a region in Tajikistan, consisting of 13 districts that are directly under central rule. The population count is 22,600 in Rogun and 66,000 in Nurobod. The largest city in the Project area is Rogun, the capital of Rogun province with an estimated 9,600 population as of 2007.

A total of 16,438 people live in the 17 Project-affected villages located along the Project alignment. In total, there are 8,413 males and 8,038 females living in 2,007 households. The average family size in these villages ranges from six persons in Bozorak and Darband to ten persons per household in Siyagulak, Tuhtor and Gulmon villages.

There are no indigenous people in the Project area.

### **Construction**

The Project could affect the local population in the following ways:

- Noise disturbance to locals particularly living close to the construction corridor (see Noise and Vibration);
- Road accidents resulting from increased construction traffic;
- Impact on water infrastructure (see Water Environment)
- Reduced air quality and impact on community health (dust associated with ground work) (see Air Quality).
- Access issues (and economic displacement) due to construction works and road closures
- Influx of construction workers and the potential for increased vulnerability and susceptibility to increased crime, alcoholism, etc. There is a potential impact associated with conflicts between workers and locals, and some women may feel discomfort.
- There are potentially positive outcomes on the local community in the form of job opportunities and training, particularly opportunities for women.

The social impact of the project on the workers themselves should also be considered. If the construction workforce is not managed, the Project could lead to issues associated with child labour, forced labour, poor working condition and labour grievances within the Contractors organisation and associated supply chain.

### **Operation**

The new road would potentially bring new investments into the area, and could also lead to increased land prices. The new road will reduce travel times from Europe to China. Therefore, the new road will be the main route for inter-regional trips and increased number of road users would potentially bring additional income for local businesses and farmers. As part of this project, local communities will obtain some social benefits including:

- The new road will provide a shorter route and thus faster trips to other regions;
- Further local investments could be attracted to the area through opening new shops, restaurants, petrol stations, etc.
- There will be some long-term opportunities for local women to obtain jobs, training and internship programmes once the new road is operational, due to the improvement in accessibility to other areas. However, such opportunities are expected to be limited.

The Project operational impacts are minimal, and social benefits (including employment, infrastructure improvements) are expected.

There could be safety implications of the Project as the new infrastructure will be a lot busier than the existing road. This increases the risk of accidents.

### **Mitigation**

A series of plans will be prepared and put in place during construction to minimise the impacts of the scheme on the local population. These include Stakeholder Engagement Plans which will set out the framework for continued stakeholder engagement through the Project and mechanisms for local residents to raise issues about the scheme during construction to ensure matters are dealt with quickly. The Contractor and all sub-contractors will sign up to a Code of Conduct which will ensure the Project meets employment and labour standards while also ensuring environmental and social protection are in place. Opportunities for local employment will put in place as well as measures to avoid conflict between the workforce and the local community (including Gender Based Violence).

Community awareness programmes will also be employed, including road safety awareness sessions, with particular focus on vulnerable groups such as children and animal herders.

Multiple workforce targeted management plans will be put in place including a Labour and Working Conditions Management Plan (LWCMP) and an Occupational and Community Health and Safety Plan. This will ensure a safe work environment for the workers throughout the construction phase.

An Operational Community Health and Safety Management Plan will be prepared and provided to local residents to ensure that they are prepared for the change in traffic volumes and the new infrastructure.

## **HOW WILL THE PROJECT MANAGE AND MONITOR PROJECT RELATED IMPACTS?**

An Environmental and Social Management Plan (ESMP) has been produced for the project, which contains all of the main mitigation areas defined above. This will be maintained as a live document and will be a requirement of the PIURR and its contractors. Fulfilment of these ESMP commitments will be further monitored by the EBRD and ADB.

Finally, the detailed design and the construction contractors will be required to fully implement the requirements of the ESIA, the ESMP and the ESAP, and independent audits will be undertaken to ensure that these requirements are fully implemented.

## **STAKEHOLDER ENGAGEMENT PLAN (SEP)**

A Stakeholder Engagement Plan (SEP) has been developed with the objective of identifying key stakeholders and ensuring that, where relevant, they are informed in a timely manner of the potential impacts of projects. The SEP also identifies a formal grievance mechanism to be used by stakeholders (internal and external) for dealing with complaints (GRM), concerns, queries and comments. It will be reviewed and updated on a regular basis. If activities change or new activities relating to stakeholder engagement commence, the SEP will be brought up to date. It

will also be reviewed periodically during project implementation and updated as necessary. The SEP includes the following:

- Public consultations and information disclosure requirements;
- Identification of stakeholders and other affected parties;
- Overview of previous engagement activities;
- Stakeholder engagement programme including methods of engagement and resources; and
- A Grievance mechanism.

Stakeholders could be individuals and organisations that may be directly or indirectly affected by the project either in a positive or negative way, who wish to express their views.

# 1 Introduction

## 1.1 Project Location and Setting

1. Tajikistan is a landlocked country of Central Asia (Figure 1). It relies on road transport for international trade. The Rogun Hydro Power Project (HPP), including the Rogun Dam, located approximately 100 km east of Dushanbe, is being built to harness the hydropower potential of the Vahdat River. Following the impoundment of the dam, the reservoir is being filled and in time it will cover the existing M-41 road that runs from Dushanbe to the border with the Kyrgyzstan Republic at Karamyk.
2. The proposed project “Obigarm - Nurobod Road Project” is to build a replacement 76 km road for the M-41 in the mountain range to the north of the Vahdat River Valley (see Figure 2 alignment and Figure 3 schematic showing bridges and tunnels).

Figure 1: Tajikistan in Central Asia and the Project in Tajikistan

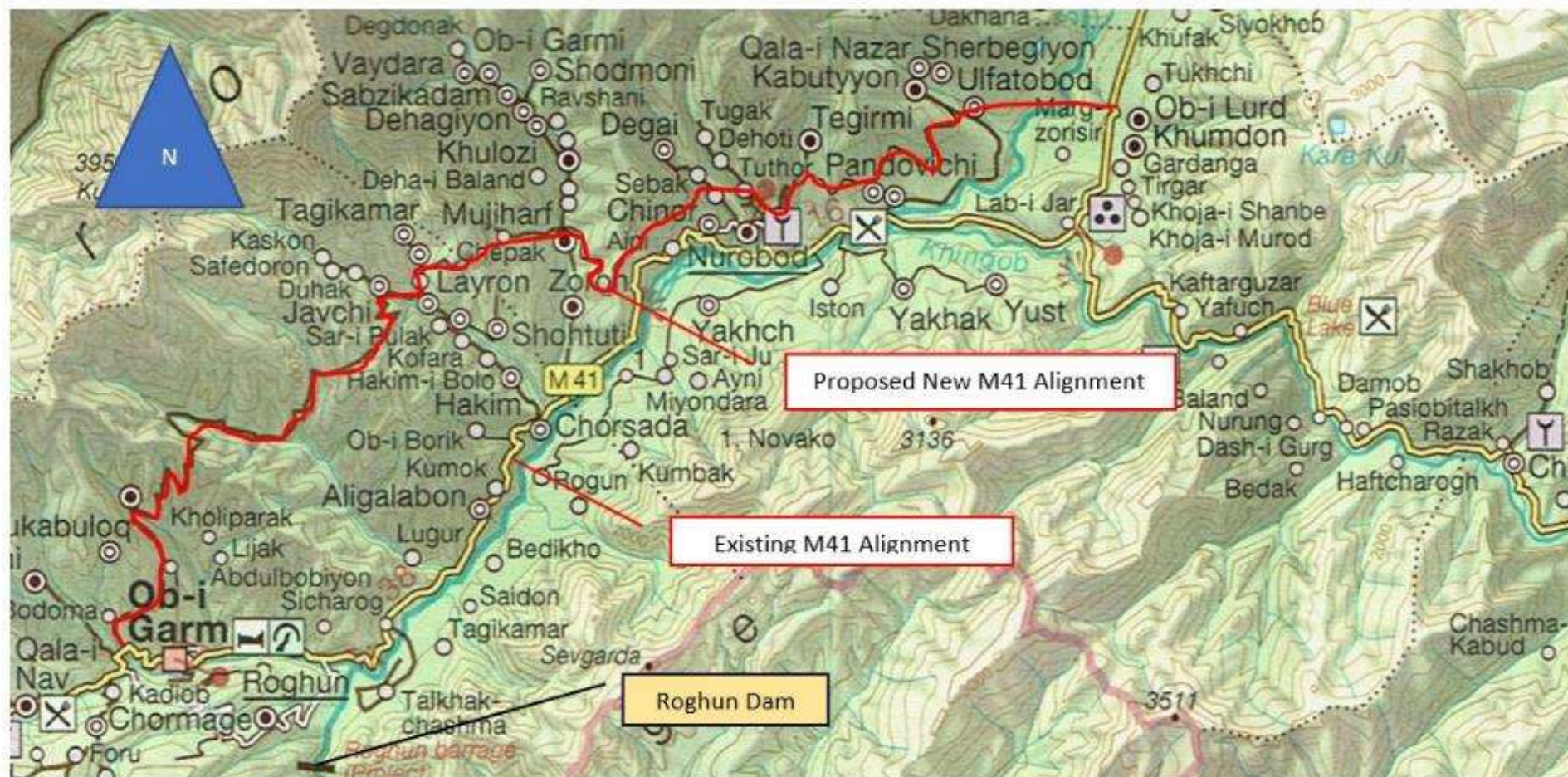


Source: Complete Atlas of the World, 2<sup>nd</sup> Edition, DK Publishing (2012)

3. During the consultation process carried out for this project [Package 1 LARP (December 2018) & Package 2 LARP July 2019)], it was determined that a population of 16,438 are located along the alignment. Table 1 sets out this information.

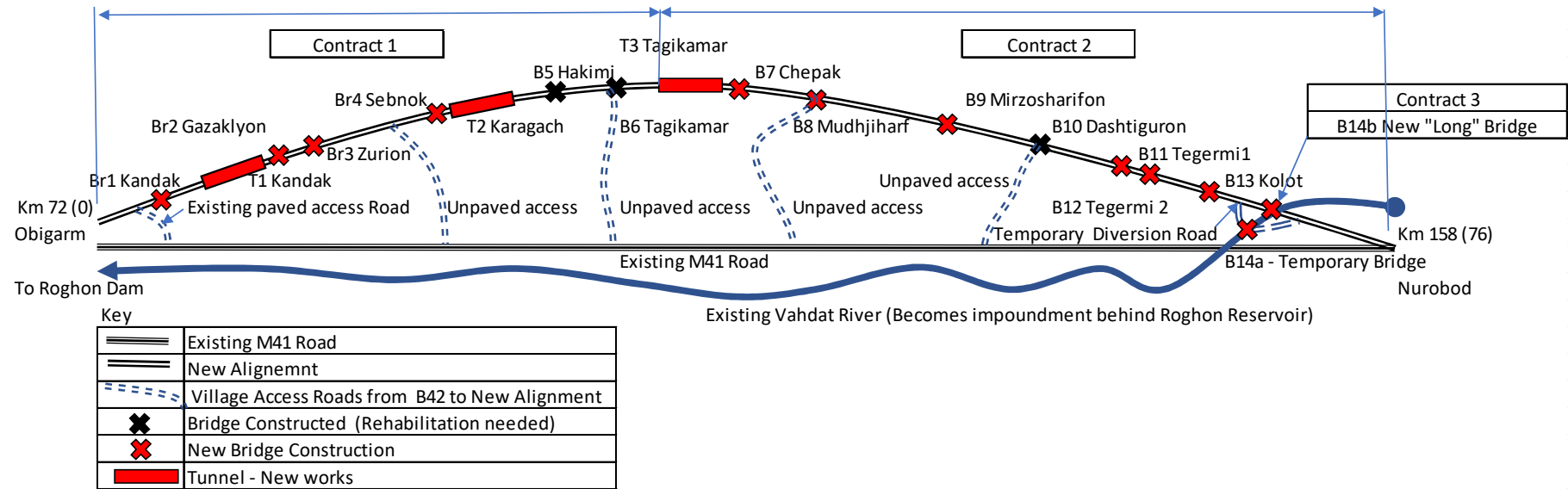


Figure 2: Existing and Proposed M41 road replacement (The Project)



Source: Southern Tajikistan – Tourist Map, Gecko Maps. [www.geckomaps.com](http://www.geckomaps.com)

Figure 3: Schematic of Alignment showing location of bridges, tunnels and access points



Source: Prepared for this ESIA document

Table 1: Population of the Project Villages on the alignment

District / Hukumat	Subdistrict / Jamoat	Villages along the Project road	Population	Male	Female	No of Households (HH)	Person / per HH (average)
Rogun	Obi Garm	Bozorak	98	49	49	16	6
		Kandak	2,318	1,228	1,090	250	9
	Sicharog	Shohi Aslon	250	132	118	28	9
Nurobod	Hakimi	Chavchii Poyon	445	239	206	61	7
		Sadokat	456	246	210	63	7
		Layron	1,312	692	620	153	8
		Siyagulak	968	518	450	136	7
	Muchiharf	Chepak	282	133	149	28	10
		Muchiharfi Kalon	1,411	709	702	169	8
	Komsomolobod	Degai	725	361	364	107	7
		Tuhtor	562	280	282	58	10
		Tegermi	2,786	1,391	1,395	345	8
		Pandovchi	805	404	401	117	7
	Safedcheshma	Dehi Tag	1,250	635	628	142	9
		Ulfatobad	2,020	1,030	990	224	9
		Gulmon	148	72	76	14	10
	Darband	Navobod	602	294	308	96	6
<b>Total</b>			<b>16,438</b>	<b>8,413</b>	<b>8,038</b>	<b>2,007</b>	<b>8</b>

Source Project LARP (Package 1 Dec 2018 & Package 2 July 2019) Table 3.3

## 1.2 Background and Rationale for Project

4. The project will replace the existing corridor (Route M41) running immediately north of the Vahdat River that will be lost when the Rogun Dam reaches its final impoundment level. The new route is through the mountain ranges north of the Vahdat River Valley up to 1 km north of the existing M41 road alignment. A feasibility study of a replacement road commenced in 1975, in 1984 the project was approved, and the construction started and continued up to 1992 when the works were suspended during the period of the former Soviet Union break-up. During construction in the Soviet era:
  - bulk earthworks (cuttings and embankments) were substantially completed to create a road platform along the length of the alignment (except bridges and tunnel sections);
  - three bridges were constructed and ten planned but not constructed; and
  - two tunnel sections were planned and had preliminary works done, but no significant tunnelling was carried out.
5. The alignment is therefore discontinuous and has not been maintained in the intervening years since construction.
6. The proposed project “Obigarm - Nurobod Road Project” aims to construct a 75 km alternative alignment (the “Project road”) for the existing M41 highway connecting the northeast region of Tajikistan and the Kyrgyz Republic between Obigarm (72 km) and Nurobod (158 km). The current M41 will be inundated by the reservoir of the Rogun Hydropower Project (HPP), that is now under construction.

The project road is divided into three packages:

- (i) Package 1: the Obigarm - Tagikamar section is about 30 km long. It includes 2 tunnels of 1.6 km and 1.7 km, and local access roads of approximately 30 km;
- (ii) Package 2: the Tagikamar-Nurobod is about 44 km long. It includes 1 tunnel of 2.6 km and 1 long temporary bridge, and local access roads of approximately 40 km; and
- (iii) Package 3 includes a permanent bridge that is approximately 760 m long, and its approaches.

These sections correspond to three contract packages that will be procured separately through open competitive bidding. The existing bridge over the [Surhkhob River](#) on the M41 will be inundated in November 2023, so the new temporary bridge in Package 2 will need to be constructed before this date. The new temporary bridge will be inundated by November 2025, so the permanent bridge at Darband will need to be constructed before this date.

- **Package 1** will be financed by USD 110 million grant from Asian Development Bank (ADB) and USD 40 million loan from Organisation of the Petroleum Exporting Countries (OPEC) Fund for International Development (OFID).

Package 1 consists of the following sections of the Road:

- Section 1 - Javoni – Kandak
- Section 2 - Gazakyon – Sebnok (Lugur);
- Section 3 - Hakimi – Siyohgulak;
- Bridge No 1 through Bridge No 6
- Tunnel No 1 (Kandak Tunnel); and
- Tunnel No 2 (Karagach Tunnel)



ending short of the south portal of Tunnel No 3 (Tagikamar Tunnel).

- **Package 2** will be financed by USD 150 million loan from European Bank for Reconstruction and Development. Package 2 consists of the following sections of the Road from 33 km:
  - Section 4 - Mudzhiharv-Alihodzha;
  - Section 5 - Alihodzha – Tuthor;
  - Section 6 - Tuthor – Kabudiyon (Samsolik);
  - Section 7 - Kaboudiyon – Humdon
  - Bridge No 7 through Bridge No 13;
  - Tunnel No 3 (Tagikamar Tunnel); and
  - The temporary bridge over the Surkhkhub River at Darband.
- **Package 3** will be financed by USD 40 million loan from Asian Infrastructure Investment Bank (AIIB) and covers the long permanent bridge (760 m) over the Rogun HPP Reservoir at Darband over the Surkhkhub River.

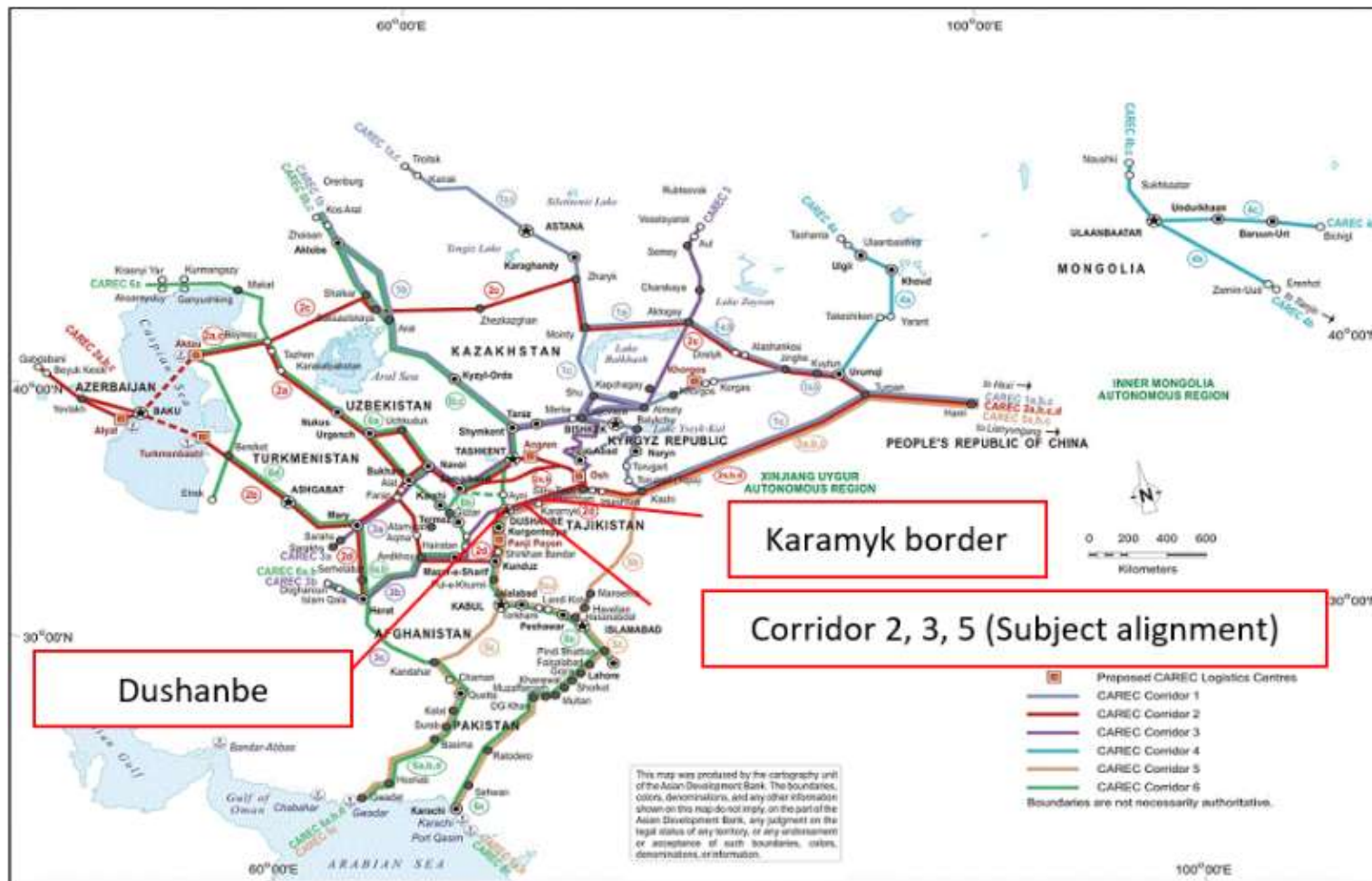
The respective chainage is presented in Table 2.

*Table 2: Project Sections and Chainage*

Section	Financier
Section 1: km 0+000 to km 30+217	ADB/OFID
Section 2: km 30+217 to km 75+600, less the section for Package 3 which runs from km 72+900 to km 74+303	EBRD
Section 3: km 72+900 to km 74+303 including the 760 m bridge	AIIB

7. The existing road corridor is part of the Central Asia Regional Economic Cooperation (CAREC) road network, comprising an element of corridors 2, 3 and 5 that runs from the Karamyk border crossing (with Kyrgyzstan) and the city of Dushanbe. A schematic of the CAREC network is shown in Figure 4.

Figure 4: CAREC Road Network and the Project in context



Source: Cartographic Unit of ADB

### 1.3 Project Proponent and Main Institutional Responsibilities

8. The Implementing Agency (IA) for the project is the Project Implementation Unit for Road Rehabilitation (PIURR) of the Ministry of Transport (MoT) of Tajikistan and office facilities were provided on the fifth floor of the Ministry offices, 14 Aini Street, Dushanbe. The National Design Consultant is Avtostrada.

### 1.4 ESIA Objectives, Methodology and Structure

9. The project's environmental and social assessment needs to comply with both the legal requirements of Tajikistan and the lenders - ADB and EBRD policies.
10. The methodology used for the preparation of this ESIA report is based on the ADB Safeguard Policy Statement (2009) EBRD Environmental and Social Policy (ESP 2014) and Performance Requirements (PRs) and Tajikistan's environmental and social legislation and permitting processes.
11. The ESIA focuses on the design, construction and operation of the alignment and also considers potential environmental and social (E&S) impacts relating to associated facilities, including:
  - Village access roads – these will be permanent access roads, connecting villages to the alignment;
  - Site construction access routes- these will be temporary access roads for use by construction traffic during the construction period;
  - Borrow pits (quarry sites);
  - Storage and disposal areas (if required) for waste materials;
  - Manufacturing / processing area(s) for concrete, asphalt and rock crushing / grading;
  - Construction camps (offices, storage, maintenance and accommodation); and
  - Maintenance depots (operational phase).
12. This ESIA covers Lots 1 and 2 only. An impact assessment of the proposed permanent long bridge over the Surkhob River (Lot 3) will be conducted as an addendum to this ESIA, but will be disclosed separately.
13. The Project area was visited for surveying of baseline data by the international and national consultants during Q3 and 4 2018, and a field survey for biodiversity was conducted in May 2019. The surveys conducted are discussed in Chapter 5 of this ESIA.
14. Extensive consultation meetings were conducted at the village level across the alignment in Q3 / 4 2018. The purpose of the consultation was to inform people about the project, to receive their feedback and to incorporate these comments and concerns into the design process. Minutes of the various consultation meetings undertaken are summarised in 12. Data and information obtained during the consultations have been included through the document where appropriate. Additional background data and information was obtained from published and unpublished sources (e.g., on climate, topography, geology and soils, natural resources flora and fauna, agriculture, and socio-economic data) and reviewed as part of this ESIA.
15. During the consultation process, environmental issues were not raised by the local population. However, concerns related to road safety, compensation for land losses and relocation were raised, and processes have been developed to address these issues. There was a high level of support for the project as a mechanism to improve prosperity, education opportunity and communication.
16. During the construction period there will be a regular monitoring in accordance with the requirements presented in the Environmental and Social Management Plan (ESMP), which forms part of this ESIA (see Section 8).

17. Land issues and impacts are addressed in detail the land acquisition plans that have been developed for the project.
18. This ESIA includes an executive summary, text in nine sections, including a summary, and five annexes. The document structure is:
  - Executive Summary
  - Section 1 – Introduction
  - Section 2 – Legal, Administrative and Policy Frameworks
  - Section 3 – Description of the project
  - Section 4 – Analysis of alternatives
  - Section 5 – Description of the Existing Environment
  - Section 6 – Consultations and Information Disclosure
  - Section 7 – Assessment of Impacts
  - Section 8 – Environmental and Social Management Plan
  - Section 9 – Conclusions and Recommendations
  - Annexes present documents reviewed during the study, noise modelling output, details of consultations and monitoring equipment certifications.
19. An impact assessment of the proposed village access roads will be conducted as a supplement to this ESIA, and will be publicly disclosed. This assessment will include consultation with stakeholders and identification and assessment of the potential impacts on environmental and social receptors (biodiversity, cultural heritage etc.).
20. An impact assessment of the proposed permanent long bridge will also be conducted as an addendum to this ESIA, but will be disclosed separately outside the timescales described above, once the detailed design has been prepared.

## 1.5 Supporting Documents

21. A full list of documents that have been reviewed during the preparation of this ESIA are included in Chapter 9 (Annex A).
22. The dedicated Project team has prepared the following documentation based on the Avtostrada Design:
  - Geotechnics: Interim Report (December 2018);
  - Road Safety: Detailed Design Stage Road Audit Report for the proposed Obi Garm – Nurobod Highway, Northern Tajikistan, final (15 November 2018);
  - Traffic / Economics: Interim Economic Evaluation for DFR (22 November 2018);
  - Tunnels - Due diligence of tunnel aspects and tunnel specifications (December 2018);
  - Structural Engineer Design Review: Detailed Design Bridge Engineering, Interim Report (December 2018);
  - Land Acquisition and Resettlement Plan [LARP] (Package 1 Dec 2018 & Package 2 July 2019);
  - Social and Gender Impact Assessment (Dec 2018);
  - Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridges Nos 9, 11, 12, 13: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-EG- (December 2018);
  - Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridge Across Dashtiguron River: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-EGR, Dushanbe, 2018
  - Hydrological Report – 16-16-EG1 (in 2 parts, undated);
  - Technical Assessment Report (Working Draft 1) Assessment of Climate Change Risks to Vahdat – Kyrgyz Border Rehabilitation Project, May 2019, Mott MacDonald.



- Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section from Chainage 424+80 to Chainage 759+14: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-Egs, Dushanbe, 2018
- Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section from Chainage 0 to Chainage 424+80: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-Egs, Dushanbe, 2018
- Preparing the Central Asia Regional Economic Cooperation Corridors 2, 3, and 5 (Obigarm-Nurobod) Road Project Consultants' Services; Inception Report – Geotechnical Consultancy Services, August 2018
- Geological engineering study for the Tajikamar Tunnel, Avtostrada Report Ref 16-16-AS.T03-CS-EN, 2017

## 2 Legal, Administrative and Policy Frameworks

### 2.1 Introduction

23. This section provides an overview of strategies / legal norms and guidelines on environmental assessment in Tajikistan which have been followed for other implemented projects in the Republic of Tajikistan. This section also identifies the relevant strategies and security policies of the Republic of Tajikistan, the Asian Development Bank (ADB), The European Bank for Reconstruction and Development (EBRD), as well as other international financial institutions (WB, AIIB, IDB, etc.) that will be applied. The project will require the implementation of all national and international environmental and social policies guidelines and performance requirements.

### 2.2 Asian Development Bank Safeguards Policy Statement (2009)

24. This ESIA has been prepared following the guidance contained in the Asian Development Bank Safeguards Policy Statement<sup>4</sup> (SPS 2009) and the EBRD Environmental and Social Policy 2014<sup>5</sup> (ESP 2014).
25. The ADB SPS describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy.
26. The Safeguard Policy Statement (SPS) builds upon three previous safeguard policies on:
- the environment;
  - involuntary resettlement; and
  - indigenous peoples,

It brings the three safeguards policies into one single policy that enhances consistency and coherence, and more comprehensively addresses environmental and social impacts and risks.

27. The SPS aims to promote sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts by:
- avoiding adverse impacts of projects on the environment and affected people, where possible;
  - minimising, mitigating, and/or compensating for adverse project impacts on the environment and affected people when avoidance is not possible; and
  - helping borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.
28. An Annex to Appendix 1 of the SPS sets out a framework for Environmental Impact Assessment reporting and this document follows the format.

### 2.3 EBRD ESP and Performance Requirements

29. All projects financed by the EBRD shall be structured to meet the requirements of the ESP. The EBRD has adopted a comprehensive set of specific Performance Requirements (PRs) that the projects are expected to meet:
- PR1: Environmental and social appraisal and management;
  - PR2: Labour and working conditions;
  - PR3: Pollution prevention and abatement;
  - PR4: Community health, safety and security;
  - PR5: Land acquisition, involuntary resettlement and economic displacement;
  - PR6: Biodiversity conservation and sustainable management of living natural resources;

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<sup>4</sup> <https://www.adb.org/documents/safeguard-policy-statement>

<sup>5</sup> <https://www.ebrd.com/news/publications/policies/environmental-and-social-policy-esp.html>

- PR7: Indigenous people (none affected by this Project);
- PR8: Cultural heritage;
- PR9: Financial intermediaries; and
- PR10: Information disclosure and stakeholder engagement.

30. Performance Requirements no. 1, 2, 3, 4, 5, 6, 8, and 10 are applicable to the Project, and have been considered within this ESIA document.

## 2.4 European Union Regulations

31. The EBRD, as a signatory to the European Principles for the Environment is committed to promoting the adoption of EU environmental principles, practices and substantive standards by EBRD-financed projects, where these can be applied at the project level, regardless of their geographical location.

32. The following EU Directives are potentially relevant to the Project, and have been considered within this ESIA document:

- The Environmental Impact Assessment Directive 2014/52/EU)
- Birds Directive, 2009/147/EC;
- Habitats Directive 92/43/EEC Directive 2008/96/EC
- Road Infrastructure Safety Management 2008/96/EC
- Directive 2004/54/EC on Safety Requirements for Tunnels
- Air Quality Directive 2008/50/EC
- Water Framework Directive 2000/60/EC
- Groundwater Directive 2006/118/EC
- Directive 2006/54/EC on the implementation of the principle of equal opportunities and equal treatment of men and women in matters of employment and occupation
- The European Framework Directive on Safety and Health at Work (Directive 89/391 EEC)

33. Tajikistan is a party to international environmental agreements, including those most relevant to this project, which are listed in Table 3.

*Table 3: Environmental Conventions*

No	Name of the document	When the document approved
1.	Vienna Convention for the Protection of the Ozone Layer	November 4, 1995
2.	Convention on Biological Diversity and to its Cartagena Protocol on Biosafety	May 15, 1997
3.	UN Framework Convention on Climate Change	December 13, 1997
4.	Convention to Combat Desertification	December 28, 1998
5.	Convention on Wetlands of International Importance Mainly as a Habitat for Waterfowl	October 24, 2000
6.	Convention on the Conservation of Migratory Species of Wild Animals	October 24, 2000
7.	Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters	June 9, 2001
8.	Convention on Persistent Organic Pollutants	December 6, 2006
9	Convention for the Protection of the World Cultural and Natural Heritage	1992
10	Convention on International Trade in Endangered Species of Wild Fauna and Flora	2016

No	Name of the document	When the document approved
11	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	2016

## 2.5 Tajikistan Country Policies and Institutional Framework for Environment, Labour and Health & Safety

### 2.5.1 Introduction

34. The legislation on environmental protection of the Republic of Tajikistan includes laws on air quality, mineral resources, on land and forest management, on health and safety, on waste and chemicals management. The "Framework" Law on Environmental Protection of the Republic of Tajikistan was adopted in 1993, and amendments were made in 1996, 2003, and then in 2011. A new law on environmental protection was adopted. The Water Code was adopted in 2000, the Land Code - in 1992, the Land Management Code - in 2001.
35. Environmental impact assessment (EIA) is the subject of the Law on Environmental Protection (2011), the Law on Ecological Expertise (2012), and the Law on Environmental Impact Assessment (updated in 2018). An environmental licensing system applies to hazardous waste management and mining. Environmental permitting systems regulate the use of natural resources, especially hunting or collecting certain species.
36. In Tajikistan, the organizations responsible for monitoring environmental and health and safety protection and their management are
  - the Committee for Environmental Protection under the Government of the Republic of Tajikistan (CEP)
  - the Sanitary Inspectorate under the Ministry of Health (SES)
  - the Industrial Safety Inspectorate; and
  - the Field Development Inspectorate.
37. The Law on Environmental Protection contains articles that relate to the protection of the subsoil and the efficient use of land resources. The main environmental laws are indicted in Table 4.

Table 4: Environmental, Labour and Health & Safety Laws of the Republic of Tajikistan

No	Name of the documents	When the document was approved
<b><i>In the field of environmental protection</i></b>		
1.	Law of RT "On Environmental Protection"	August 2, 2011
2.	Law of RT "On Ecological Expertise"	April 16, 2012
3.	Law of RT "On Environmental Impact Assessment"	November 1, 2018
4.	Law of RT "On the protection of atmospheric air"	December 28, 2012
5.	Law of RT "On production and consumption waste"	May 10, 2002, amended in 2011
6.	Law of RT "On Environmental Audit"	December 26, 2011
7.	Law of RT "On Specially Protected Natural Territories"	December 26, 2011
8.	Law of RT "On Environmental Monitoring"	March 25, 2011
9.	Law of RT "On Radiation Safety"	August 1, 2003
10.	Law of RT "On the protection and use of flora"	May 17, 2004
11.	Law of RT "On Biological Security"	March 1, 2005
12.	Law of RT "On fauna"	January 5, 2008
13.	Law of RT "On Soil Protection"	October 16, 2009
14.	Law of RT "On hydrometeorological activity"	December 2, 2002

No	Name of the documents	When the document was approved
15.	Law of RT "On the collection, conservation and rational use of genetic resources of cultivated plants"	August 1, 2012
<b><i>In the field of health, social protection and emergency situations</i></b>		
1.	Law of RT "On the protection of public health"	May 15, 1997
2.	Law of RT "On ensuring sanitary-epidemiological safety of the population"	December 8, 2003
3.	Law of RT "On counteraction to HIV\AIDS"	December 28, 2005
4.	Law of RT "On protection of population and territories from emergency situations of natural and man-made character"	July 15, 2004
5.	Law of RT "On Fire Safety"	December 29, 2010
6	Law of Republic of Tajikistan on Appeals of Individuals and Legal Entities	2016
7	Law on public sanitation and epidemiology welfare	2013
<b><i>In the field of energy, industry and minerals</i></b>		
1.	Law of RT "On Energy Saving"	May 10, 2002
2.	Law of RT "On mineral resources"	July 20, 1994
3.	Law of RT "On precious metals and precious stones"	May 12, 2001
4.	Law of RT "On industrial safety of hazardous production facilities"	February 28, 2004
<b><i>In the field of water and land relationship, agriculture</i></b>		
1.	Law of RT "On drinking water and drinking water supply"	December 29, 2010
2.	Law of RT "On Land Reform"	March 5, 1992
3.	Law of RT "On Land Valuation"	May 12, 2001
4.	Law of RT "On Land Management"	January 5, 2008, amended 2016
5.	Law of RT "On the production and safe handling of pesticides and agrochemicals"	April 22, 2003
<b><i>Codes</i></b>		
1.	Land Code of the Republic of Tajikistan	December 13, 1996, amended in 2016
2.	Water Code of the Republic of Tajikistan	October 20, 2000
3.	Forest Code of the Republic of Tajikistan	August 2, 2011
4.	Labour Code of the Republic of Tajikistan	2016

38. These laws, along with the normative acts (for example Regulation # 641 "Order of compensation for losses of land users and damage of the agricultural production process", approved by the Resolution of the Government of the Republic of Tajikistan (2011) approved by the Government of the Republic of Tajikistan, create a favourable legal environment for the protection of the environment in the Republic as well as the use and protection of its natural resources. The most appropriate of these laws, codes and regulations are described in more detail in the following subsections.

## 2.6 Tajikistan Law / Regulation on Environment

### 2.6.1 Fundamental Law on the Environment

39. The fundamental law on the environment - the Law "On Environmental Protection" - adopted in 2011 (July 21, 2011, No. 208). The previous Law on Nature Protection ceased to exist in 2011. The new Law proclaims that the policy of the Republic of Tajikistan in the field of environmental protection should be aimed at ensuring the priority of environmental measures, taking into account a scientifically based combination of economic development

and other activities that affect the environment. environment, with respect for nature and the rational use of natural resources. The law defines the applicable legal principles, protected objects, the competence and role of the government, the Committee for Environmental Protection under the Government of the Republic of Tajikistan, local executive state authorities, public organizations and citizens.

40. The law also stipulates measures to guarantee the protection of the right of society and citizens to a healthy environment, and imposes a duty to undertake an environmental impact assessment when making any decision on an activity that could have a negative impact on the environment. The law also defines environmental emergencies and environmental disasters, and prescribes procedures for dealing with such situations; defines the responsibilities of officials and enterprises to prevent and eliminate harmful environmental consequences, as well as the responsibility of citizens and organizations. The law defines the types of control over compliance with the provisions of environmental legislation: state, departmental, industrial and public control. State control is carried out by the Committee for Environmental Protection (CEP), the Health Inspectorate of the Ministry of Health, the Industry Safety Inspectorate and the Extractive Industry Inspectorate. Public control is carried out by public organizations or labour collectives, and a state body, enterprise, organization or official may be subject to verification.

#### 2.6.2 Environmental Expertise Act

41. The Law on Ecological Expertise (2012) determines the principles and procedure for conducting an environmental impact assessment and is aimed at preventing the harmful effects of a planned economic and other activity on the environment and the social, economic and other consequences of the implementation of the object of environmental impact assessment.

#### 2.6.3 Environmental Impact Assessment Act

42. The Law on Environmental Impact Assessment (2018) establishes the legal and organizational framework for environmental impact assessment, its relationship with state environmental impact assessment, as well as the procedure for recording and classifying objects for environmental impact assessment.

#### 2.6.4 Water Code

43. The Water Code (2000) provides for a policy on water management that allows dispute settlement, utilization and cadastral planning. It contributes to the rational use and protection of water resources and determines the types of rights to use water resources, powers and the role of regional and local authorities for the allocation of rights to water use among different users, collection of fees, water use planning, water use rights and dispute resolution.

#### 2.6.5 Land Code

44. The current Land Code (1992, amended 2016). The Land Code regulates land relations and is aimed at rational "use and protection of land and soil fertility ...". Land is subject to rational use, and the Code allows local authorities to make decisions regarding "rational" land use.

#### 2.6.6 Land Management Act (2001)

45. The law requires authorities to perform mapping and monitoring of land quality, including on soil pollution, erosion and waterlogging.

#### 2.6.7 The Law on the Licensing of Certain Types of Activities (2004, amended in 2015)

46. It includes several types of activities, in particular handling hazardous waste; environmental audit; collection and processing of ferrous and non-ferrous scrap metals; and others. The

licenses are to be issued by the CEP under the Government, which is also the specially authorised state body in charge of regulating environmental audit.

#### 2.6.8 Legal Framework for Environmental Penalties

47. When detecting violations of environmental legislation, waste management in particular, the CEP authorities apply penalties in accordance with the following articles of the Administrative Code of the Republic of Tajikistan. Namely:
- Article 223. Violation of standards, rules, regulations, instructions and other environmental requirements for the protection of the environment and the rational use of natural resources;
  - Article 224. Release (discharge) of polluting substances into the environment with excess of standards or without a permit, waste disposal, physical and other harmful effects
  - Article 232. Violation of environmental protection requirements during transportation, disposal, use, disposal (dumping) industrial, household and other wastes into the natural environment.
48. The fines can only be witnessed by the local CEP authorities.

### 2.7 Legal Framework for ESIA, Environmental Licences and Permits

#### 2.7.1 Overview

49. There are three laws in the republic, which stipulate all aspects of the Environmental Impact Assessment:
- the Law “On Environmental Protection”;
  - the Law “On Ecological Expertise”; and
  - the Law “On Environmental Impact Assessment”.
50. Chapter V (articles 33-39) of the Law on Environmental Protection (2011) introduces the concept of state environmental impact assessment, the task of which is the State Ecological Expertise (SEE) to determine whether the planned activities and projects comply with environmental legislation, established standards and the environmental safety of society. These laws stipulate the mandatory requirement for carrying out state environmental impact assessment for all types of economic and other activities, based on the principles of scientific validity, objectivity and comprehensiveness, the legality of the conclusions of environmental impact assessment. The SEE precedes the decision on the object of environmental expertise in order to prevent possible adverse effects of this activity on the environment.
51. Funding for programs and projects is allowed only on receipt of positive opinions by SEE. The following types of economic activities and projects are subject to SEE: a) draft state programs, materials prior to preliminary planning, feasibility studies, economic development schemes; b) regional and sectoral development programs; c) urban planning and territorial plans, development and development schemes; d) environmental programs and projects; e) construction and reconstruction of various objects, regardless of the form of their property; e) draft standards for environmental quality and other regulatory, technological and methodological documentation governing economic activities; g) existing enterprises and business entities, etc.
52. Laws require that all types of business and other activities are carried out in accordance with established environmental standards and regulations, and provide for adequate measures to mitigate and protect the environment to prevent pollution and improve its condition. Evaluation of materials for SEE, which presents an analysis of short-term and long-term environmental, genetic, economic and demographic impacts and consequences, is carried

out before decisions are made on the location, construction or reconstruction of facilities, regardless of the form of their ownership. If a violation of environmental protection requirements occurs, construction may be suspended or terminated until measures are taken to improve the situation, by order of the CEP and / or other authorised regulatory bodies, such as sanitary and epidemiological, geological, and public security agencies.

#### 2.7.2 Environmental Impact Assessment

53. Environmental Impact Assessment (EIA) is an integral part of the state environmental review, as provided for in the Procedure of Environmental Impact Assessment (adopted by the Resolution of the Government of the Republic of Tajikistan No. 532). EIA is the responsibility of the initiator of the project. Conducting a State Environmental Review of all investment projects is the responsibility of the Committee for Environmental Protection under the Government of the Republic of Tajikistan (CEP) and its regional offices. In addition, according to the 2018 Law on State Environmental Review, all construction work, including rehabilitation, must be assessed for their environmental impact and proposed mitigation measures and monitored by the CEP.

#### 2.7.3 Consideration of Categories

54. Annex 1 to the Resolution No. 532 of the Government of the Republic of Tajikistan includes the approved list of facilities and activities for which the development of materials for environmental impact assessment is required. According to this document, objects and activities are divided into 4 categories of environmental impact:

- A impact category – high risk
- Б (B) impact category – medium risk
- В (V) impact category – low risk
- Г (G) impact category – minimal or no risk

55. This Project belongs to the A category of environmental impact (highways of national importance). The Б and В categories of environmental impact are respectively roads of regional and local importance (rural roads). A Preliminary Data analysis under the Tajikistan System is presented in Chapter **Error! Reference source not found..**

#### 2.7.4 Administrative Basis for EA

56. The Law on Environmental Protection determines that the state environmental review is conducted by an authorised state body of the Republic of Tajikistan in the field of environmental protection, i.e. Committee on Environmental Protection. The CEP has a significant mandate, which includes environmental policy and inspection duties. The CEP has units at the regional, city and district levels, in the form of environmental protection departments.
57. A special unit under the Committee (CEP) is charged with leading and managing the process of EIA and SEA. For the preparation of EA, initiators of state and private sector projects are responsible for, in addition to complying with environmental regulations, rules and procedures in a particular sector, standards established in other sectors and environmental standards adopted by other line agencies, in particular, sanitary and epidemiological, geological, water, etc.

#### 2.7.5 Public Participation

58. Article 12 of the Law on Environmental Protection stipulates the right of citizens to live in a favourable natural environment and to protect their health from adverse effects. Citizens also have the right to receive environmental information (Article 13), as well as the right to participate in and monitor the development, adoption and implementation of decisions related to the impact on the environment (Article 13). This right is ensured by the



publication and public discussion of draft environmentally important decisions. The duty of the competent authorities is to take into account the suggestions and comments of citizens. On 17 July 2001, Tajikistan acceded to the Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters. The provision of this Convention on the right to conduct public environmental impact assessment prevails over the provision of the national law.

59. According to the law, for any project subject to and EIA, the public has the right to initiate a public environmental assessment prior to or concurrently with the state environmental assessment. The outcome of the public assessment is of an advisory nature and has to be reviewed during the state environmental assessment. The EIA is carried out by an expert or an expert committee, as set out in the legislation. According to the EIA law, depending on the significance of environmental impacts, a project can be assigned a category "A", "B", "V" and "G". Review of the documents can take up to 60 days depending on the category of the project. As a result of the review, a positive or a negative conclusion is issued by the state institution. A positive conclusion is often supplemented by recommendations, for example, obtaining additional permits (emissions to air, wastewater discharge and waste) and activities to improve the surrounding environment. The conclusion is valid for the duration of the life cycle of the technology. If changes are made to the work processes or technologies which result in greater/smaller impact on the environment, a new assessment will have to be carried out.
60. The public has the right to request public hearings to be carried out. For category "A" and "B" projects, the authorised state body should develop a stakeholder engagement plan with the possibility of conducting consultations and taking into account the opinions of citizens.
61. In Tajikistan disagreements are resolved through Jamoats' (Hukumats') grievance mechanism or appeal to court. A grievance redress mechanism (GRM) capable of receiving and facilitating the resolution of affected persons' concerns and grievances related to the project is required as a formalised way for the PIURR to identify and resolve concerns and grievances.

#### 2.7.6 Environmental Permits and Licences

62. The 2011 Law on Permitting set the legal, organizational and economic basis for the permits system: the list of activities that require a permit, the permitting procedure, and the types of permits and the competent state bodies authorised to issue them. The Law was one of the elements of the country's permit system reform that reduced the total number of types of permits (more than 600) to only 88. Eight types are issued by the CEP.
63. An indicative list of the permit types which may be required for the Project is provided in Table 5.

*Table 5: Indicative List of Permits and Licences*

Description of Authorisation Document	Date of Issue	Issuing Authority
<b>Design Stage: Project Feasibility Study and Environmental Impact Assessment</b>		
Conclusion of the State Ecological Expertise on the project	Final EIA Report	Committee for Environmental Protection under the Government of the Republic of Tajikistan (CEP RT)
<b>At the Construction Stage: Permits and Licences</b>		
License to conduct the type of activity	Prior to construction	Ministry of Industry and New Technologies of the Republic of Tajikistan

Description of Authorisation Document	Date of Issue	Issuing Authority
Permission for land use for the construction of the camp, asphalt and concrete plants and the development of quarries for the extraction of soil for the preparation of building materials (gravel, sand, crushed stone) and excavation for road pavement.	Prior to construction	Local authorities (Hukumats)
Permission for special water use	Before and during construction	(CEP RT), Tajikgeology (technical water), Ministry of Health and social defence of the population of the Republic of Tajikistan (drinking water)
Permission to cut down trees and shrubs	At the construction stage	(CEP RT)
Permission for emissions of harmful substances into the atmosphere (MPE) from stationary and mobile sources	At the construction stage	(CEP RT)
Permission for discharge of hazardous substances into water bodies (MPD)	At the construction stage	(CEP RT)
Permission for land acquisition for temporary storage of construction waste (substandard soil, old asphalt, dismantled concrete products, etc.)	At the construction stage	(CEP RT), Local authorities (Hukumats)
Permission to remove construction and household waste for storage in specially designated areas (disposal areas)	As required	Local authorities (Hukumats)

## 2.8 Environmental Standards

64. Standards are established for atmospheric and water pollution, noise, vibration, magnetic fields and other physical factors, as well as for the residual content of chemicals and biologically harmful microbes in food. Exceeding these levels leads to administrative actions, including financial sanctions. Some ministries, each in their area of responsibility, define environmental quality standards. For example, acceptable levels of noise, vibration, magnetic fields, and other physical factors are established by the Ministry of Health.
65. The environmental quality standards in Tajikistan are based on GOST, SNiP and SanPiN. GOST (Tajik: GOST) refers to a set of technical standards that is supported by the Euro-Asian Council for Standardization, Methodology and Certification (EASM), a regional standardization organization working under the auspices of the Commonwealth of Independent States (CIS). SNiP means technical standards (in Tajik: SNIP) – it is a construction code, a set of rules that define minimum standards for constructed facilities, such as buildings and undeveloped buildings. SanPiN (in Tajik: Koidakho wa meyorhoi sanitation) stands for sanitary rules and norms (standards).
66. Environmental quality standards in Tajikistan are provided by both MDK (in Tajik: MAC) and DVA (in Tajik: PDV). The maximum allowable concentration approved by the law on hygienic standards. By MDC is meant the concentration of chemical elements and their composition in the environment, which, when exposed daily for a long time in the human body, will lead

to pathological changes or diseases established by modern research methods at any time in the life of the present and future generation. Maximum permissible (or allowed) emissions (MEL) are the standard maximum permissible emissions of harmful (polluting) substances into the atmospheric air, which are established for a permanent source of air pollution in accordance with technical standards for emissions and background air pollution. This ensures that standards for environmental air quality and hygiene are not exceeded, the most permissible (critical) loads on environmental systems and other requirements of environmental regulations.

67. Table 6 presents an overview of the National Standards and Regulations that apply to the Project.

*Table 6: National Standards Applicable to the Project*

<b>№</b>	<b>National Standards –GOSTs</b>
1	31431—2011, Protection of nature, air. The number of maximum allowable emissions (MAE), November 29, 2011
2	31434—2011, Protection of nature, air. Determination of efficiency parameters of dust removal systems, November 29, 2011
3	IEC 61241-0—2011, Electrical equipment used in areas containing flammable dust. Part 0. General requirements, 29 November 2011
4	GOST 17.0.0.01-76 (STSEV 1364-78) (in addition to 1987) A system of standards for the protection of the environment and the improvement of the use of natural resources. Generalities.
5	General provisions GOST 17.0.0.04-80 (1998) nature Protection. Environmental passport (certificate) of industrial facility. Generalities.
6	GOST RISO14001-98. Environmental management systems. Requirements and guidelines.
7	GOST 17.0.0.02-79 (1980). Protection of Nature. Providing metrological control of air, surface water and soil pollution.
8	GOST 17.1.1.01-77 (STSEV 3544-82). Use and protection of water. General conditions and definitions.
9	GOST 17.2.1.01- 76. Classification of emissions (content).
10	GOST 12.1.014-84 (1996) SSBT. Air in the area of work performed. Methodology for measuring pollutant concentrations using indicator tubes.
11	GOST 12.1.005-88 (1991) SSBT. General sanitary and hygienic requirements for air in the area of work performed.
12	GOST 17.2.2.05-97. Norms and methods for measuring emissions containing the use of diesel fuel from tractors and self-propelled agricultural machinery.
13	GOST 21393-75 Diesel vehicles. Analysis of the transparency of exhaust gases. Norms and methods of measurement.
14	GOST 17.2.2.03-77. Concentration of carbon monoxide in the exhaust gases of vehicles with gasoline engines. Methodology of norms and measurements.
15	GOST 17.2.2.03-87. Norms and methods of measurement of carbon monoxide in exhaust gases of vehicles with gasoline engines.
16	GOST 17.4.2.01-81. Designations of sanitary parameters of the condition

<b>№</b>	<b>National Standards –GOSTs</b>
17	GOST 17.4.1.02-83. Classification of chemicals for pollution control.
18	GOST 12.1.003-83 (1991) SSBT. Noise. General safety requirements.
19	GOST 12.1.023-80 (1996) SSBT. Noise. Methods of the level of threshold noise for stationary machines.
20	GOST 12.1.029-80 (1996) SSBT. Means and methods of protection from noise. Classification
21	GOST 12.1.036-81 (1996) SSBT. Noise. Permissible noise levels inside residential and public buildings.
22	GOST 12.1.007-76 (1999) SSBT. Harmful substances. Classification and general safety requirements.
23	GOST 12.4.119-82 SSBT. Personal respiratory protection. Methods for the evaluation of protective functions for aerosols.
24	GOST 12.4.125-83 (1985) SSBT. Collective protection against mechanical factors. Classification.
<b>Sanitary norms and rules (SanPiN)</b>	
25	SanPiN 2.1.4.559-96 Drinking water. Hygienic requirements for water quality from centralised drinking water supply systems. Quality control.
26	SN 2.2.4 / 2.1.8.562-96 Noise at workplaces, in residential and public buildings, and in the area of residence.

#### 2.8.1 Comparison of Tajik and International Standards

68. The following tables summarise the specific standards for air quality, water, waste and noise exposure in Tajikistan compared with international guidelines and standards. In general, it can be concluded that the Tajik system in the field of environmental standards is well developed and that Tajik standards are generally broadly aligned with the standards of international financial institutions (IFIs). The most stringent standard will be applied to the project.

Table 7: Comparison of Environmental Standards for Atmospheric air

	National Standards / Requirements Standards of Tajikistan <sup>6</sup> ,	IFC / World Bank Guidelines / Standards WHO Air Quality Guidelines <sup>7</sup>	EU Air Quality Standards Directive 2008/50/EC <sup>8</sup> Directive 2004/107/EC <sup>9</sup>	IFC's General Recommendations on Environmental, Safety and Health (Sewage and Atmospheric Air Quality)	The accepted norms of the project (mg / m <sup>3</sup> )	Justification
<b>Air quality - protection of the population (for receptors)</b>	mg / m <sup>3</sup> <ul style="list-style-type: none"> <li>PM 0.15</li> <li>NO 0.06</li> <li>NO<sub>2</sub> 0.04</li> <li>SO<sub>2</sub> 0.05</li> <li>Ammonia 0.06</li> <li>Benzopyrene 0.1</li> <li>Benzol 0.1</li> <li>Acetone 0.35</li> <li>Gasoline 1.5</li> <li>V<sub>2</sub>O<sub>5</sub> 0.002</li> <li>Phenylacetic acid 0.15</li> <li>HCl 0.2</li> <li>HF 0.005</li> <li>Fe<sub>2</sub>O<sub>3</sub> 0.04</li> <li>HNO<sub>3</sub> 0.4</li> <li>H<sub>2</sub>SO<sub>4</sub> 0.1</li> <li>Xylol 0.2</li> <li>Manganese and its oxides 0.001</li> <li>Copper oxide 0.002</li> </ul>	Where a number of national air quality standards are applied. If no national standards are established, then WHO standards are applied WHO guidelines, µg/m <sup>3</sup> : <ul style="list-style-type: none"> <li>PM<sub>2.5</sub> 10 (1 year)</li> <li>PM<sub>2.5</sub> 25 (24 hours)</li> <li>PM<sub>10</sub> 20 (1 year)</li> <li>PM<sub>10</sub> 50 (24 hours)</li> <li>Ozone 100 (8 hours)</li> <li>NO<sub>2</sub> 40 (1 year)</li> <li>NO<sub>2</sub> 200 (1 hour)</li> <li>SO<sub>2</sub> 20 (24 hours)</li> <li>SO<sub>2</sub> 500 (10 minutes)</li> </ul>	EU Air Quality Standards, µg/m <sup>3</sup> (unless otherwise indicated) <ul style="list-style-type: none"> <li>PM<sub>2.5</sub> 25 (1 year)</li> <li>PM<sub>10</sub> 50 (24 hours)</li> <li>PM<sub>10</sub> 40 (1 year)</li> <li>NO<sub>2</sub> 200 (1 hour)</li> <li>NO<sub>2</sub> 40 (1 year)</li> <li>SO<sub>2</sub> 350 (1 hour)</li> <li>SO<sub>2</sub> 125 (24 hours)</li> <li>Lead 0.5 (1 year)</li> <li>CO 10 mg/m<sup>3</sup> (8 hours)</li> <li>Benzene 5 (1 year)</li> <li>Ozone 120 (8 hours)</li> <li>Arsenic 6 ng/m<sup>3</sup> (1 year)</li> <li>Cadmium 5 ng/m<sup>3</sup> (1 year)</li> </ul>	Concentration of emissions according to the General Guidelines for Protection of Environment, Health and Safety of Vital Functions (PEHS), and: <ul style="list-style-type: none"> <li>H<sub>2</sub>S: 5 mg/nm<sup>3</sup></li> </ul>	mg/m <sup>3</sup> : <ul style="list-style-type: none"> <li>PM 0.15</li> <li>NO 0.06</li> <li>NO<sub>2</sub> 0.04</li> <li>SO<sub>2</sub> 0.05</li> <li>CO 3.00</li> <li>Ammonia 0.06</li> <li>Benzopyrene 0.1</li> <li>Benzol 0.1</li> <li>Acetone 0.35</li> <li>Gasoline 1.5</li> <li>V<sub>2</sub>O<sub>5</sub> 0.002</li> <li>Phenylacetic acid 0.15</li> <li>HCl 0.2</li> <li>HF 0.005</li> <li>Fe<sub>2</sub>O<sub>3</sub> 0.04</li> <li>HNO<sub>3</sub> 0.4</li> <li>H<sub>2</sub>SO<sub>4</sub> 0.1</li> <li>Xylol 0.2</li> <li>Manganese and its oxides 0.001</li> </ul>	Tajikistan Environmental Standards are in line with other international standards <sup>10</sup>  The more stringent of IFC and EU standards have been used where there are no national standards for any pollutant

<sup>6</sup> Annex 3 to the Environmental Impact Assessment Procedure, adopted by resolution of the Government of the Republic of Tajikistan No. 464 of 3 October 2006.

<sup>7</sup> <https://www.who.int/airpollution/publications/agq2005/en/>

<sup>8</sup> Directive 2008/50/EC on ambient air quality and cleaner air for Europe

<sup>9</sup> Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air

<sup>10</sup> The IFC cites the world Health Organization's guidelines for ambient air quality, generally applicable only in jurisdictions where there are no national standards.

	<b>National Standards / Requirements</b> Standards of Tajikistan <sup>6</sup> ,	<b>IFC / World Bank Guidelines / Standards</b> WHO Air Quality Guidelines <sup>7</sup>	<b>EU Air Quality Standards</b> <b>Directive 2008/50/EC<sup>8</sup></b> <b>Directive 2004/107/EC<sup>9</sup></b>	<b>IFC's General Recommendations on Environmental, Safety and Health (Sewage and Atmospheric Air Quality)</b>	<b>The accepted norms of the project (mg / m<sup>3</sup>)</b>	<b>Justification</b>
	<ul style="list-style-type: none"> <li>• Magnesium oxide 0.05</li> <li>• Nickel oxide 0.001</li> <li>• Unlimited dust (SiO<sub>2</sub> 70 %) 0.05</li> <li>• SiO<sub>2</sub> = 70 % - 20 % 0.1</li> <li>• SiO<sub>2</sub> less than 20 % 0.15</li> <li>• Lead and its composition 0.0003</li> <li>• Lead sulphur 0.001</li> <li>• Hydrogen sulphide, H<sub>2</sub>S 0.008</li> <li>• Turpentine 1</li> <li>• Ethyl alcohol (Ethanol) 5.0</li> <li>• Butyl alcohol (butanol) 0.1</li> <li>• Propane alcohol (propanol) 0.3</li> <li>• Methyl alcohol (methanol) 0.5</li> <li>• Styrene 0.003</li> <li>• Ultrafine powder 0.05</li> <li>• CO 3.0</li> <li>• Phenol 0.01</li> <li>• Formaldehyde 0.003</li> <li>• Fluoride (HF, SiF<sub>4</sub>) 0/05</li> <li>• Freon (all brands)10</li> <li>• Chromium trioxide 0.0015</li> <li>• Chlorine 0.03</li> <li>• ZnO 0.05</li> </ul>		<ul style="list-style-type: none"> <li>• Nickel 20 ng/m<sup>3</sup> (1 year)</li> <li>• PAH 1 ng/m<sup>3</sup> (1 year)</li> </ul> <p>Additionally, Directive 2008/50/EC introduced more stringent requirements for PM<sub>2.5</sub></p> <ul style="list-style-type: none"> <li>• PM<sub>2.5</sub> 20 (3 year) - obligatory</li> <li>• PM<sub>2.5</sub> 18 (3 year) – objective to be attained where possible in 2020</li> </ul>		<ul style="list-style-type: none"> <li>• Copper oxide 0.002</li> <li>• Magnesium oxide 0.05</li> <li>• Nickel oxide 0.001</li> <li>• Unlimited dust (SiO<sub>2</sub> 70 %) 0.05</li> <li>• SiO<sub>2</sub> = 70 % - 20 % 0.1</li> <li>• SiO<sub>2</sub> less than 20 % 0.15</li> <li>• Lead and its composition 0.0003</li> <li>• Lead sulphur 0.001</li> <li>• Hydrogen sulphide, H<sub>2</sub>S 0.008</li> <li>• Turpentine 1</li> <li>• Ethyl alcohol (Ethanol) 5.0</li> <li>• Butyl alcohol (butanol) 0.1</li> <li>• Propane alcohol (propanol)0.3</li> <li>• Methyl alcohol (methanol) 0.5</li> <li>• Styrene 0.003</li> <li>• Ultrafine powder 0.05</li> <li>• Phenol 0.01</li> <li>• Formaldehyde 0.003</li> <li>• Fluoride (HF, SiF<sub>4</sub>) 0/05</li> <li>• Freon (all brands) 10</li> <li>• Chromium trioxide 0.0015</li> <li>• Chlorine 0.03</li> <li>• ZnO 0.05</li> <li>• Ethylene oxide 0.03</li> </ul>	

	<b>National Standards / Requirements</b> Standards of Tajikistan <sup>6</sup> ,	<b>IFC / World Bank Guidelines / Standards</b> WHO Air Quality Guidelines <sup>7</sup>	<b>EU Air Quality Standards</b> <b>Directive 2008/50/EC</b> <sup>8</sup> <b>Directive 2004/107/EC</b> <sup>9</sup>	<b>IFC's General Recommendations on Environmental, Safety and Health (Sewage and Atmospheric Air Quality)</b>	<b>The accepted norms of the project (mg / m<sup>3</sup>)</b>	<b>Justification</b>
	<ul style="list-style-type: none"> <li>Ethylene oxide 0.03</li> </ul>				<ul style="list-style-type: none"> <li>Lead 0.5 (1 year)</li> <li>CO 10 mg/m<sup>3</sup> (8 hours)</li> <li>Benzene 5 (1 year)</li> <li>Ozone 120 (8 hours)</li> <li>Arsenic 6 ng/m<sup>3</sup> (1 year)</li> <li>Cadmium 5 ng/m<sup>3</sup> (1 year)</li> </ul>	

Table 8: Environmental standards for water quality and discharges to water

Issue	National Standards / Requirements	IFC / World Bank Guidelines / Standards	EU Standards for water quality	Accepted standards	Justification
	Tajikistan	IFC EHS Guidelines – Wastewater and Ambient Water Quality <sup>11</sup>			
<b>Discharge of harmful substances to the surface of the water: Treated wastewater</b>	<p>List of MDK water quality on the surface of water bodies (requirements to water quality of fishery water bodies)<sup>12</sup></p> <ul style="list-style-type: none"> <li>pH 6.5-8.5</li> <li>Aluminium (Al) 0.04</li> <li>Iron (Fe) 0.1</li> <li>Cadmium (Cd) 0.005</li> <li>Copper (Cu) 0.001</li> <li>Nickel (Ni) 0.01</li> <li>Tetraethyl lead (Pb) 0.006</li> <li>Zinc plate (Zn) 0.01</li> <li>Chromium (Cr<sup>+6</sup>) 0.02</li> <li>Chromium (Cr<sup>3+</sup>) 0.07</li> <li>Oil and petrochemicals 0.05</li> <li>White arsenic (As) 0.05</li> <li>Calcium (Ca) 180</li> <li>Silicon (SiO<sub>3</sub><sup>2-</sup>) 1.0</li> </ul>	<p>For used domestic wastewater - mg/l (unless otherwise indicated):</p> <ul style="list-style-type: none"> <li>pH 6-9</li> <li>BOD 30</li> <li>COD 125</li> <li>General nitrogen 10</li> <li>General phosphorus 2</li> <li>Oil and fat 10</li> <li>TSS 50</li> <li>Common coliform bacteria 400/100ml.</li> </ul>	<p>Standards<sup>13</sup> relevant to urban sewage discharge (e.g. sewage discharge from temporary camp), mg/l</p> <ul style="list-style-type: none"> <li>BOD 25</li> <li>COD 125</li> <li>Total nitrogen 15</li> <li>Total phosphorus 2</li> <li>TSS 35</li> </ul> <p>Standards<sup>14</sup> relevant to discharges to any surface water body which are not considered potable (e.g. runoff from road construction), mg/l</p> <ul style="list-style-type: none"> <li>Lead 0.072 (annual average)</li> <li>Mercury 0.00005 (annual average)</li> <li>Mercury 0.00007 (maximum)</li> <li>Nickel 0.02 (annual average)</li> <li>Cadmium 0.00008-0.00025 (annual average)**</li> <li>Cadmium 0.00045-0.0015 (maximum)**</li> </ul> <p><i>** dependent on water hardness</i></p>	<ul style="list-style-type: none"> <li>pH 6.5-8.5</li> <li>BOD 25</li> <li>COD 125</li> <li>Total nitrogen 10</li> <li>Total phosphorus 2</li> <li>TSS 3535Common coliform bacteria 400/100 ml</li> <li>Aluminium (Al) 0.04</li> <li>Iron (Fe) 0.1</li> <li>Cadmium (Cd) 0.005</li> <li>Copper (Cu) 0.001</li> <li>Nickel (Ni) 0.01</li> <li>Tetraethyl lead (Pb) 0.006</li> <li>Zinc plate (Zn) 0.01</li> <li>Chromium (Cr<sup>+6</sup>) 0.02</li> <li>Chromium (Cr<sup>3+</sup>) 0.07</li> <li>Oil and petrochemicals 0.05</li> <li>White arsenic (As) 0.05</li> <li>Calcium (Ca) 180</li> <li>Silicon (SiO<sub>3</sub><sup>2-</sup>) 1.0</li> </ul>	<p>Tajik MDK is the toughest standard supplemented IFC and EU standards have been used where there are no national standards for any pollutant</p>

<sup>11</sup> <https://www.ifc.org/wps/wcm/connect/026dcb004886583db4e6f66a6515bb18/1-3%2BWastewater%2Band%2BAmbient%2BWater%2BQuality.pdf?MOD=AJPERES>

<sup>13</sup> EU Urban waste water directive 91/271/EEC

<sup>14</sup> EU Annual average EQS (2008/105/EC)



Table 9: Comparison of Environmental Standards for Waste

Issue	Tajikistan Standards/Requirements	IFC recommendations on environmental, safety and health issues	EU Standards	Accepted Project Standards	Justification
<b>Waste treatment and disposal (Coastal part)</b>	No numeric standards are indicated in the source documents. All generated waste must be treated and disposed of in accordance with national legislation on production and consumption waste.	There is no corresponding numeric standard.	There is no corresponding numeric standard.	There is no corresponding numeric standard.	All generated waste must be treated and disposed of in accordance with national legislation on production and consumption waste.
<b>Secondary protective embankment (secondary containment) of liquid wastes</b>	No numeric standards are indicated in the source documents. No numerical standards are specified in the Tajik legislation.	A secondary containment (SC) is included where liquid waste is stored in volumes of more than 220 litres. The available volume of the SC must be at least 110% of the largest storage container, or 25% of the total storage capacity (but not less).	There is no corresponding numeric standard.	There is no corresponding numeric standard.	IFC Environmental, Health and Safety Recommendations A secondary containment (VO) is included where liquid waste is stored in volumes of more than 220 litres. The available volume of the VO must be at least 110% of the largest storage container, or 25% of the total storage capacity (but not less).

Table 10: Comparison of Environmental Standards for Noise Exposure

Issue	National Standards/Requirements	International Regulations/Standards	EU Standards	Accepted Project Standards	Justification
	Tajikistan	IFC recommendations on environmental, safety and health issues EHS Guidelines – Noise Management <sup>15</sup>			
<b>Restriction of noise at night time for the protection of human</b>	<p>Noise exposure at night (2300-0700) should not exceed the following levels (SanPiN 2.2.4 / 2.1.8.562-96):</p> <ul style="list-style-type: none"> <li>In residential and public buildings: <ul style="list-style-type: none"> <li>Hotel and motels, as well as business premises: 25 dB(A);</li> <li>Living rooms in apartments, houses, dormitories, nursing homes and pensions, sleeping rooms in kindergartens and in boarding schools: 30 dB(A);</li> <li>Rooms in hotels and hostels: 35 dB(A);</li> </ul> </li> <li>In residential and other areas: <ul style="list-style-type: none"> <li>Recreation areas, adjacent hospitals and medical centres: 35 dB(A)</li> <li>Areas directly adjacent to residential buildings, clinics, dispensary, rest homes, homes for the elderly and disabled, kindergartens, schools and other educational institutions, libraries; 45 dB(A);</li> <li>Areas immediately adjacent to hotel and hostel buildings: 50 dB(A)</li> </ul> </li> </ul>	<p>Noise exposure should not exceed the following levels or result in a maximum increase in background levels of 3 dB at the nearest site of the receptor outside the site:</p> <ul style="list-style-type: none"> <li>Institution, organization, educational: <p>Night time (22: 00-07: 00): 45 dB(A)</p> </li> <li>Industrial, commercial: <p>Night time (22: 00-07: 00): 70 dB(A)</p> </li> </ul>	There is no corresponding numeric standard.	<p>Tajik standards to be applied at night time is defined as from 2300 – 0700.</p> <p>Exception 1: The IFC Standard will be valid from 2200 to 2300</p> <p>Exception 2: Territories, adjoining hotels and hostels where the IFC standard is more stringent 45 dB(A)</p>	The most stringent and provide comprehensive measures criteria

<sup>15</sup> <https://www.ifc.org/wps/wcm/connect/06e3b50048865838b4c6f66a6515bb18/1-7%2BNoise.pdf?MOD=AJPERES>

Issue	National Standards/Requirements	International Regulations/Standards	EU Standards	Accepted Project Standards	Justification
	Tajikistan	IFC recommendations on environmental, safety and health issues EHS Guidelines – Noise Management <sup>15</sup>			
<b>Restriction of noise in daytime for the protection of human</b>	<p>Daytime noise exposure (0700-2300) should not be exceeded in residential and public buildings (SanPin 2.2.4 / 2.1.8.562-96):</p> <ul style="list-style-type: none"> <li>• Inside residential and public buildings: <ul style="list-style-type: none"> <li>○ wards in hospitals and sanatoriums and operating rooms: 35 dB(A);</li> <li>○ Consultation rooms in clinics, clinics, dispensaries, hospitals and sanatoriums 35 dB(A).</li> <li>○ Classrooms, teachers' general office, school and other conference rooms of other educational organizations, as well as 40 dB(A) public reading rooms.</li> <li>○ Living quarters in apartments, rest houses, boarding houses, homes for the elderly and disabled, sleeping quarters in kindergartens, as well as residential schools: 40 dB(A);</li> <li>○ Hotel and hostel rooms: 45 dB(A);</li> <li>○ Halls in cafeteria, restaurants, tables: 55 dB (A);</li> <li>○ Shops trading halls, passenger halls at airports and train stations, consumer services centres: 60 dB (A);</li> </ul> </li> </ul>	<p>Noise exposure should not exceed the following levels or result in a maximum increase in background levels of 3 dB at the nearest receptor site outside the site:</p> <ul style="list-style-type: none"> <li>• Institution, organization, educational: <ul style="list-style-type: none"> <li>Daytime (0700-2200): 55 dB(A)</li> <li>Night-time (2200-0700)</li> </ul> </li> <li>• Industrial, commercial: <ul style="list-style-type: none"> <li>Daytime (0700-2200): 70 dB(A)</li> <li>Night time (2200-0700): 70 dB(a).</li> </ul> </li> </ul>	There is no corresponding numeric standard.	Tajik standards to be applied at day time is defined as from 0700 – 2300	The most stringent and provide comprehensive measures criteria

Issue	National Standards/Requirements	International Regulations/Standards	EU Standards	Accepted Project Standards	Justification
	Tajikistan	IFC recommendations on environmental, safety and health issues EHS Guidelines – Noise Management <sup>15</sup>			
	<ul style="list-style-type: none"> <li>• Inside residential and other areas: <ul style="list-style-type: none"> <li>○ Recreation areas, directly adjacent hospital buildings and health centres: 45 dB (A)</li> <li>○ Territories directly adjacent residential buildings, clinics, dispensary, rest homes, homes for the elderly and disabled, kindergartens, schools and other educational institutions, libraries: 55 dB (A);</li> <li>○ Territories directly adjacent hotels and hostels: 60 dB (A);</li> <li>○ Recreation areas on the territory of hospitals and sanatoriums 35 dB (A);</li> <li>○ Recreation areas in the neighbourhoods and residential areas, holiday homes, homes for the elderly and disabled, children's playgrounds in kindergartens, schools and other educational institutions: 45 dB (A).</li> </ul> </li> </ul>				

### 2.8.2 Standards for Vibration

69. There are no state standards for vibration in Tajikistan. However, as a permanent member of the Commonwealth of Independent States (CIS), it uses the standards developed by the CIS Council for ecology and safety at work to regulate the level of vibration:

- GOST 12.1.012-2004 Vibration safety. General requirements
- GOST 31191.1-2004 Vibration and shock. Part 1
- GOST 31191.2-2004 Vibration and shock. Part 2.

### 2.8.3 Compliance with established rules and regulations

70. A number of legal acts establish liability for violation of environmental laws, the enforcement of which is carried out by a number of state bodies. In particular, The law "on administrative violations" 2010. defines the administrative responsibility of organizations, their employees and citizens for a number of violations, namely, irrational and wasteful use of land resources, violation of the rules of water use or protection of water resources, or non-compliance with the requirements of the state environmental assessment. Administrative sanctions in connection with the violation of environmental norms and rules can be imposed by the commissions of Hukumats, courts, inspectors of the Committee for environmental protection, Veterinary inspection of the Ministry of agriculture, the Agency for land management, geodesy and cartography. The most typical administrative sanction is a fine of 10 minimum monthly salaries for citizens and up to 15 minimum salaries for employees and organizations. Criminal code 1998 it covers crimes against environmental safety and the environment, in particular, violation of environmental safety at work, poaching, soil pollution, violation of the rules of protection and use of underground resources. The maximum fine is up to 2,000 minimum wages and the maximum sentence is up to 8 years in prison.

## 2.9 National Environmental Programs

### 2.9.1 State Environmental Program (2009 to 2019)

71. The program, approved in 2009, calls for the adoption of modern environmental standards for water, air, soil, solid waste, toxic waste, as well as noise control, to the maximum extent allowed. Standards must be accompanied by emission allowances.
72. The program also provides for more effective monitoring, improved environmental impact assessment, and improved funding for environmental protection measures.

### 2.9.2 Concept of Environmental Protection in Tajikistan

73. The concept adopted in 2008 leans upon the principles of implementation of environmental issues in various aspects of the economy, the use of international standards for the creation of environmental management systems, protection and rational use of water and land resources.

## 2.10 Regulatory Framework for Land Acquisition and Resettlement

### 2.10.1 Overview

74. In the legislation of Tajikistan, there is no special law or policy, which regulates the issues of resettlement and/or land acquisition or expropriation of rights to land and immovable property for state or public needs. Moreover, there is no separate law that completely provides norms and mechanisms for the determination of the full and fair, market value of land. The key legislative acts regulating land management relations and the ownership rights to immovable properties in the Republic of Tajikistan are the following:

- Constitution of the Republic of Tajikistan (1994, as amended in 2003)<sup>16</sup>
- Land Code (amended in 2012)<sup>17</sup>
- Land Code (amended in 2008)<sup>18</sup>
- Civil Code (amended in 2007)<sup>19</sup>
- Regulation “about compensation of losses to the land users and losses of agricultural products” (approved by the Decree of Government of Republic of Tajikistan, 2000. № 515)<sup>20</sup>

75. The Constitution of the Republic of Tajikistan, Land Code and the Civil Code of the Republic of Tajikistan are the fundamental laws on which the legislation is based. The framework for the Project is based on the ADB SPS 2009 requirements and applicable laws, regulations and policies. Where differences exist between local law and ADB policies and practices, the resettlement for this Project will be resolved in favour of the latter.

#### 2.10.2 Types of Land Ownership and Land Use Rights Allocation

76. All land is owned by the Republic of Tajikistan, which is responsible for its effective use. Several tenure options for agricultural land are defined by the Land Code. There are primary use rights and secondary use rights. Primary use rights include the following:

- Perpetual use which has no fixed term. It is granted to legal entities such as state and cooperative agricultural enterprises, public and religious organizations and charities, industrial and transportation needs, public enterprises, defence and joint ventures that include foreign entities.
- Limited or fixed-term use may be granted to legal or physical persons for either a short-term (up to 3 years) or long-term (3 to 20 years).
- Life-long inheritable tenure which may be assigned to physical persons or collectives. Physical persons must re-register the right in the case of inheritance. This right applies to land-shares used to organise a dekhan farm, as well as household (garden) plots.

77. The only secondary use-right recognised under the Land Code is the right to lease. According to the Code, primary rights holders may lease out their plots for a term not exceeding 20 years. The land is used in accordance with the state-established land-use standards. The right to use land may be terminated for various reasons such as: termination of activities by the land user, non-use for two years and use of the land differing from the use established in the use-rights document. (Land Code Article 37)

78. Dekhan land is the result of the splitting up of large state-owned farm enterprises, known as kolkhoz and sovkhoz farms, which were established throughout much of the former Soviet Union. Sovkhoz farms were run by the state, while kolkhoz farms were a form of co-operative farm, run by a committee of members approved by the state. The Agrarian Reform Program in Tajikistan was adopted for the period of 2012-2020. Creation of Dekhan farms is one of the priority areas of land reform. The

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<sup>16</sup> Constitution, November 6, 1994, as amended on 22 June 2003.

<sup>17</sup> Land Code of the Republic of Tajikistan as amended on 01 August 2012

<sup>18</sup> Land Code, as amended by N 498 from December 12, 1997., N 746 from May 14, 1999, N 15 from May 12, 2001, N 23 from February 28, 2004. From 28.07.2006 №199, from 5.01.2008 №357, from 18.06.2008 №405.

<sup>19</sup> Civil Code, as amended by August 6, 2001, N 41: May 3 2002 №5, March 1, 2005, N 85; April 29, 2006 №180, May 12, 2007. №247).

<sup>20</sup> Approved by the Decree of Government of Republic of Tajikistan, December 30, 2000. №515.

basis for creating Dehkan farm in the Republic of Tajikistan is defined by the Law “On Dehkan farms”<sup>21</sup>, №48 of 10 May 2002. It resulted in the creation of 31 Dehkan farms in 1992 with 300 hectares of land. In 2003, there were 16,433 registered Dehkans farms with 240,100 hectares<sup>22</sup>.

79. In dekhkan farms, the land remains state property (which cannot be bought or sold), but farmers are granted inheritable land use rights which give complete legal freedom to landholders to manage the land as they desire. The state collects taxes and can repossess the land if it believes the land is not being managed properly. There are three types of dekhkan land: individual (the land use certificate is held by an individual), family (the certificate is jointly held) and collective (the certificate details common property shareholders).
  80. A collective Dehkan consists of two or more unrelated families, producing and marketing jointly. Dekhan farm —associations, or —associative dekhkan farms, operate in a similar manner to collective Dekhans, although the families involved technically have their own Dekhans and work together cooperatively. Both family and collective Dehkans operate by appointing a head who officially holds the farm’s land registration certificate and legally represents the interests of the farm (Duncan 2000; GOT 2008; ARD 2003; Robinson et al. 2009; GOT 2009a).
  81. Presidential land is similar to dekhkan land. It was allocated in small plots to private households in the late 1990s by Presidential Decree. The essential difference between dekhkan and Presidential land is that no land-use rights certificate is required for the latter land plots (they are registered at the jamoat level per household).
  82. Reserve Fund land usually consists of unused land. It also includes land plots for which land use rights have been abandoned. State reserve land is at the disposal of the district administrations and is rented out or distributed for individual agricultural cultivation purposes. Article 100 of the Land Code states that State land stock is reserved for the agricultural, industrial, transport and other needs of the national economy.
  83. Supported Farms land includes land provided to different government institutions as assistance to their members and employees. The land is given to employees who did not get any land under other government schemes.
- 2.10.3 Tajikistan Constitution, Law / Regulation on Land Acquisition, Resettlement and Compensation
84. The Constitution of the Republic of Tajikistan is the main legal document which guarantees citizen’s rights. Article 13 states that land, bowels of the earth, [i.e. mineral resources], water, airspace, animal and vegetable kingdoms, [i.e. flora and fauna], and other natural resources are owned by the state, and the state guarantees their effective use in the interests of the people. Furthermore, Article 12 states that the economy of Tajikistan is based on various forms of ownership and the state will guarantee freedom of economic activity, entrepreneurship, equality of rights, and the protection of all forms of ownership, including private ownership.
  85. The legal basis for state acquisition of private property for public works is outlined in Article 32 which states “...the property of an individual is taken away only on the

<sup>21</sup> Law of the RT “On Dehkan farms”.2002. www.mmk.tj

<sup>22</sup> Source: Statistical Yearbook of the Republic of Tajikistan. 2001. Statistical Agency. Dushanbe, 2001, c.175. Statistical Yearbook of the Republic of Tajikistan. 2004. Statistical Agency. Dushanbe, 2004, c.173.

*basis of the law, with the consent of the owner and to meet the requirements of the state and society, and with the state paying full compensation.”*

*2.10.3.1 Provisions regulated by the Land Code*

86. In August 2012 amendments to the Land Code that enable legal sales and lease transactions for land use rights were approved.<sup>23</sup> The Land Code also includes changes to the provisions related to land acquisition.<sup>24</sup>
87. The revocation/allotment of lands and resettlement envisages compensation for losses incurred by land users or those with other registered rights to the land when the land plot is revoked for state and public needs.
88. The state may revoke land plots for state and public needs from land users after:
  - allocating a land plot of equal value;
  - constructing housing and other buildings with the same purpose and value, in a new location for the natural persons and legal entities to whom the land plot had been allocated, in accordance with established procedures;
  - fully compensating for all other losses, including lost profits, in accordance with the legislation of the Republic of Tajikistan.
89. Upon the revocation of land plots for state and public needs, all losses shall be calculated according to the market price, which shall be defined by taking into consideration the location of the land plot, and compensation shall be paid to the persons/legal entity whose land has been taken away. Termination of the right to use a land plot, for state and public needs, can be carried out after allocation of an equal land plot and compensation of other expenses is provided by part one of the present article. (L.C. Article 41; In the Republic of Tajikistan Law edition dated 1 August 2012, No. 891).
90. The procedure for the compensation of losses to land users and losses arising from the removal of land from circulation is regulated by Article 43 of the Land Code edition dated 1 August 2012, No. 891:
  - In the event of revocation of a land plot for state and public needs, compensation for losses to land users and others with registered rights to the land, and losses connected to the removal of land from circulation, shall be made by the natural/legal persons whose activity led to the revocation.
  - In the event of withdrawal of a land plot for state and public needs, the procedure for compensation of losses to land users and others with registered rights to the land, and losses connected to the removal of land from circulation, shall be defined by the Government of the Republic of Tajikistan (In RT Law edition dated 5 January 2008, No. 357).
  - Upon termination of the rights to a property, the property will be assessed based on its market value (Article 265 Civil Code).
  - Land users should be notified in writing about land revocation by the local executive government body no later than one year before the pending withdrawal of the land (Article 40. Land Code of the Republic of Tajikistan Law edition dated 1 August 2012 no. 891).
  - In the event that international agreements recognised by the Republic of Tajikistan establish other rules than those contained in the Land Code of the Republic of Tajikistan, the rules of the international agreement shall be applied (Article 105, LC of the RT edition dated 28 February 2004 No. 23).

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<sup>23</sup> Law 891, dated August 2012, article 19.

<sup>24</sup> Articles 37-45



- The Land Code of 1997 is the core legal document related to land acquisition. It has been updated a few times and most recently in August 2012. Article 2 of the Land Code states that “land is an exclusive ownership of the State... [but]... the State guarantees its effective use in the interests of its citizens”. However, Articles 10-14, the Land Code outlines land title as being of long-term, short-term, and inherited land use entitlement. Article 14 of the LC of the RT also states that land users may lease land plots by agreement (In the Republic of Tajikistan Law addition dated 1 August 2012 No. 891).
- Article 24 of the Land Code describes the allocation of land for non-agricultural purposes, and provides that when choosing a suitable location for such land uses, land not suitable for agriculture should be favoured. The same principle is stressed by Article 29, which discourages the use of high-yielding agricultural land for non-agricultural use. However, Article 29 also allows for allocation, and appropriating of agricultural land for “*other very important State objects*”.

91. In accordance to Article 19 of the Land Code, the land right users may:

- execute civil-legal transactions (buying-selling, gift, exchange, mortgage and other) with allocated (acquired) use right to a land plot with a right to alienate it independently without interference of executive government bodies, except for provisions of present Code; (In the Republic of Tajikistan Law edition dated 1 August 2012 No. 891)
- lease the land plot;
- establish private (based on consent) servitude to a land plot; (In edition dated 1 August 2012 No. 891)
- mortgage the right to a land plot;
- receive compensation in the event of withdrawal of the right to use the land plot for state and public need in accordance with Article 41 – 43 of the present Code.

92. Compensation for land which belongs to the State but is allocated and essentially leased to users by each hukumat, is divided between the hukumat and the user according to the following proportion:

- 40 % to the hukumat, which will no longer derive income from taxes and leases for the portion of the land being acquired
- 60% to the land user, who suffers a reduction in his/her income-generating asset.

93. The compensation received by the hukumat is used for the management, construction, and maintenance of local infrastructure. The land user also receives compensation for lost crops based on the provisions outlined in the Entitlement Matrix.

## 2.11 Tajikistan Law / Regulation on Labour, Health and Safety

### 2.11.1 Law on Industrial Safety of Hazardous Production Facilities (2004)

94. This Law is aimed at ensuring the safe operation and preventing accidents at hazardous production facilities, ensuring emergency preparedness of organizations operating hazardous production facilities including their ability to localise and eliminate the consequences of these accidents, to ensure compensation for damages caused by accidents to individuals and legal entities, the environment and the state.

#### 2.11.2 Labour Code (2016)

95. This Code regulates labour relations and other relations directly related to them, aimed at protecting the rights and freedoms of the parties to labour relations, establishing minimum guarantees of rights and freedoms at work.

### 3 Description of the Project

#### 3.1 Project Components

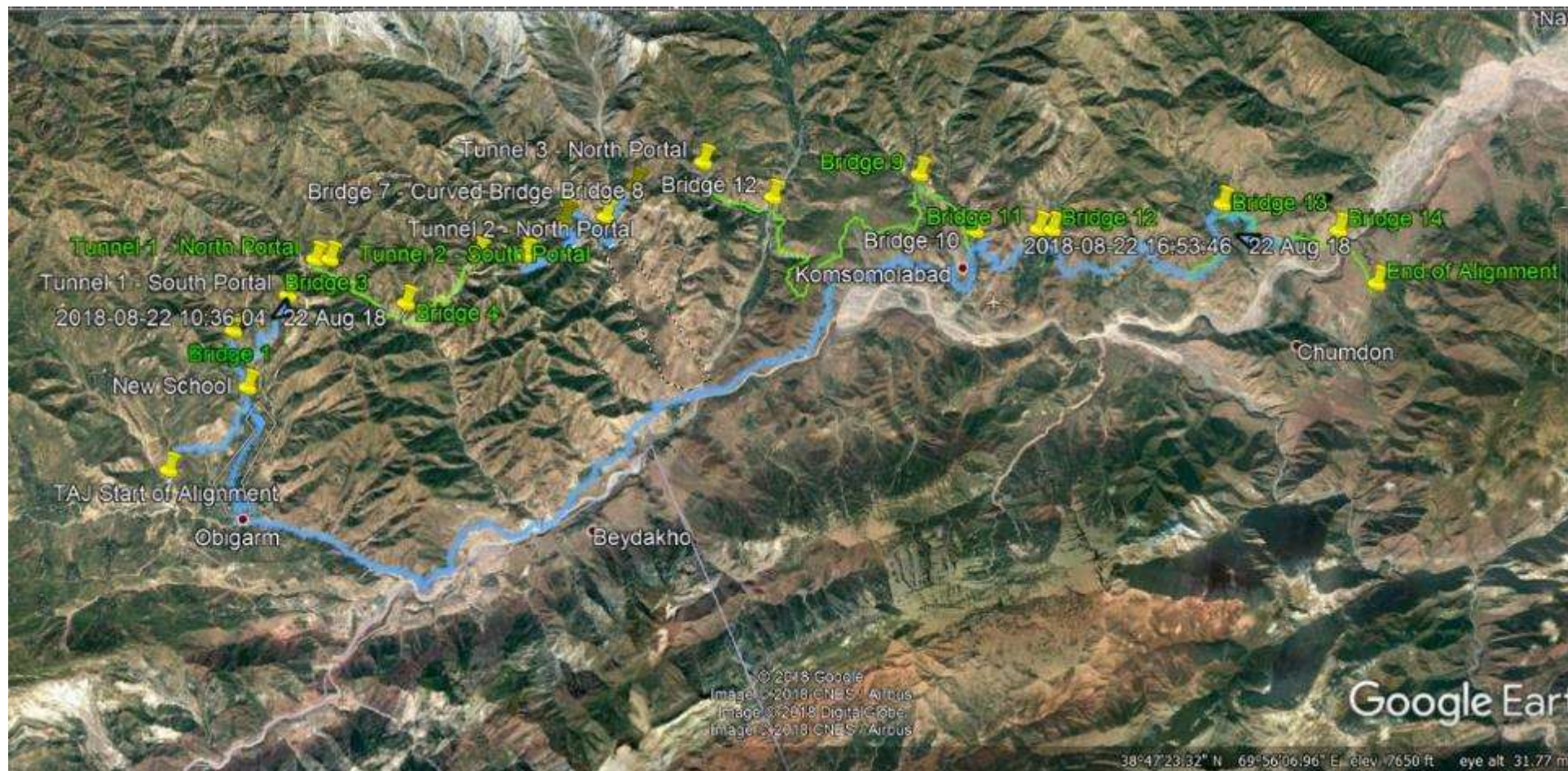
96. A national design consultant has been appointed<sup>25</sup>, they have: reviewed the existing alignment; carried out geotechnical testing and produced a design that, mainly, follows the existing alignment. It restores areas where earthslips have occurred, cutting back slopes to a stable angle where slips have occurred and building, strengthening or replacing bridges and the design requirements for tunnel sections. The review also concluded that an additional (third) 2.6 km tunnel was needed to remove a high level tightly curved mountain section.
97. The design speed of the road is 50 kph due to the road being predominantly in mountainous terrain, this is in line with the specifications for Class III roads. On the sections of which are in rolling or flat terrain, the national speed limit of 90 km/h will apply. There are also sections where lower speed limits than 90 km/h will be applicable, and these will be indicated with signage as follows:
- Approaches to villages – 40 km/h (advisory speed limit)<sup>26</sup>
  - Sharp bends – 50 km/h (advisory speed limit)
  - Tunnels – 40 km/h (advisory speed limit)
98. In addition to the construction activities on the road there are other works and activities associated with the development of the alignment. These include:
- Borrow areas (quarry sites) – bulk earthworks were carried out in the soviet era the new works will remediate erosion effects and construct the engineered sub base, and asphalt layers. Excess spoil and rock can be used in the reconstruction process, so new borrow areas may not be required, or will be of limited number;
  - Storage areas for excess spoil – The re-engineering of slopes and embankments will generate quantities of spoil and the tunnel sections will generate rock material. The location of temporary and permanent spoil storage and disposal areas will need careful consideration;
  - Manufacturing / processing area(s) for concrete, asphalt and rock crushing / grading;
  - Construction camps (offices, storage, maintenance and accommodation); and
  - Site construction access routes to bring plant and materials to site
  - Village access roads to permit permanent access to the alignment from villages.
99. Figure 5 shows the location of the proposed works.

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<sup>25</sup> Avtostrada (Tajikistan)

<sup>26</sup> This may be made mandatory subject to approval by the Ministry of Transport and the Tajikistan Traffic Police

Figure 5: Plan of Works –North section is new alignment (South is existing alignment)



100. Figure 6 is a schematic showing the key engineering elements (tunnels and bridges) on the alignment.
101. The seventeen acknowledged villages that the alignment passes through are indicated in Figure 7. The position of the village marker indicates if the village is passed by or through. Exceptions are at Kandak (km 4 to 6), Komsomolobod sub rayon (km 68 to 69) and Gulmon (km 72) where the alignment will cut through villages. At some of the intermediate river valleys (km 26, 28, 49, 53 and 57) the alignment crosses over village development on bridge structures.



Figure 6: Schematic of alignment showing distance along alignment, tunnels & bridges

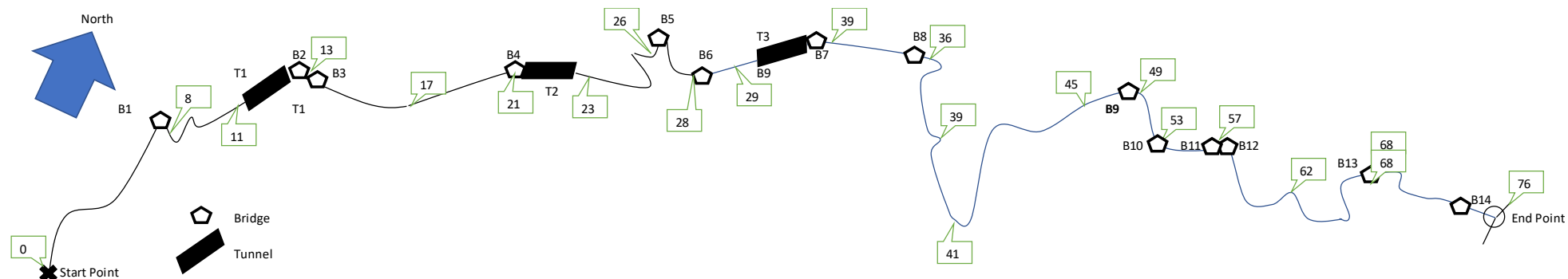
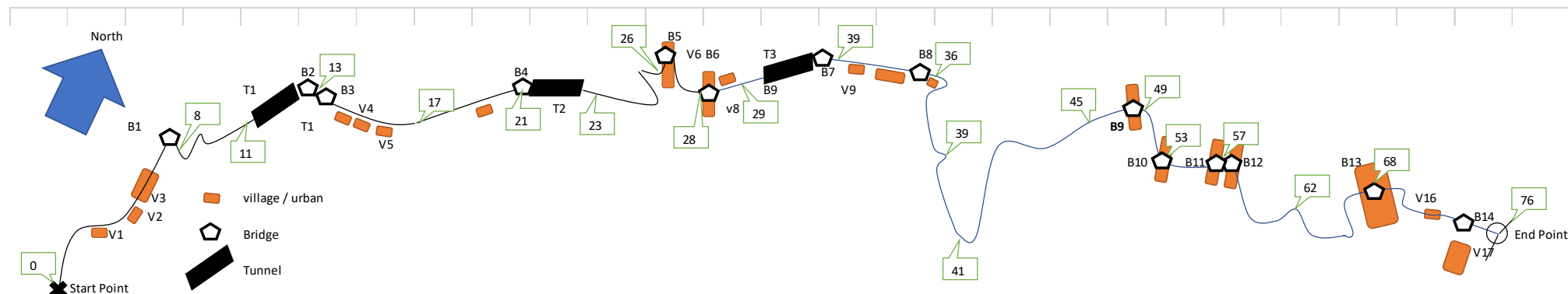


Figure 7: Schematic of villages on the alignment



102. The status of the villages is set out in Table 11.

Table 11: Schedule of acknowledged villages on the alignment

	Km (approx)	Rayon / District (Hukumat)	Sub Rayon / District (Jamoat)	Village (Mahala)	Other Notes
1	2	Rogun (Рогун)	Obigarm (Обигарм)	Bozorak (Бозорак)	Pass by to left
2	3			Labijar (Лабичар)	Pass by to left
3	4-6			Kandak (Кандак)	Pass through
4	15	Nurabad (Нуробод)	Sicharog (Сичарог)	Sh. Aslon (Ш. Аслон)	Pass by to left
5	16			Dehi Alisho (Дехи Алишо)	Pass by to left
6	26		Hakimi (Хакими)	Javji Royn (Чавчи Поён)	
7	28			Sadoqat (Садокат)	
8	29			Siyhgulak (Сияхгулак)	
9	35		Mujaharf (Мучахарф)	Chepak (Чепак)	
10	36			Mujaharfi kalon (Мучахарфи калон)	
11	49		Komsomolobod (Комсомолобод)	Degay (Дегай)	
12	53			Tutkhor (Тутхор)	
13	57			Bulbuldara (Булбулдара)	Pass through
14	58			Tegermi (Тегарми)	Pass through
15	68			Pandovchi (Пандович)	Pass through
16	72		Safedchashma (Сафедчашма)	Gulmon (Гулмон)	Pass through
17	76		Darband (Дарбанд)	Darband town	

Source: Information from the Social Safeguards Team (ADB consultants and PIURR), during on-site consultations (August 2018) and LARP (Dec 2018)

### 3.2 Packaging of the Project

103. The project will be competitively tendered as three separate bid packages:

- Package 1: Obigarm - Tagikamar km 0 – km 30 +217: Includes 2 tunnels (Kandak and Karagach), 4 new bridge constructions and 2 bridge rehabilitations, and local access roads of approximately 30 km;
- Package 2: Tagikamar-Nurobod km 30 +217– km 75 +600 (less the section for Package 3 which runs from km 72+900 to km 74+303): Includes Tunnel 3 (Tagikamar), 6 new bridge constructions, 1 bridge rehabilitation and one road diversion with a new temporary bridge at Darband, and local access roads of approximately 40 km; and
- Package 3: km 30 +217 - Long Bridge at Darband: The permanent bridge will be approximately 760m long, and is needed to cross the Surkhkhob River at the east end of the alignment. It will be awarded as an “Employer Design” contract.

### 3.3 Construction Camps and Operational Maintenance Depots

104. There are no existing facilities on the alignment that can be reused or hired to construct the works and the Contractor will need to bring onto site all plant, machinery and materials for the works as well as buildings and ancillary elements to provide offices and accommodation, as well as staff to provide the management, skilled, semi-skilled and labour functions for construction. Most workers will need to be accommodated in construction camps with associated sleeping accommodation, recreation facilities, water supply, toilets, electricity, waste collection and disposal. Effectively, self-contained villages (construction camps for workers) will be needed on, or close to the alignment, for the duration of the project.

105. There will be some opportunity for local employment in the semi-skilled, labour and administration roles and national employment in skilled, semi-skilled, labour and

administration categories. A minimum of 50 % of the workforce should be locally sourced where feasible, and contracts for each package will stress that the Contractor should consider use of local staff where appropriate. It is anticipated that the proportions for the Project will be closer to 80% local vs 20% international. Participation of women in the workforce will also be promoted.

106. The discontinuous nature of the existing alignment (no through passage at the proposed tunnel sites) means that separate camps will be needed between the tunnel sections. Table 12 indicates how a system of camps could be operated based on the split of the three construction contracts, the aspects of the project served and the potential impacts from Construction Site Access Roads. These locations are indicative for the purposes of impact assessment in this report; the contractors will be responsible for developing, operating, and removing the camps, workshops and other facilities they will need to construct their respective contracts. It is estimated that approximately 1,100 construction workers will be engaged in activities for Packages 1 and 2, including all activities (road construction, tunnelling, bridge works, concrete production, support services, etc.).

*Table 12: Indicative Locations of Construction Camps and Construction Elements Served*

	Camp	Serving	Construction Site Access Road	Notes
Contract 1	1/1	<ul style="list-style-type: none"> <li>Km 0 to Tunnel 1 (W) portal</li> <li>Tunnel 1 portal</li> </ul>	From Obi Garm along alignment	Limited impacts on access
	1/2	<ul style="list-style-type: none"> <li>Tunnel 1 (E) portal to Tunnel 2 (W) portal</li> <li>Tunnel 1 - E Portal</li> <li>Tunnel 2 – W Portal</li> </ul>	On existing unpaved Road from M41	Impacts on village communities adjacent to the unpaved road (traffic noise, dust generation, road safety)
	1/3	<ul style="list-style-type: none"> <li>Tunnel 2 (E) to Tunnel 3 (S)</li> <li>Tunnel 2 – E Portal</li> </ul>	On existing unpaved Road from M41	
Contract 2	2/1	<ul style="list-style-type: none"> <li>Tunnel 3 S Portal</li> </ul>	On existing unpaved Road from M41	Generally access is off existing paved roads
	2/2	<ul style="list-style-type: none"> <li>Tunnel 3 N Portal to point to be determined</li> <li>Tunnel 3 N Portal</li> </ul>	On existing unpaved Road from M41	
	2/3	<ul style="list-style-type: none"> <li>Point to be determined to end of alignment (km 76)</li> <li>Temporary Crossing including Bailey Bridge</li> </ul>	From existing M41 Road	Generally access is off existing paved roads
Contract 3	3/1	<ul style="list-style-type: none"> <li>Long Bridge Construction</li> </ul>	From existing M41 Road	

Note 1) Camp locations are indicative, identified for the purposes of impact assessment. The Contractor is responsible for the identification, development, operation and decommissioning of camps.

Note 2) It is assumed that each tunnel will be driven from each portal i.e. two working faces.

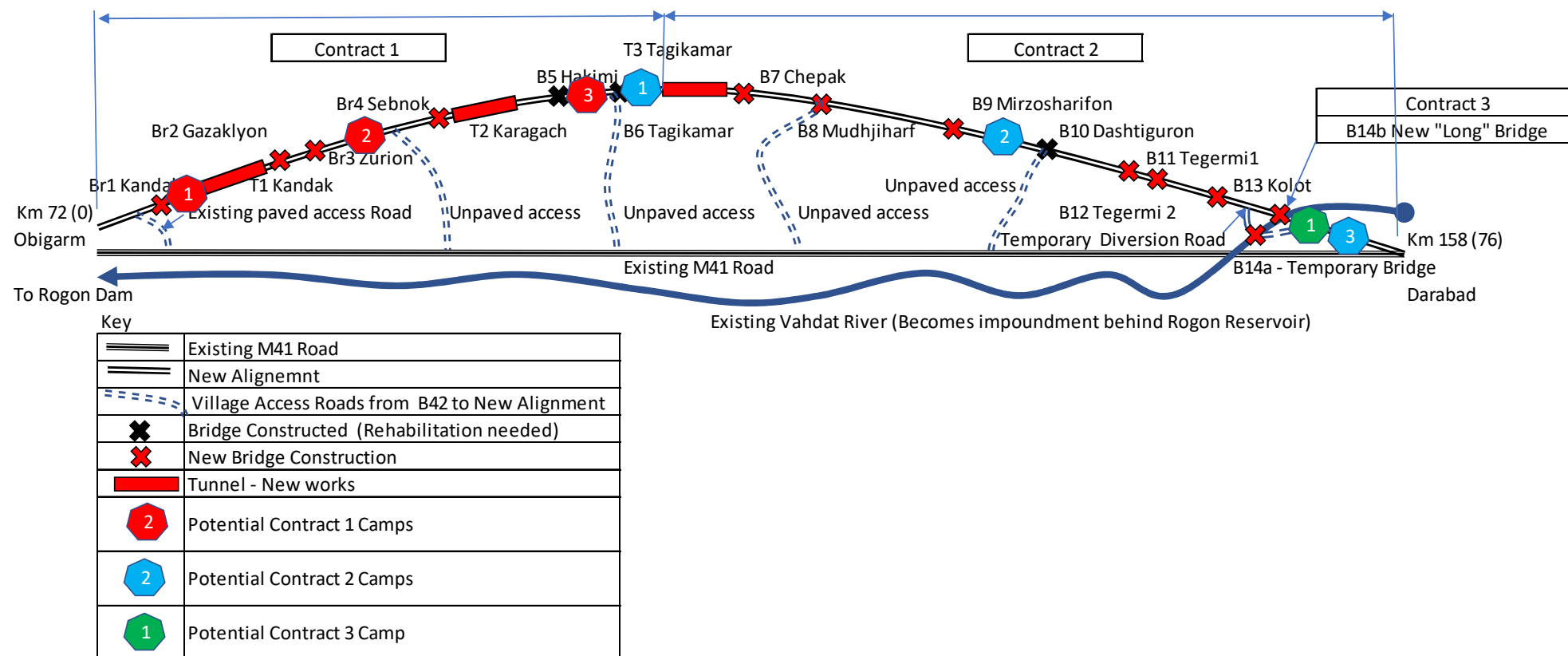
107. Figure 8 illustrates how location and access to camps could proceed, although the final decision on number of camps and their location will rest with the Contractor,



who will need to enter into leasing land from owners, and consider the environmental and social impacts of the chosen locations.

108. Prior to establishment of camps, the environmental and social impacts of each will be assessed and appropriate measures will be developed and implemented to mitigate environmental and social impacts. Locations will be selected to minimise impacts to the extent practicable.
109. It is anticipated that one or more of the construction camps will be retained following completion of the Project, and used as operational maintenance depots during the operation of the road.

Figure 8: Indicative Locations for Construction Camps on the Alignment



Note 1) Camp locations are indicative, identified for the purposes of impact assessment. The Contractor is responsible for the identification, development, operation and decommissioning of camps, and consideration of their environmental and social impacts.

Source: This ESIA

110. Prior to construction of the long bridge across the reservoir / Surkhob River (Package 3), a temporary bridge will be installed (as part of Package 2) at the east end of the alignment. This will be a prefabricated “Bailey” bridge 7 m wide and 125 m long, with three spans supported by a two piers. Piling works will be required in the river to install the support piers. The bridge, and associated construction camp, will be located approximately 1.25 km from the nearest village.

### 3.4 Permanent Long Bridge

111. A permanent bridge will be constructed above the temporary bridge during Package 3 of the Project and will be awarded as an “Employer Design” contract. The dimensions of the permanent bridge will be approximately 760 m long and 11.5 m wide.

### 3.5 Access Roads

112. Two types of road providing access to the alignment will be developed. These are:

- Site construction access routes - these will be temporary access roads to the alignment for use by construction traffic during the construction period.
- Village access roads – these will be permanent access roads, connecting villages to the alignment.

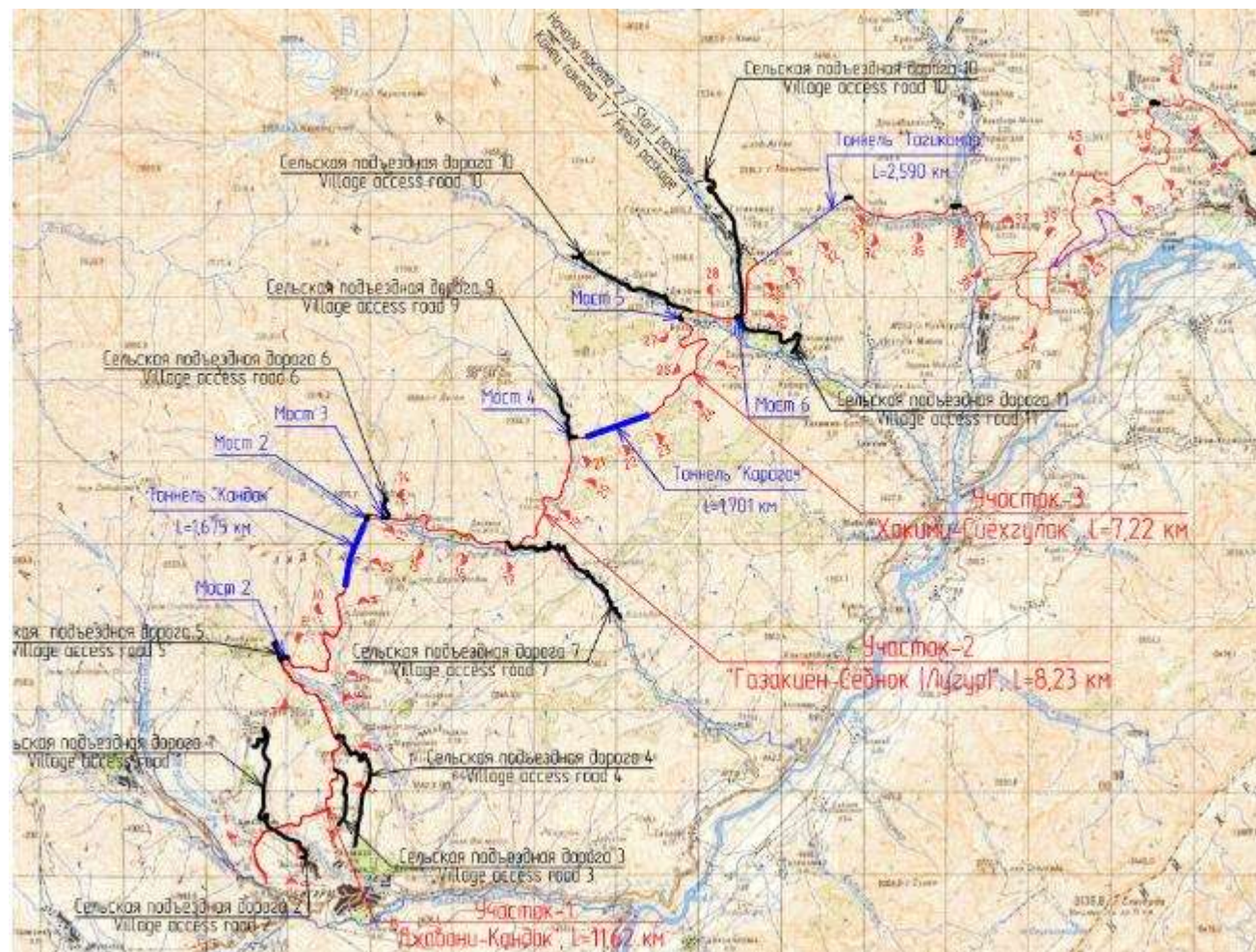
113. 30.25 km of village access roads are proposed for Lot 1, and 44.5 km for Lot 2. The proposed locations of the village access roads for Lots 1 and 2 are shown in Figure 9 and Figure 10, and summarised in Table 13.

114. A supplementary impact assessment of the proposed village access roads will be conducted as a supplement to this ESIA, and publicly disclosed. This assessment will include consultation with stakeholders, including regarding any proposed land acquisition. However, a road safety audit<sup>27</sup> for the main alignment included assessment of road safety considerations at the junctions between the alignment and the access roads.

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<sup>27</sup> Detailed design stage road safety audit report for the proposed Obigarm-Nurabod Highway, northern Tajikistan, Road Safety International

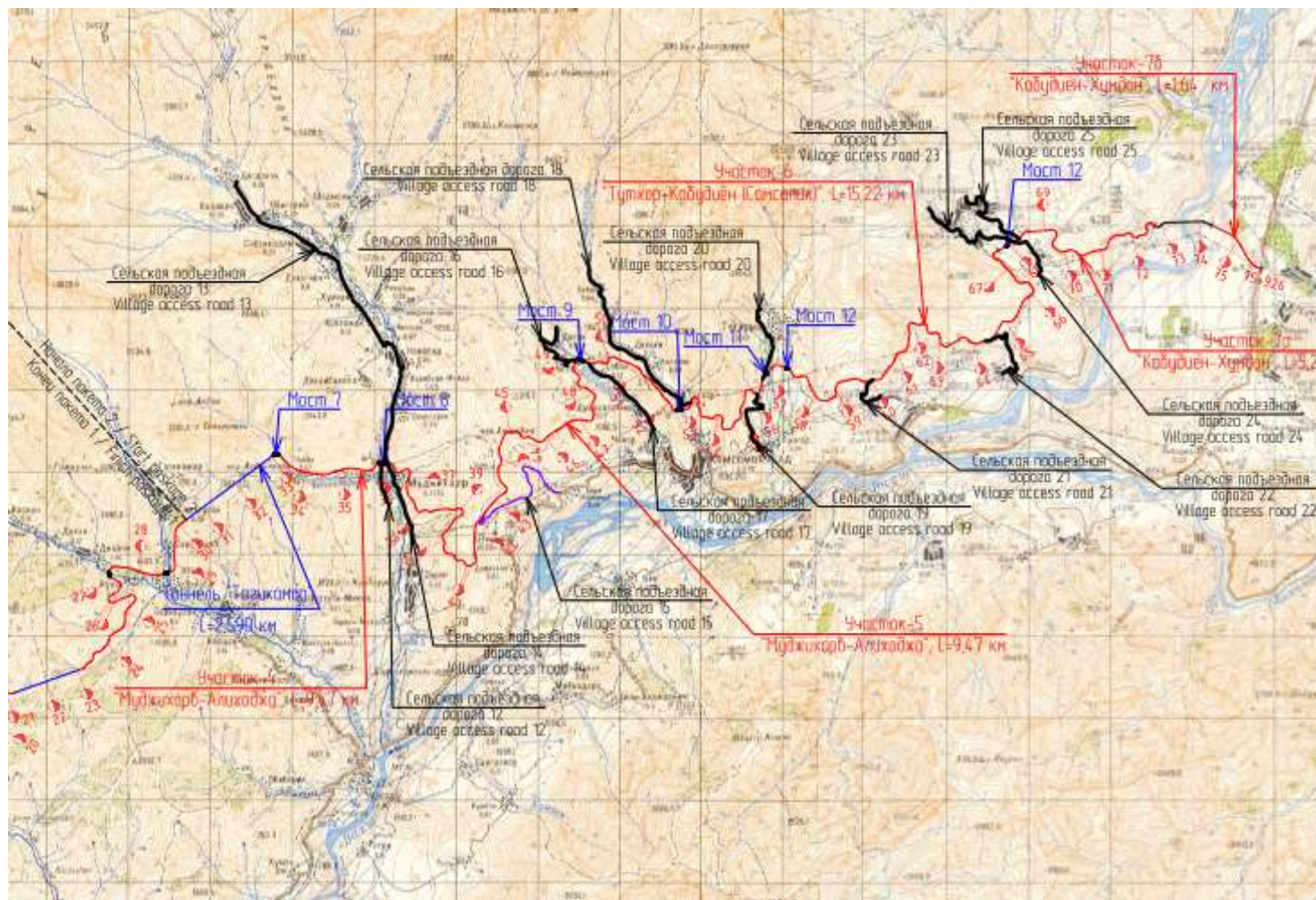
Figure 9: Proposed locations of village access roads (Lot 1)



Source: Avtostrada Drawing no 16-16-AD-DR.01, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)



Figure 10: Proposed locations of village access roads (Lot 2)



Source: Avtostrada Drawing no 16-16-AD-DR.02, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)

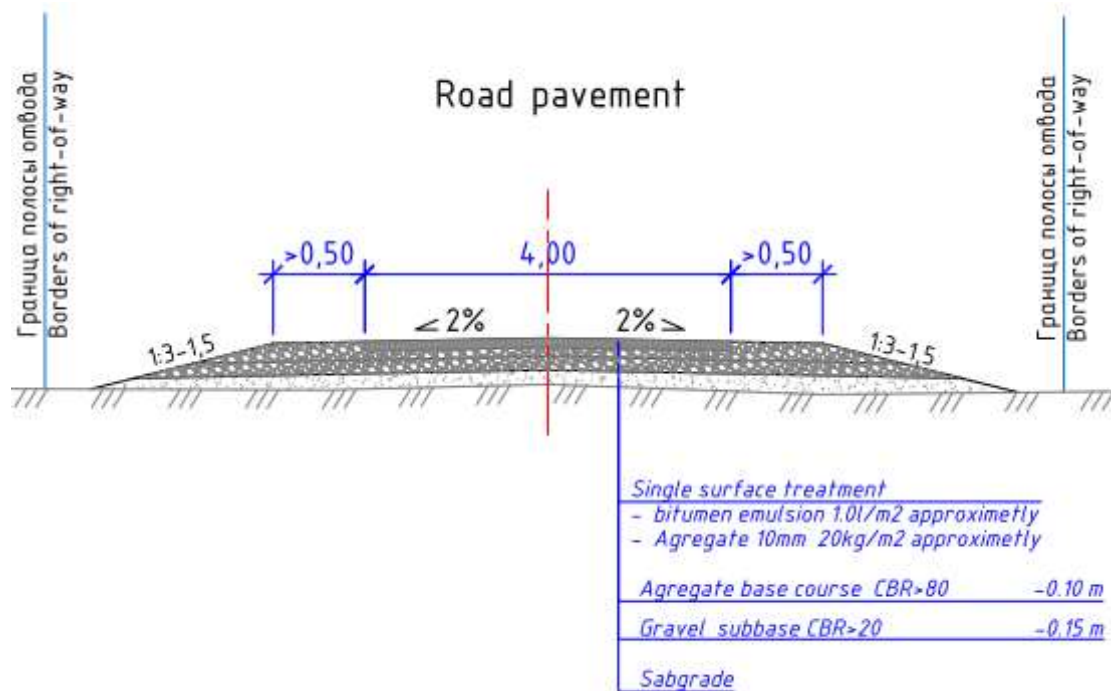
Table 13: Village access roads

No	Package / Lot	Village name	Location from the main road	Length, km
1	1	Kukabulok	To the left	3.95
2	1	Eshonon	To the right	1.25
3	1	Eshonon	To the right	3.30
4	1	Kandak	To the right	3.80
5	1	Kandaki bolo	To the left	0.75
6	1	Gazakiyon	To the left	0.65
7	1	Dialisho	To the right	4.65
8	1	Sebnok	To the left	1.45
9	1	Chavchi (Hakimi)	To the left	3.65
10	1	Tagikamar 1	To the left	3.60
11	1	Tagikamar 2	To the right	3.20
<b>TOTAL LOT 1</b>				<b>30.25</b>
12	2	Mujiharf	To the right	1.35
13	2	Degdonac	To the left	9.60
14	2	Mujiharf	To the right	1.85
15	2	Ayni access road	To the right	3.70
16	2	Mirzosharifon	To the left	2.25
17	2	Sebak	To the right	2.85
18	2	Tukhor	To the left	4.90
19	2	Sunjit	To the right	1.80
20	2	Tegermi	To the left	2.00
21	2	Sanipul	To the right	1.85
22	2	Safedchashma	To the left	1.95
23	2	Ulfatobod 1	To the left	2.89
24	2	Ulfatobod 2	To the left	1.30
25	2	Sherbigiyon	To the left	2.75
26	2	Brick factory	To the right	3.80
<b>TOTAL LOT 2</b>				<b>44.8</b>

Source: Avtostrada Drawing nos 16-16-AD-DR.01 & 16-16-AD-DR.02, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)

115. The proposed construction specifications for the village access roads is presented in Figure 11.

Figure 11: Specifications for village access roads (all distances in metres)

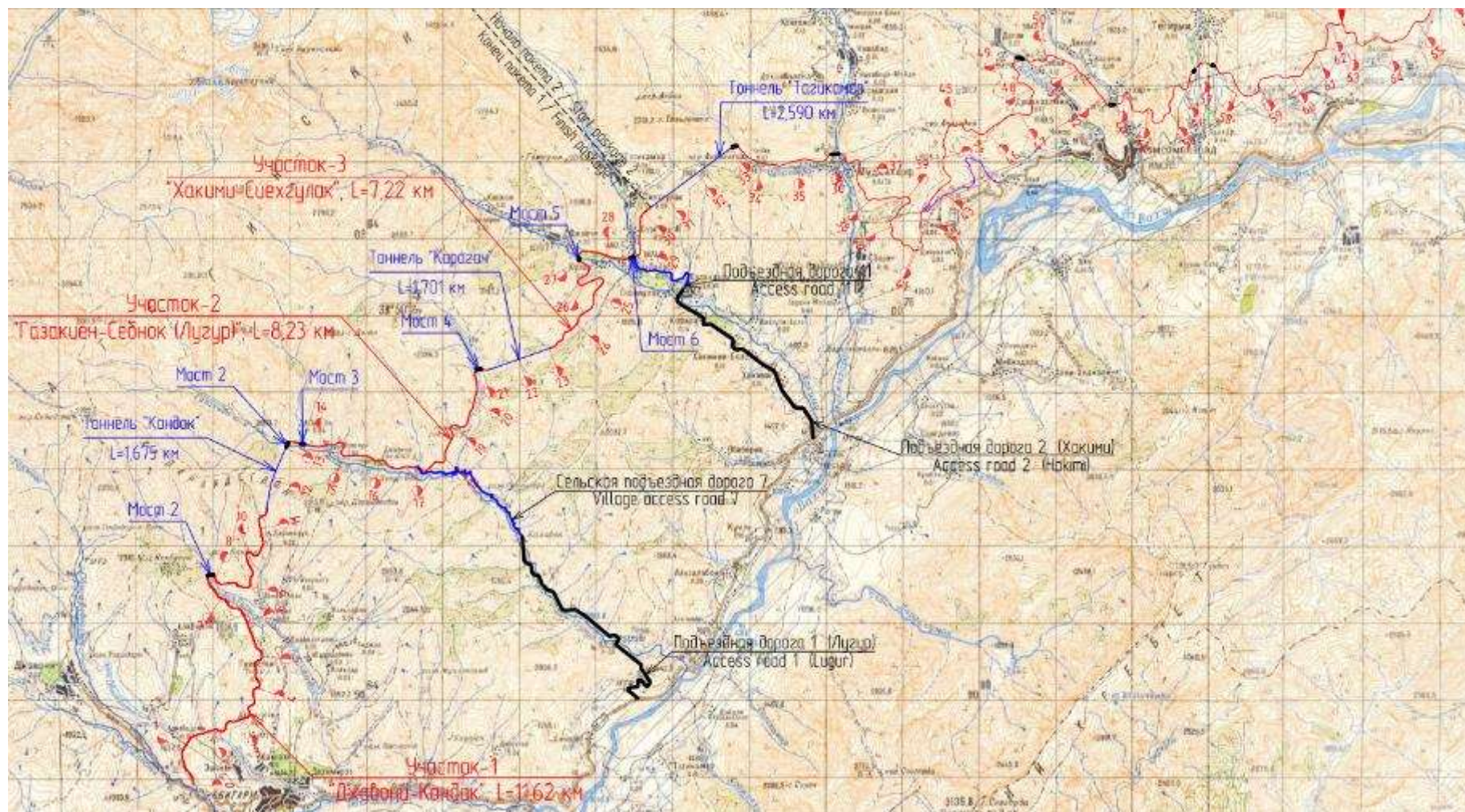


Source: Avtostrada Drawing nos 16-16-AD-DR.01 & 16-16-AD-DR.02, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)

116. The proposed locations of the site construction access routes are shown on Figure 12 and Figure 13.



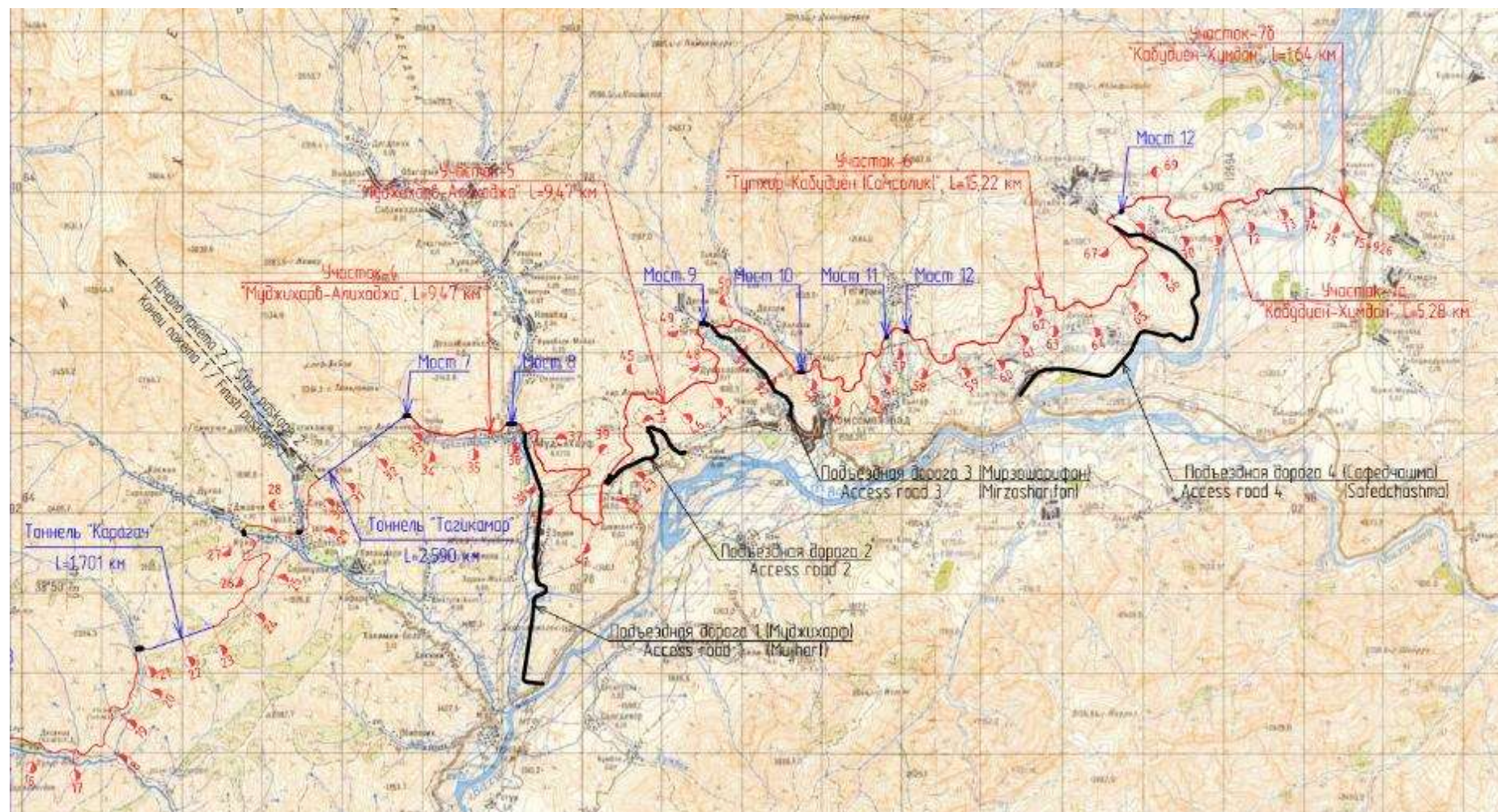
Figure 12: Proposed location of site construction access routes (Lot 1)



Source: Avtostrada Drawing no 16-16-AD-DR.01, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)



Figure 13: Proposed location of site construction access routes (Lot 2)

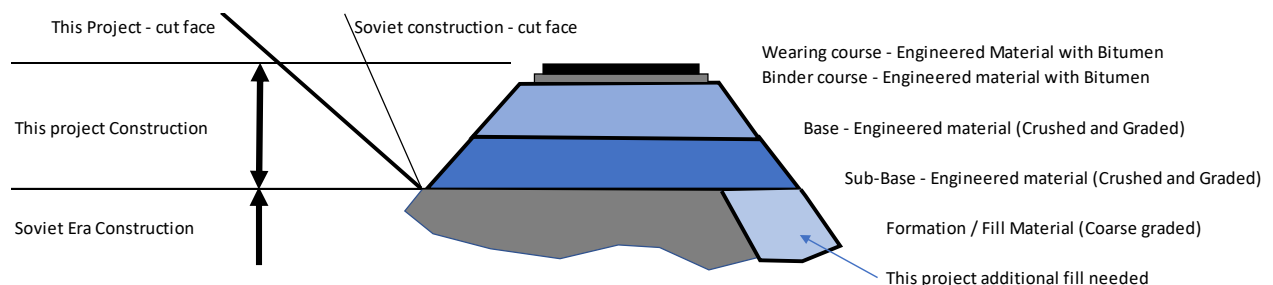


Source: Avtostrada Drawing no 16-16-AD-DR.02, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)

### 3.6 Basic Road Construction

117. A road is formed in a number of layers with the upper layers requiring increasing levels of material processing i.e. crushing and grading (with potential for adverse dust and noise impacts). The lowest layer is the “formation” and requires minimal material processing – this is the stage of construction partially existing from the Soviet era. The objective is to form a stable level base to build on. The next two layers are the “sub-base” and “base” courses. These layers are constructed from rock / stone that has been crushed and graded before being placed and compacted with a heavy roller. The upper two layers are the “binder course” and the “wearing course”, which the vehicles run on. These layers are of finer material mixed with bitumen to bind, seal and give a smooth running surface. Road construction standards have changed since the Soviet era and the current design will need to widen the formation (requiring additional fill) and further cutting of slopes to a more stable angle (generating potential fill material). Figure 14 shows the typical road cross section for this project.

Figure 14: Typical road cross section showing processing requirements



Source: This ESIA

118. The road has been designed in accordance with State Standard (GOST) 33475-2015<sup>28</sup>, adopting the specifications prescribed for Category III roads. These are summarised in Table 14.

Table 14: Technical Parameters for Class III Roads

Design traffic speed	50 km/h
Number of lanes	2*
Width of lanes	3.5 m
Width of carriage ways	7.0 m
Width of shoulders	2.5
Minimum width of hard shoulders:	1.5 m
• including margin course	0.5-0.75 m
Smallest horizontal curve radius in plan	50 m**
Greatest longitudinal slope	100‰***
Smallest vertical curves:	
• cambered	1,500 m
• saddle like	400 m
Road surface	permanent type
Type of loading for artificial structures	A14 and H14
Pavement load	115 кН

\* In sections with a protracted inclines (over 70 ‰) an additional lane in the uphill direction is provided for the movements of freight transport.

\*\* According to the norms of road design of the Asian Highway network.

\*\*\* According to minutes of technical Meetings

<sup>28</sup> State Standard (GOST) 33475-2015<sup>28</sup>: Public Roads; Geometric Elements; Technical Requirements

119. During construction, additional working width will be required to allow construction activities to proceed affectively. The construction width will range from 12 m where access is highly restricted, to a maximum of 120 m in some locations.

### 3.7 Project Resource Usage

120. The Project will use resources, including the following key resources:

- Water - Construction of road embankments requires a substantial amount of water for compaction purposes, particularly in the dry season when the earth is dry, estimated at 10,000 litres every 1-2 hrs, plus 20,000 litres over a day for dust control over the active work areas. Similarly amounts would be required during pavement construction. Tunnelling would require about 6-8,000 l /day. Concrete work, (Bridges/drainage need water but probably no more than 1 -2,000 l per day depending on how many different sites they are working. This water will be taken from streams crossing the road or the Reservoir/Sukhrob River and not from the springs used by the villages.
- Construction materials – To minimise degradation of landscapes and soil erosion the Contractor(s) will reuse spoil or, if needed, use existing quarries or new quarries near the alignment for required additional materials, where this is possible. This will limit the need for new quarries. However, a limited number of new borrow pits may be required.
- Human resources – the project workforce will be both local and from other areas of Tajikistan overseas. Local employment and procurement will be engaged where available and suitable, and a Local Employment and Procurement Plan will be implemented to reinforce this.
- Fuel and energy

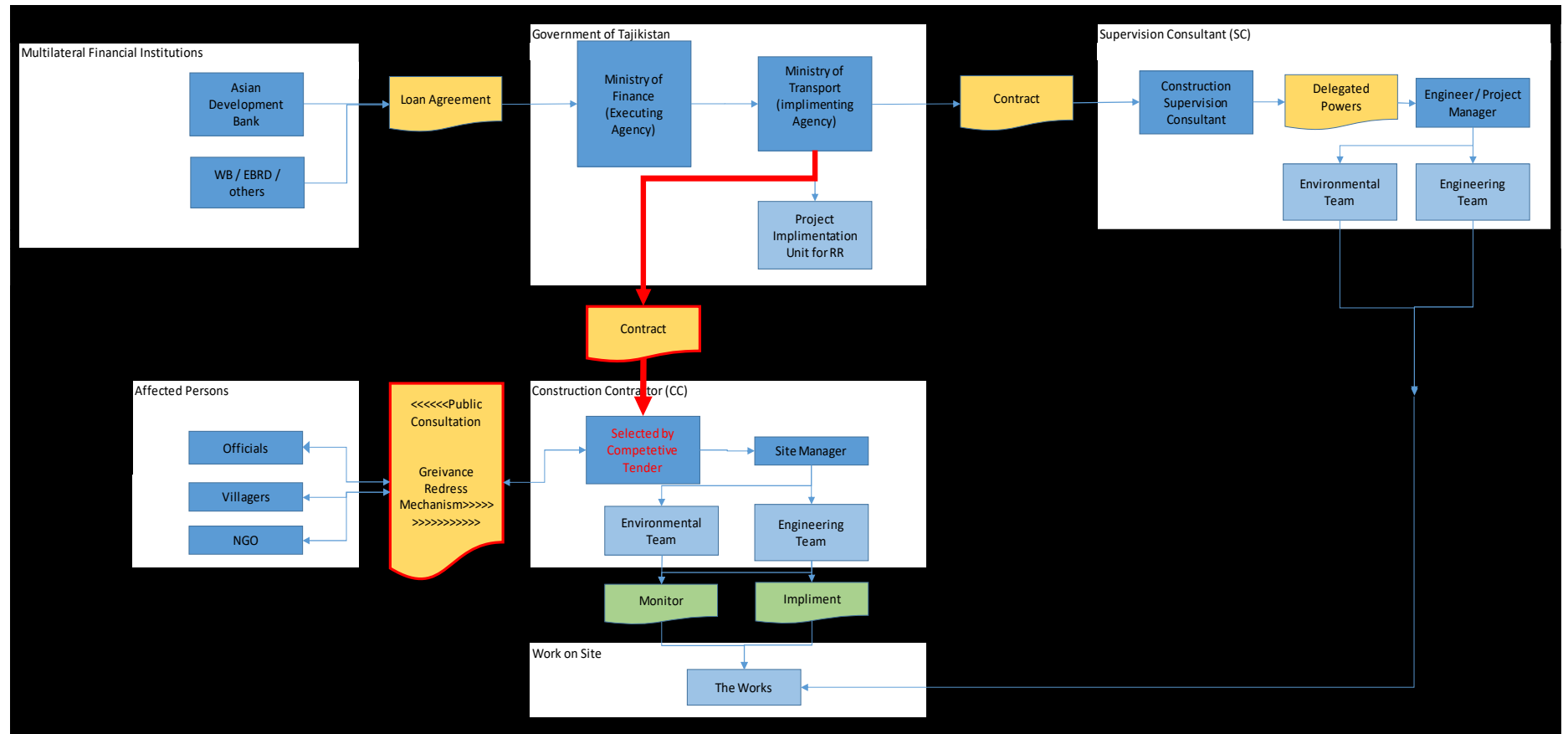
### 3.8 Proposed Project Delivery Mechanism

121. The project is currently in the baseline data collection phase to confirm: need; technical feasibility; acceptable cost; acceptable level of environmental and social impact, etc. ADB on behalf of the Ministry of Transport has commissioned a specialist team to carry out the “due diligence” aspect of the project. This ESIA document is an output from the due diligence process. The ESIA document will be used to assist the ADB and the EBRD in approving the loan / grant and the ESMP component will be adopted in the final design and construction contract to identify environmental requirements and practices that will be included in the works. In this due diligence phase the parties involved are: Asian Development Bank, EBRD, Ministry of Transport, ADB appointed due diligence specialists and other project stakeholders (Government agencies, affected communities, NGOs, etc.)

122. In the implementation phase Contractors will be added to the parties involved in the project. Figure 15 identifies the key players who will implement the project. The construction contracts will be signed between The Ministry of Transport and the successful contractors. ADB (and other agencies) will provide funds to the Government to pay for the works through MoT and a Construction Supervision Consultant will be appointed to act as the Engineer for the contracts on behalf of the MoT under certain delegated powers.



Figure 15: Parties engaged in Project Delivery at the Construction Phase



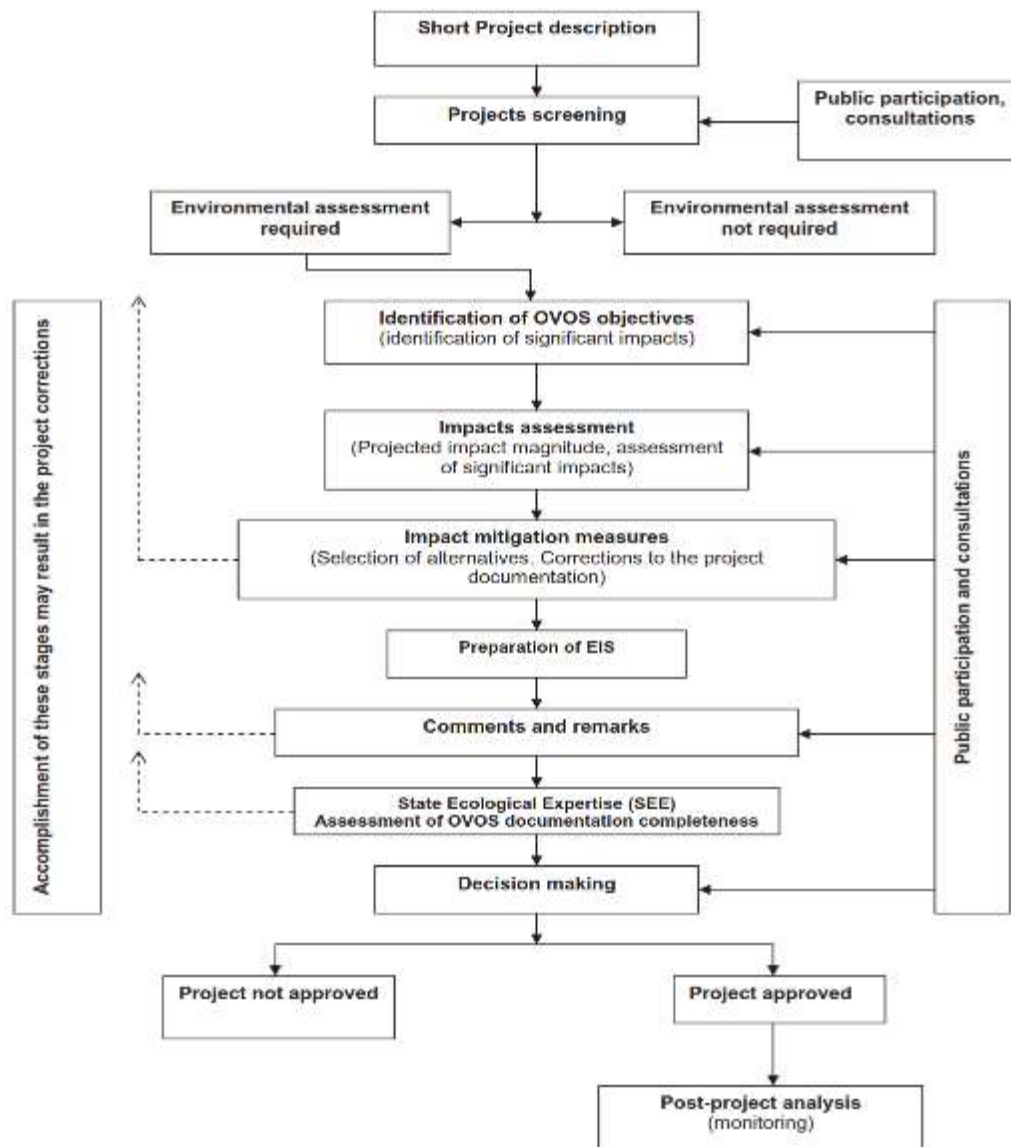
### 3.9 Schedule and Timeframe

123. The current (tentative) programme is:

- design finalised by end of January /early February 2019;
- preparation of bidding documents mid January 2019 onwards;
- ESIA ready for disclosure on the ADB and EBRD websites by mid June 2019;
- 120 day (four month) disclosure on ADB and EBRD websites;
- 60 day disclosure of the local EIA (OVOS) under Tajik State Committee for Environmental Protection (SCEP) rules. Disclosure will be via the MoT website and distribution of literature summarising the project, public consultations and in local newspapers (where these exist). The locations for disclosure and conducting public consultations to cover representative stakeholders along all parts of the proposed roadway are the following:
  - Jamoat Obi-Garm;
  - Jamoat Khakimi;
  - Jamoat Mudjikharf; and
  - Nurobod city.
- Project considered by ADB & EBRD Boards for funding approval November 2019;
- Contractor expected to be ready to mobilise in the spring of 2020.

124. The process for disclosure and approval of the OVOS is shown in Figure 15Figure 16

Figure 16: Disclosure and Approval Process for OVOS



Source: United Nations Economic Commission for Europe Environmental Performance Reviews – Tajikistan, Second Review (2012)

125. An impact assessment of the proposed village access roads will be conducted as a supplement to this ESIA, and disclosed after this ESIA, but still within the within the 120 day disclosure period for the main ESIA. This assessment will include consultation with stakeholders and identification and assessment of potential receptors (biodiversity, cultural heritage, etc.).
126. An impact assessment of the proposed permanent long bridge will also be conducted as an addendum to this ESIA, but will be disclosed separately outside the timescales described above, once the detailed design has been prepared.

### 3.10 Project Costs

127. The Technical Assistance Report prepared by ADB in June 2018, mentions the following:
128. The project is expected to cost about \$400 million. The government of Tajikistan has approached the Asian Development Bank (ADB), the European Bank for Reconstruction and Development, and the Asian Infrastructure Investment Bank (AIIB) to help finance the project. The government will provide counterpart funding of about \$70 million equivalent to cover taxes and duties, land acquisition and resettlement costs, incremental administrative expenses, financing charges, and other miscellaneous costs”.

### 3.11 Project Categorisation by ADB

129. ADB uses a classification system to reflect the significance of a project’s potential environmental impacts. A project’s category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project’s area of influence<sup>29</sup>.
130. Category A projects. A project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
131. Category B projects. A project is classified as category B if its potential adverse environmental impacts 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. An initial environmental examination is required.
132. Category A projects require a 120-day disclosure period before Board consideration.
133. ADB has prepared a set of Rapid Environmental Assessment (REA) Checklists to assist in the categorization of projects. In reaching a decision for this project the REA for roads and highways was used.
134. The project will be constructed on an alignment developed during the Soviet era. Several of the planned bridges and the three planned tunnels were not completed, and the alignment has been abandoned with cut slopes and embankments eroded over time. While bulk earthworks will be required to remediate embankments and cut back slopes to stable angles these works will not be as extensive as full reconstruction. Subsequent works are the forming of the engineered layers and the asphalt running surface. These works will require engineered stone from a crushing and grading operation and operation of an asphalt plant.
135. The alignment passes close to 17 villages (Table 11). Of these it bisects three, passes over three on existing bridge structures, and the remainder are generally bypassed on the uphill side that offers some shielding from construction and operation noise sources.
136. The hot summers and the clay like material on the alignment and access roads result in severe dust pollution from vehicle movements on dry, dusty surfaces. Dust management will be required.

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<sup>29</sup> Extracted from the ADB Safeguard Policy Statement (ADB 19 para 50)

137. The alignment passes through a highly modified landscape of grazing land. There was no permanent native woodland identified during field trips. River valley bases, where villages are sited have tree planting to provide shelter belts, orchard crops and wood for fuel.
138. Based on field observations and the engineering design, the Project Team prepared the REA. ADB concluded that the project should be defined as Category A for Environmental Safeguards and this document has been prepared on that basis.

### 3.12 Project Categorisation by the EBRD

139. Under the EBRD ESP projects are categorised as A, B, C or FI to determine the nature and level of environmental and social investigations, information disclosure and stakeholder engagement required. This will be commensurate with the nature, location, sensitivity and scale of the project, and the significance of its potential adverse future environmental and social impacts.
140. A project is categorised A when it could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorisation, cannot readily be identified or assessed, and which, therefore, require a formalised and participatory environmental and social impact assessment process.
141. Contained within the example list of Category A projects that relate to this project are:
- 6. Construction of motorways, express roads and lines for long-distance railway traffic; airports with a basic runway length of 2,100 metres or more; new roads of four or more lanes, or realignment and/or widening of existing roads to provide four or more lanes, where such new roads, or realigned and/or widened sections of road would be 10 km or more in a continuous length.*
142. The project has four lanes in some sections and exceeds the 10 km length threshold, so would be classified as Category A by EBRD.



## 4 Analysis of Alternatives

143. One of the reporting requirements of an ESIA is to investigate alternatives to the Project. In relation to a proposed activity, “alternatives” means different ways of meeting the general purposes and requirements of the proposed activity. Normally this section will include an assessment of alternative corridors, alignments, transport modes and technologies, as well as the ‘no project’ alternative.
144. In this case the inundation of the existing M-41 road corridor will remove all access to the established towns of Nurobod and Obi Garm for the existing 72,767 population<sup>30</sup> so the ‘no project scenario’ would have major social consequences, as detailed in Section 4.1.
145. Alternative corridors have not been considered, because they would require long diversion through adjacent valleys, and would not reinstate access to the towns of Nurobod and Obi Garm, and other villages along the alignment, when the existing M-41 is inundated.
146. The proposed alignment was established in the Soviet era. Therefore, the corridor is effectively fixed. Partial construction of the identified alignment, including bulk earthworks for cuttings and embankments, has already been undertaken and the route has generally been protected from development. It is therefore reasonable to assume that the environmental and social impact of any alternative alignment is likely to be greater than the established alignment, so there is limited value in assessing alternative alignments. The analysis therefore focuses on the established alignment and options for modification to this alignment.

### 4.1 No Project Scenario

147. A “no project” scenario would leave villages on the alignment with only the completed soviet era sections including cuttings and embankments as access road link. Villages at the west end of the alignment (before the Kandak tunnel) would have access to Obigarm along the substandard section of the soviet era alignment and on existing village access roads. Villages to the east of the Kandak tunnel would have no formal access, other than pedestrian tracks across mountain passes. None of the three tunnel sections are complete, so there would be no through access to villages in the central section of the road. In addition, villages to the east of the third tunnel would have no access to Nurobod since the existing bridge crossing will be flooded by the Rogan Dam reservoir.
148. The no project scenario would deprive a 2018 population<sup>31</sup> of 72,767 of access to medical facilities, emergency services, markets and transport opportunities.

### 4.2 Alternative Alignments

149. Given the increasingly complex topography (mountainous) and geological conditions to the north, and the severance effect of the Rogun dam impoundment and reservoir to the south, there are no other feasible alternative alignments.

### 4.3 Modifications to the Alignment

150. A number of micro-realignments of the proposed route have been made since the original design, including:

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<sup>30</sup> The population is derived from project district populations based on Districts’ and Jamoats’ statistics. See Table 3.1 (Population in Project Districts) LARP (Dec 2018)

<sup>31</sup> Source - Project LARP (Dec 2018)

- Realignment to avoid a cemetery on the original routing (km 70 +500);
- Modifications to cut slopes;
- Road curvature;
- Modification / reconstruction of bridges;
- Addition of tunnel no 3 (Package 2) to eliminate a stretch of winding road, improving journey times and road safety;

151. The design consultants have reviewed the works carried out during the Soviet era and concluded that modification was needed to bring the road design (primarily road safety and engineering design requirements) up to current standards. This required modifications to cut slopes (flatter slopes for slope stability), road curvature (to maintain safe design speeds on the alignment) and the modification / reconstruction of bridges that had suffered from lack of maintenance creating structural safety (durability) issues. The two soviet era tunnel sections (Kandak and Karagach) and the new tunnel section (Tagikamar) are all new designs, as there was no significant construction during the Soviet era.

152. The design consultants identified a section (km 29.5 to km 39.25) where the road climbed to a high pass via a series of tight curves and concluded that from a road safety, cost and design perspective a 2.6 km tunnel section was more appropriate, reducing the alignment distance by 6.5 km. This is the Tagikamar tunnel, tunnel no 3, (Package 2). The location and approach are illustrated in Figure 17.

Figure 17: New Third Tunnel (Tagikamar) – showing earlier “high pass” no tunnel option



#### 4.4 Alternative Road Surfacing

153. Asphalt and concrete pavement types have been considered. Priority was given to asphalt. This type of pavement has been chosen because there is:

- less noise during operation, compared to concrete (less noise nuisance for existing residents and wildlife);
- less vibration compared to concrete (many buildings along observed to be of mudbrick construction);

- better visibility of road markings on black asphalt (edge and lane markings - Road safety);
- better in winter snow/ice melt;
- recyclability of material.

#### 4.5 Alternative Tunnelling Techniques

154. There are two techniques that could be considered for the three tunnel sections:

- Drill and Blast; and
- Tunnel Boring Machine.

155. However, due to the relatively short tunnel lengths drill and blast has been selected for the tunnel design. The three tunnel sites are remote from sensitive receivers (residential receptors in the villages, ecological receptors) so noise and vibration impacts are unlikely to be an issue. The assessment will proceed on the basis of drill and blast.

#### 4.6 Road Safety Improvements

156. A number of design amendments have been made to improve road safety on the alignment, as a response to community consultations and a road safety audit conducted in November 2018<sup>32</sup>, as follows:

- An advisory 40 km/h speed limit in villages will be applied. This may be made mandatory subject to approval by the MoT and the Tajik Traffic Police
- Crossings will have a raised “island” across the parking lanes in villages, which means that pedestrians will need to cross a maximum of 2 lanes at any location. The provision of parking lanes may also provide an economic opportunity, as they provide a location for drivers to stop and rest, and a location where local people can sell produce;
- Crossing points will be moved away from the apex of intersections– away from the path of turning traffic – to reduce the potential for accidents;
- Warning signs will be installed at all pedestrian crossings;
- Various improvements to road markings and signage; and
- Modifications to proposed tunnel control offices to improve operator safety during access / exit;

#### 4.7 Other Amendments

157. Asbestos containing materials were originally specified in the designs for the tunnels. To comply with EBRD and ADB standards, this material has been removed from the specifications, and will not be used for this Project.

158. Provision will be made for installation of 6 inch pipes at intervals below the carriageway in residential areas to allow passage of water pipes and other village services. The location of the pipes will be finalised in discussion with the local communities. The 6 inch pipes would provide a conduit for water pipes, and ensure they can be maintained and replaced without excavating the carriageway. This design solution would avoid the need to excavate the carriageway to maintain the water pipes.

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<sup>32</sup> Detailed design stage road safety audit report for the proposed Obigarm-Nurabod Highway, northern Tajikistan, Road Safety International

#### 4.8 Cumulative Impact Assessment

159. There are no other projects in the area that will impact on or be impacted on the Obigarm Nurobod Road Project. The Rogun Dam project is complete and the dam is now being impounded. The first turbine was commissioned in November 2018<sup>33</sup> and the second is scheduled for commissioning in 2019. Each turbine has an installed capacity of 6MW and there is provision for 6 turbines to be installed. It should also be noted that the Rogun dam sourced much of its rockfill requirements from inside the impoundment area and the processing facilities were developed within the impoundment area. The M41 road was not a significant construction corridor. There are no other major projects planned or in progress within the influence area of the project.

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<sup>33</sup> <https://www.salini-impregilo.com/en/press/news-events/tajikistan-president-starts-first-turbine-of-rogun-hydropower-plant-being-developed-with-the-participation-of-salini-impregilo.html>

The Italian company Salini Impregilo have been responsible for the final stages of the dam construction and the commissioning of the turbines.

## 5 Description of the Existing Environment

### 5.1 Introduction

160. This section describes the current environmental and social baseline of the area within which the project is located. It also identifies the future baseline, which is the anticipated trends in the baseline that would occur without the scheme.

### 5.2 Topography and Landscape

161. The area of the road belongs to the Hissar-Alai region. The relief of this region is typically mountainous, with access to the sub-Alpine and Alpine zones in the upper part of the ridge, with steep peaks and small glaciers. Almost every gorge has rough streams and rivers. On the steep slopes there are rocks and numerous stone scree deposits.
162. There are ridges of latitudinal and sublatitudinal strike, including the ridges of: Zeravshan, Turkestan, Hissar and Karategin. The road starts at the Western spurs of the Karategin ridge and stretches along its southern slope almost to its middle. The road passes through the valley of the Obigarm river from the village Obigarm and then runs parallel to the Vakhsh river, almost to its source.

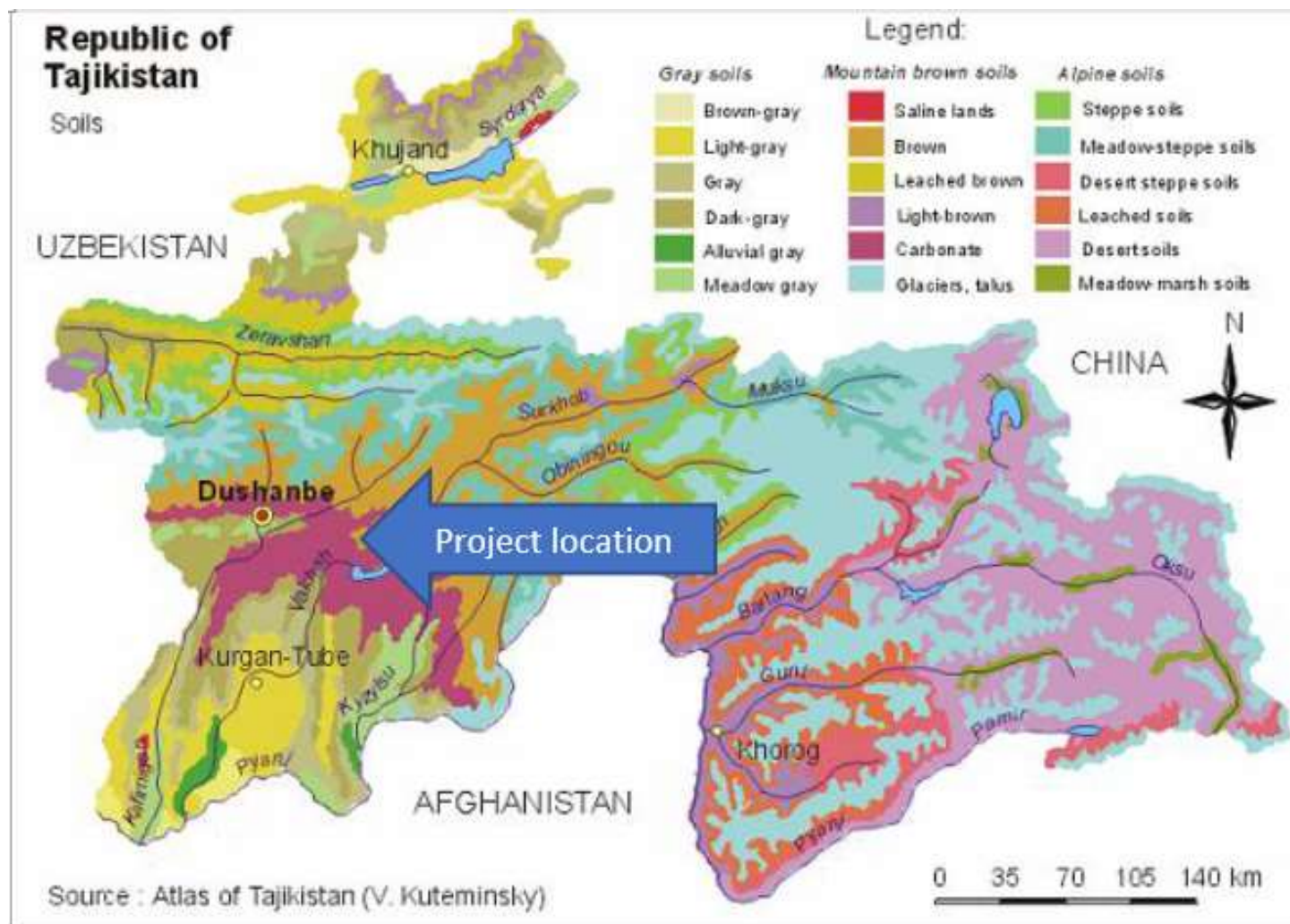
### 5.3 Soils, Geology and Hydrogeology

#### 5.3.1 Geology and Soils

163. The Republic of Tajikistan has a complex relief and geological structure. The rocks covering the country were formed from the Archean-Proterozoic to the Quaternary period and are mainly represented by rocks formed through volcanic activity and rocks of sedimentary origin. The geological structure of the country is divided into Karamazar (Northern Tajikistan), Central Tajikistan (Hissar – Alai), Pamir (with Darvaz), Tajik depression and Fergana depression. The project is located in the Hissar-Alai region.
164. The Hissar-Alai region is rich in minerals, including: antimony, mercury, tungsten, tin, gold, arsenic, etc. The area is also rich in mineral waters and hot springs.
165. Most of the country is covered by mountainous terrain, with only 7% of the land area in valleys, so the soil cover of the territory is varied and unevenly distributed.
166. The country has varied climatic conditions, resulting in different types of soils (up to 15 types). The parts of the project alignment that are located at lower altitude have soils that are generally brown, and well-moistened. In the upper levels (highlands) they become Alpine meadow-steppe and steppe light brown. A map of soil types in Tajikistan is shown in Figure 18.



Figure 18: Soil Types in Tajikistan (including the project alignment)



167. Engineering geological surveys were conducted by the designers Avtostrada in 2016-18<sup>34</sup>, building on surveys conducted during the geological studies conducted during the Soviet era. The studies were conducted on two 42.5 km sections of the alignment – from Chainage 0 to Chainage 424+80, and from Chainage 424+80 to Chainage 759+14. These identified that the nature and thicknesses of soils across the survey area is highly heterogeneous, and identified the engineering geology elements (EGE), over the area of investigation set out in Table 15.

*Table 15: Lithologies Identified in the Project Area*

Number of EGE	Description of soil
1	Sand with the inclusion of crushed stone more than 10%.
2	Crushed stone with the inclusion of boulders up to 10%
3	Loam of a solid consistency, light, silty, with inclusion of crushed stone more than 10%
4	Loam of light, silty, solid consistency with inclusion of gravel up to 10%
5	Weathered granite of very low-strength
6	Strongly weathered granite, low strength
7	Medium weathered granite, medium strength
8	Medium strength slates
9	Conglomerates with limestone cement
10	Silty boulder with inclusion of oversized rocks up to 5%, aggregate sand up to 30%
11	Silty boulder. Basically, lies in river beds
12*	Crushed stone with the inclusion of blocks up to 30%, aggregate loam more than 40%
13	Crushed stone with the inclusion of blocks up to 30%, aggregate loam more than 40%
14	Light loam, silty from high-plastic to very soft consistency with inclusion of pebble and gravel up to 30%
15	Granite medium-weathered, stiff
16	Granite slightly weathered, stiff
17	Crushed stone with the inclusion of blocks up to 30%, aggregate sand up to 30%
18	Gruss in bedrock
19*	Asphalt concrete soil (remains of asphalt concrete pavement)
20	Soil-vegetative layer with inclusion of crushed stone and boulder, roots of vegetation more than 10%
21	Silty boulder, aggregate loam more than 40%

- 
- <sup>34</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 424+80 To Chainage 759+14: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018; and
  - Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 0 to Chainage 424+80: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018

Number of EGE	Description of soil
22	Crushed stone with the inclusion of boulders up to 30%, aggregate sand more than 40%
23	Crushed stone with the inclusion of boulders up to 30%, aggregate sand more than 40%. The plasticity and soil moisture are made of aggregate
24	Slates, stiff
25	Slates, sandy, stiff
26**	Gruss, filler sand
27**	Loam, light, dusty fluid consistency with inclusion of crushed stone up to 30%
28**	Limestone, medium strength
29**	Hard marly limestone
30**	Hard dolomitic limestone

\* Only referenced in survey report for Chainage 0 to Chainage 424+80

\*\* Only referenced in survey report for Chainage 424+80 to Chainage 759+14

Source: Avtostrada Engineering Geological Survey (Chainage 424+80 to Chainage 759+14) 2018 and Avtostrada Engineering Geological Survey (Chainage 0 to Chainage 424+80) 2018

168. The Avtostrada Engineering Geological Survey (Chainage 0 to Chainage 424+80) indicates the following lithologies are present

- Unconsolidated Quaternary deposits comprising heterogeneous channel deposits and low alluvial terraces, with a cover of loamy material with detrital material of younger generations of proluvial and mudflow sediments in some locations
- Complex of continental deposits, represented by Neogene deposits of two main types.
  - Conglomerates of grey colour, fine-grained, dense, with sandy-clay cement. They contain interbeds of grey and reddish-brown, loose sandstones.
  - More widely spread interstratification of siltstones, clays, sandstones, conglomerates of grey and reddish-brown colour. Conglomerates are small and medium-sized, dense, strong, on sandy-calcareous cement, not fissured, slightly weathered.
- Complex of Proterozoic metamorphic rocks formation. Deposits are represented by crystalline schists. The colour of the rocks is grey and dark grey. The structure is dense, and the texture is layered, banded, and massive. The thickness of the deposits is 1,800-2,400 m.
- Complex of intrusive formations, represented by various granites, diorites, gabbros, quartz diorites.

169. The Geotechnical Inception Report<sup>35</sup> indicates that the road foundation is laid mostly on geological unit 15, 16, 17 and 18 which are classified as medium to hard granite, gruss on bed rock and crushed stone.

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<sup>35</sup> • Preparing the Central Asia Regional Economic Cooperation Corridors 2, 3, and 5 (Obigarm-Nurobod) Road Project Consultants' Services; Inception Report – Geotechnical Consultancy Services, August 2018



170. Other detailed geotechnical studies have been conducted for specific elements of the road construction (bridges, tunnels, etc.) and these are summarised below.

#### **Tajikamar Tunnel**

171. A geological engineering study for the Tajikamar Tunnel<sup>36</sup> in the centre of the alignment indicates the following geology in the vicinity of the tunnel

- 1-10 m of Quaternary eluvial deposits comprising loams and sandy loams from hard to refractory consistency. The composition of the source rock granites and granodiorites are strongly-medium weathered. The surface up to 20 cm contains plant roots.
- Late Carboniferous intrusive igneous rock, comprising granite and granodiorite, grey-white / grey-brown, with a medium-fine grained massive texture. The main mineral composition consists of quartz, orthoclase, amphibole and mica. There are four sub-layers of weathering - fully weathered, strongly weathered, medium weathered and a zone of intensive fracturing.

#### **Bridge No 10**

172. A geological engineering study for Bridge 10, across the Dashtiguron River<sup>37</sup> indicates that the geology in the location comprises Carboniferous granites overlain by soils and Quaternary drift deposits.

#### **Bridge Nos 9, 11, 12 & 13**

173. A geological engineering study for Bridges 9 (Mirzoshafiron River), 11 (Tegirmi River 1), 12 (Tegirmi River 2) and 13 (Kalod River)<sup>38</sup> indicates that the geology in these locations comprises Carboniferous granites overlain by soils and Quaternary drift deposits.

### **5.3.2 Hydrogeology**

174. The Avtostrada Engineering Geological Surveys (Chainage 0 to Chainage 424+80 and Chainage 424+80 to Chainage 759+14) indicate that the rock formations of the region are characterized by steep incidence angles and large fractures, which means that resisted water-bearing strata along the area are absent. Underground waters, by the nature of their spread, are trenches, fissure-pore and pore. They are confined mainly to alluvial deposits, and on the surface occur as springs. The formation and accumulation of groundwater in this area is associated with atmospheric precipitation, falling in the form of rain and snow. The high degree of fracturing of intrusive rocks and the complex tectonic structure of the area in general, contributes to the intensive absorption of atmospheric precipitation and snow melt, which are the main source of recharge of groundwater resources.

175. During these surveys, groundwater was identified in 13 pits dug along the Project at depths of between 1.0 and 8.0 m. Groundwater was not encountered below a depth of 3.0 m in the remaining pits. Groundwater was also recorded by the Avtostrada Engineering Geological Survey for Bridges 9, 11, 12 and 13, with recorded depths of

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<sup>36</sup> Avtostrada Report Ref 16-16-AS.T03-CS-EN, 2017

<sup>37</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridge Across Dashtiguron River: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-EGR, Dushanbe, 2018

<sup>38</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridges Nos 9, 11, 12, 13: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-EG-T, Dushanbe, 2018

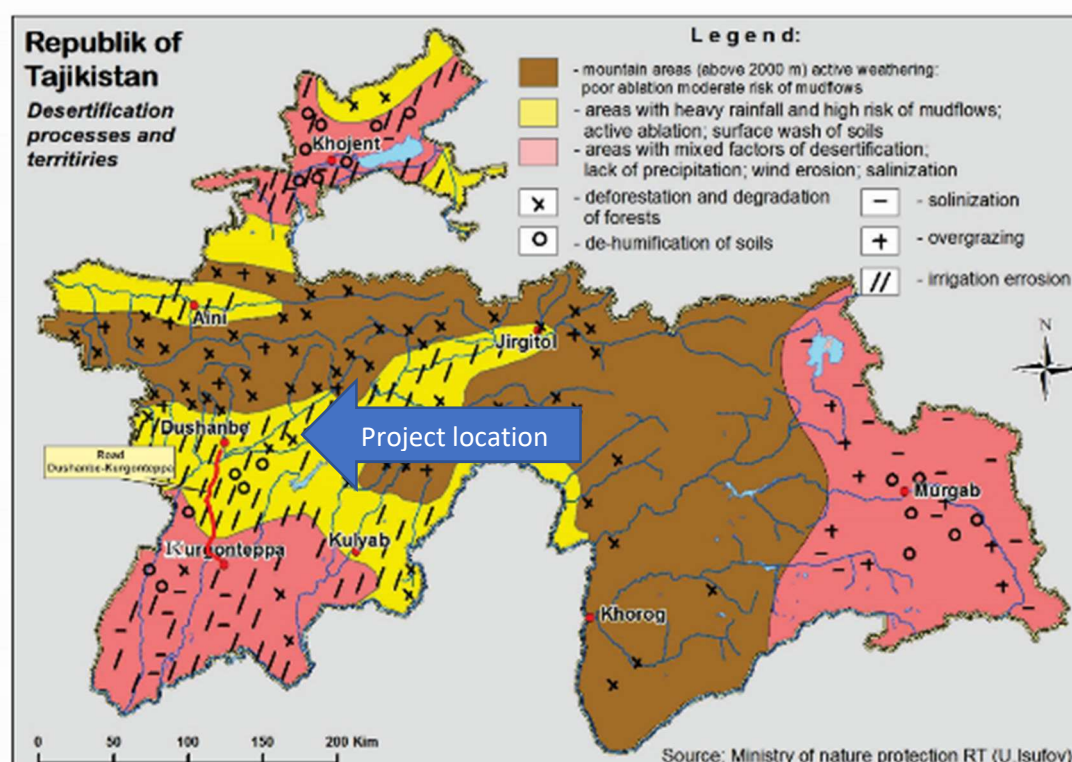
at 10.0 m (Bridge 9 – based on Soviet era survey), and between 2.0 and 4.7 m at Bridges 11 and 12.

176. Brief descriptions of localised soil outcrops at river crossings along the alignment are also provided in Section 5.7.1.2.

### 5.3.3 Desertification

177. Soil erosion is a key problem for Tajikistan. Erosion is a widespread natural phenomenon due to the country's topography and climate, but is exacerbated by weak management practices such as: grazing on steep mountain slopes, over-felling of forests and shrubs, forest degradation, overgrazing and inadequate irrigation. Soil erosion in the Project area has had a notable impact on the parts of the road that were constructed in the soviet era.
178. The two main factors causing soil degradation in the project area are wind and water flowing over slopes, creating gullies that accelerate the erosion process. Anthropogenic factors have accelerated this erosion through intensive agricultural development on road slopes and unsustainable crop cultivation practices.
179. While natural factors contribute to soil erosion, unsustainable human behaviour has accelerated the process to an unacceptable degree: it is estimated that 97% of agricultural land in Tajikistan has some level of erosion. Land degradation caused by erosion from overgrazing affects about 3 million hectares of land or 85% of pastures (Asian Development Bank, 2004). In addition, excessive use of pesticides and fertilizers has led to pollution of the soil and watercourses.
180. Since the 1930s, intensive development of foothill valleys and flood zones has occurred to increase the area of arable land. Up to 100 thousand hectares of flood zones, pistachio trees and partially deciduous forests were destroyed in the process of land development. During the economic and energy crises in the 1990s, juniper forests were cut down. Deforestation and reduction of pastures of animals, forests had a negative impact on the quality and diversity of forests, and the natural renewal of forests has almost stopped.
181. In the zone of influence of the project, in the Komsomolabad, Mujiharf, Khakimi, Safedchashma jamoats, intense erosion processes (water erosion, gully) are strongly observed. Figure 19 shows the extent of desertification in Tajikistan and the location of the project in context. It shows it is located in an area with heavy rainfall and high risk of mudflows, which is also subject to irrigation erosion and degradation of forests. In the Project area, erosion effects are managed at a local level in all jamoats.

Figure 19: The Process of Desertification in Tajikistan



Source: Tajikgeodesy

182. The widespread degradation of land resources in Tajikistan will increase the susceptibility of land to the effects of climate change, as set out in Section 5.5.

#### 5.3.4 Contamination

183. No investigations for soil and/or groundwater contamination are known to have been conducted in the vicinity of the alignment. However, given the generally remote and undeveloped location of the area around the alignment, the potential for existing contamination is considered to be low. There is potential for residual contamination (e.g. from fuels and hydrocarbons) associated with the original works for construction of the alignment in the 1980s. However, if present, this would be anticipated to be localized and is likely to have substantially degraded since that time.

### 5.4 Climate

#### 5.4.1 Climate – Tajikistan<sup>39</sup>

184. The climate of Tajikistan is continental, influenced by its position in Central Asia at the border between the subtropical and temperate climatic zones. The main features of Tajikistan's climate are: high solar radiation, low cloudiness, long sunshine hours, rapid changes of daily and seasonal air temperatures, uneven distribution of precipitation during a year, and high dust content in the air.

185. In the mountain regions of Tajikistan there are glaciers covering a total area of 8,400 km<sup>2</sup> (which is ca 6% of the country's area). An ongoing decrease in the country's

<sup>39</sup> Information taken from Technical Assessment Report (Working Draft 1) Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project, Mott MacDonald, 31 May 2019

glacial area and volume has been observed. The road alignment is generally between 1300 m and 1600 m asl.

186. In the cold part of a year there is a polar front over Tajikistan. The weather is affected by dry and cold air masses moving from the Siberian anticyclone and meeting the damp warm air from the Atlantic Ocean in the form of cyclones.
187. Annual mean temperature in the south is +17°C, in the Pamirs it reaches -6°C.
188. Maximum air temperature can reach +47°C on the south; the lowest temperature can reach - 63°C in the Eastern Pamirs.
189. Precipitation is distributed unevenly both temporally and spatially. Annual rainfall is 400-1,200 mm in the west of Tajikistan. The highest totals are measured at the Fedchenko Glacier (more than 2,000 mm per year).
190. Areas up to 1,000 m asl are characterized by a warm summer with an average temperature of 30°C, and in the months of June–September there is little precipitation. For the mountain ridges of Central Tajikistan and the Western Pamirs, a mild climate is typical: the summer is cooler, winter is cold, and there is high precipitation during the winter season.
191. Mean annual wind speed can vary between 0.8 to 6.0 m/sec. Wind direction and speed greatly depends on the atmospheric circulation and landscape. The strongest winds blow in highland areas (e.g. Fedchenko Glacier in the Central Pamirs) and in the areas where landscape results in the convergence of air flows (Khujand, Fayzabad). Mean annual wind speed in these areas can reach 5-6 m/sec.
192. Additionally, frontal sandstorms that accompany cold-wave intrusions, rush upwards along the valleys of Kafirnigan and Vakhsh. At the same time a strong wind (18-20 m/sec) along with sandstorm blow for several hours. The biggest number of days with sandstorms is observed in the south of the country and reaches 14 days a year.

#### 5.4.2 Climate – Project Area

193. The Obigarm-Nurabad road project corridor, 72 km to 158 km is served by two meteorological stations<sup>40</sup>:

- Weather station Bostanabad located on the eastern part of Faizabad district;
- Weather station Nurabad, located in Nurabad district.

##### 5.4.2.1 Bostanabad Weather Station

194. The station is located between the Karategin Range to the north-west and the Vakhsh Range to the south-east in the Faizabad district. The height of the station is 1,964 m above sea level.
195. The territory of Bostanabad located in an area of low humidity with warm summers and moderately mild winters.
196. The average annual temperature is 7.6 °C.
197. The frost-free period lasts on average 252 days per year.
198. The average temperature of the coldest month (January) is -4.8°C. The average minimum air temperature is -8.50°C, but with the invasion of large cold air masses it

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<sup>40</sup> Location information taken from [https://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/documents/5th\\_meeting\\_program\\_presentation/CountryReport/Tajikistan.pdf](https://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/documents/5th_meeting_program_presentation/CountryReport/Tajikistan.pdf)

can be reduced to -25 to -28°C. At the same time during the day the air in the winter months on some days can warm up to 9-15°C.

199. The average temperature of the warmest month (July) is 20°C. In the hottest months, in the daytime the air warms up to 25-30°C, and the absolute maximum is 33°C. At the same time, if the average minimum temperature in the summer months is 12-15°C, and in the coldest years on some days it can fall at night to 0-5°C.
200. The average annual rainfall is 679 mm. The Bostanabad characteristic annual pattern of precipitation is a maximum in March-April and almost complete absence in August-September. Its main number 373 mm during the spring period, in the winter months falls 182 mm, 79 mm in autumn, and in summer 45 mm.
201. The average annual relative humidity is 53% and the average monthly humidity ranges from 33-75%
202. Snow cover appears in early October, but constant snow cover is from early November. Average maximum snow depth is 50-70 cm, sometimes reaching up to 100 cm,
203. In the area of Bostanabad the predominant wind direction is north-west (57% of the total number of cases). The average monthly wind speed ranges from 4-4.2 m/sec in the warm season to 5.2-5.8 m / sec in the cold season. The maximum wind speed recorded annually is 18 m/sec.
204. There are ice-frost phenomena: ice, frost, sleet, with up to 30 days per year where icing of all kinds occurs.

#### 5.4.2.2 Nurabad Weather Station

205. Nurabad weather station is located in the eastern part of the Kuhistan mountain system. The height of the station is 1,258 m above sea level. The station serves the entire territory of Nurabad district. The location of Nurabad weather station is shown on Figure 20.

Figure 20: Nurabad Weather Station



Source: Tajik Meteorological Service

206. The station is located in the spurs of the south-eastern slopes of the Karategin Range, in the valley of the Vakhsh river. The terrain is mountainous. The height of the mountains exceed 2,000 m. The width of the valley near the station is 3-4 km and quite heavily terraced. The Vakhsh river flows 2 km to the south.

207. The climate is dry, with warm summers and moderately mild winters.

208. Weather data for Nurabad was provided by Agency for Hydrometeorology under the Committee on Environmental Protection (Tajik Meteorological Service). Temperature and precipitation data are presented in Table 16.

Table 16: Nurabad Weather Station Temperature and Precipitation Data

Month	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Average air temp °C	-3	-1.7	4.6	12.2	16.1	21.1	24.4	24.6	20.0	13.0	6.8	0.9	11.6
Average precipitation, mm	90.1	113.2	165.2	133.8	112.6	30.9	17.5	5.9	8.5	58.4	57.7	90.4	884.2

Source: Tajik Meteorological Service

209. Snow cover appears in November and disappears in February / March. Average maximum snow depth is 22 cm, sometimes reaching up to 90 cm.

210. In the area of Nurabad, winds of the northern and north-eastern directions prevail. The probability of maximum wind speeds is presented in Table 17.

Table 17: Nurabad Weather Station Wind Speed Data

Wind speed (m/s) recurrence once in				
1 year	5 years	10 years	15 years	20 years
18	22	24	25	28

Source: Tajik Meteorological Service

## 5.5 Climate Change

211. Climate change has been identified as an increasing threat to the environment in Tajikistan. The greatest concern is the increase in air temperature, which would lead to serious consequences in relation to glacial and water resources.

212. The World Bank Climate Change Knowledge Portal provides the following climate trends for Tajikistan<sup>41</sup>:

Temperature:

- The temperature of the above-ground air rises in most areas.
- Since 1940, the mean annual temperature has increased by 0.3-1.2°C, with an average of 0.1-0.2°C per decade.
- The minimum mean temperature has also increased by 0.5-2.0°C, with some exceptions in high mountainous areas, where it has dropped by 0.1°C. Smaller temperature increases have been noticed in higher altitudes and larger increases in lower altitudes.
- Urbanisation has caused the near surface area temperature of large cities to increase by 1.2-1.9°C.
- The number of days with temperatures equal to 40°C or over has increased in the flattest areas of Tajikistan.

<sup>41</sup> <https://climateknowledgeportal.worldbank.org/country/tajikistan>



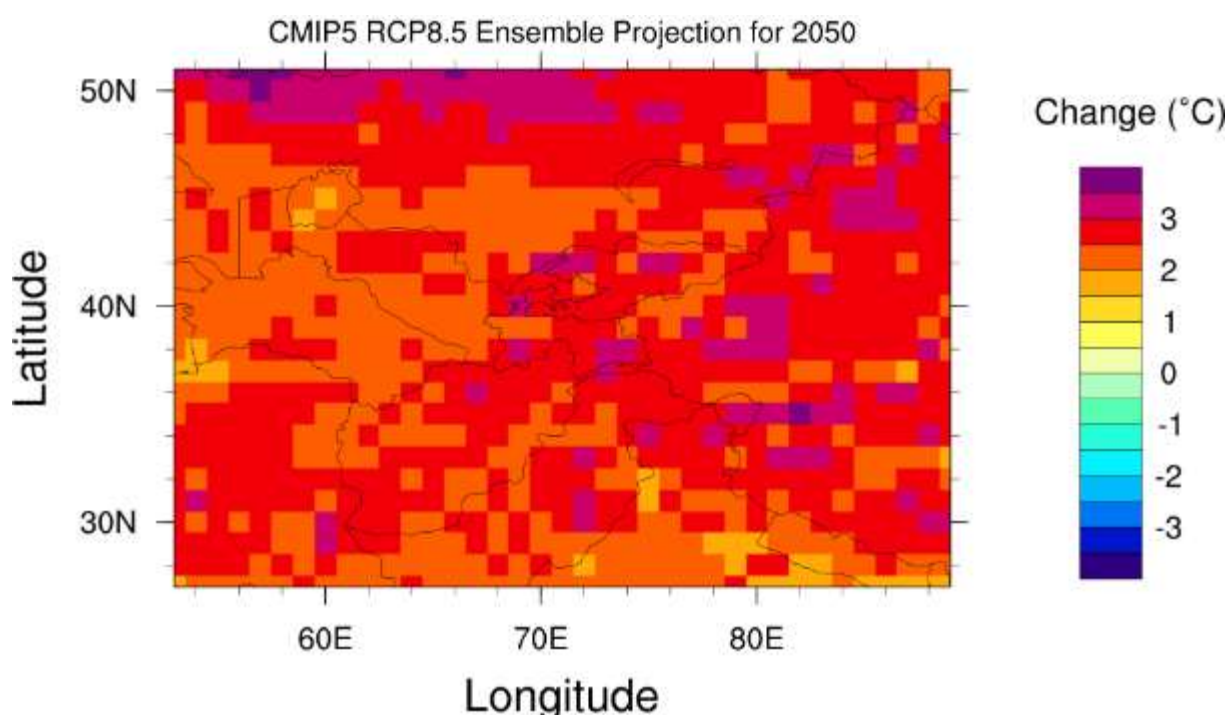
#### Precipitation:

- The mean annual precipitation is projected to decrease by 5% (see Figure 23)<sup>42</sup>.
- In December, January, February and March, April, May the precipitation is projected to decrease by 2% and 5% respectively by 2050.
- In June, July, August precipitation and September, October, November precipitation is projected to increase by 1% and 4%, respectively.
- Dry days are projected to increase by approximately 3 days by 2050.
- Winters are projected to be drier and summers wetter. This could result in both increased floods and droughts.

213. The following key climate projections are concluded:

- Mean annual temperature will rise by 2.7°C in 2050 (Representative Concentration Pathway (RCP) 8.5, High Emission) (see Figure 21 and Figure 22);
- Mean annual precipitation will rise by 18.1mm in 2050 (RCP 8.5, High Emission);
- Annual accumulated cooling degrees of temperature above 18°C will rise by 261.6°C in 2050. (RCP 8.5, High Emission); and
- Total annual hot days of temperature above 35°C will rise by 8.5 days in 2050 (RCP 8.5, High Emission).

Figure 21: Map of the annual mean temperature change for 2050

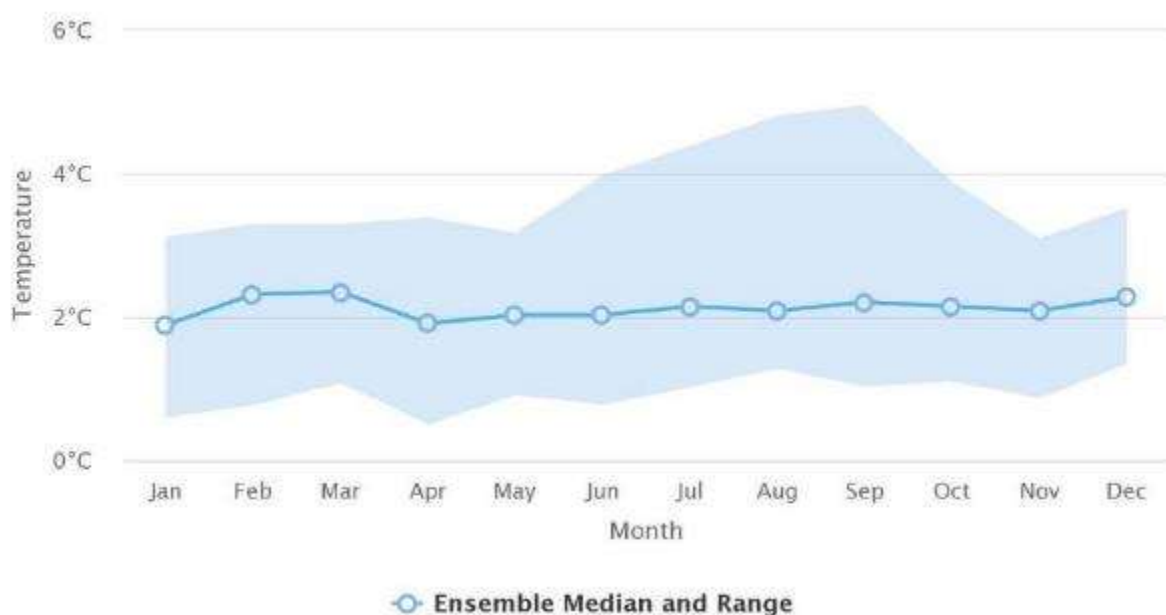


Source: Climate Change Knowledge Portal, <https://climateknowledgeportal.worldbank.org/country/tajikistan>

<sup>42</sup> The estimate is in contradiction with the information on the much higher 20% increase in precipitation contained in the document No 37.6 pursuant to Appendix A (*Document Register*) to this Report titled "The reply to Mr. Ed Vowles on the likely impact of climate change on road and bridge construction" given by the ADB climate change experts which predict an increase in precipitation of 20% which used a generalized assumption for the entire territory of Central Asia.

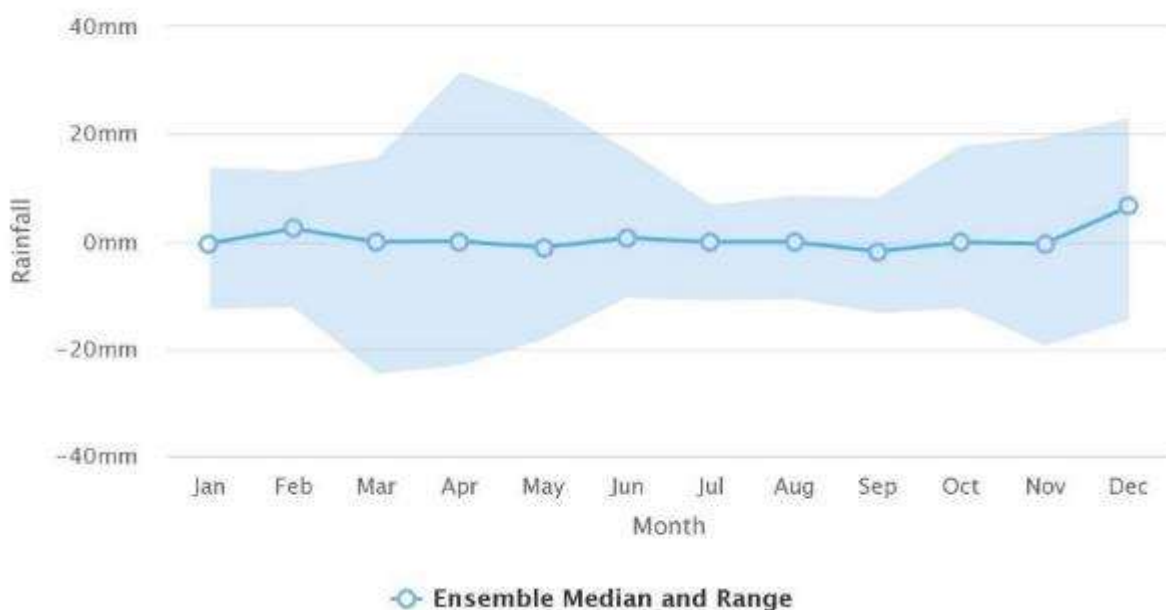


Figure 22: Projected change in monthly temperature for Tajikistan for 2040-2059



Source: Climate Change Knowledge Portal, <https://climateknowledgeportal.worldbank.org/country/tajikistan>

Figure 23: Projected change in monthly precipitation for Tajikistan for 2050



Source: Climate Change Knowledge Portal, <https://climateknowledgeportal.worldbank.org/country/tajikistan>

214. In addition to changing temperature and precipitation<sup>43</sup>, it is anticipated that there will be more extreme intensities, such as extreme temperatures, isolated abnormal

<sup>43</sup> For example, projected changes in temperature could decrease water levels in reservoirs, water reserves of glaciers and reduce the amount of snow cover in the mountains.

precipitation<sup>44</sup>, and prolonged droughts. These factors are particularly relevant for transport infrastructure structures with a long lifetime, such as bridges and tunnels.

215. The key climatic hazards are anticipated to be:

- Temperature (extreme high temperature) / heat stress - Higher temperature fluctuations. The projected average temperature may also increase average moisture levels in the Project Area;
- Precipitation (intense) / avalanches, mudslides, landslides, rock falls, floods and mudflows: Higher and more intense precipitation (torrential rains) and higher flows in rivers which may result in a greater risk of flash floods, and associated mudflows. This will also cause more intense erosion and a higher risk of mudslides and landslides, both in terms of their occurrence and harmful effects;
- Glaciers and snow / ongoing glacial melt, snow accumulation and melt (rapid snow melting may also cause landslides) - As winters are projected to be drier and summers wetter, this could result in increased floods in summer when the river flows are higher and droughts in winter, when river flows are lower; and
- Wind: Higher wind speed and gusts of wind, in particular around the new Rogun HPP Reservoir.

## 5.6 Greenhouse Gas Emissions

216. Since 2010 coal production has increased as a measure to address seasonal energy shortages and as a substitute for gas imports, which are often problematic. This coping strategy could lead to an increase in carbon emissions in the near future. From an environmental point of view, this is not ideal, however, a strong electricity deficit in the country, given population growth, will slow the pace of development and thus the ability to eliminate poverty.

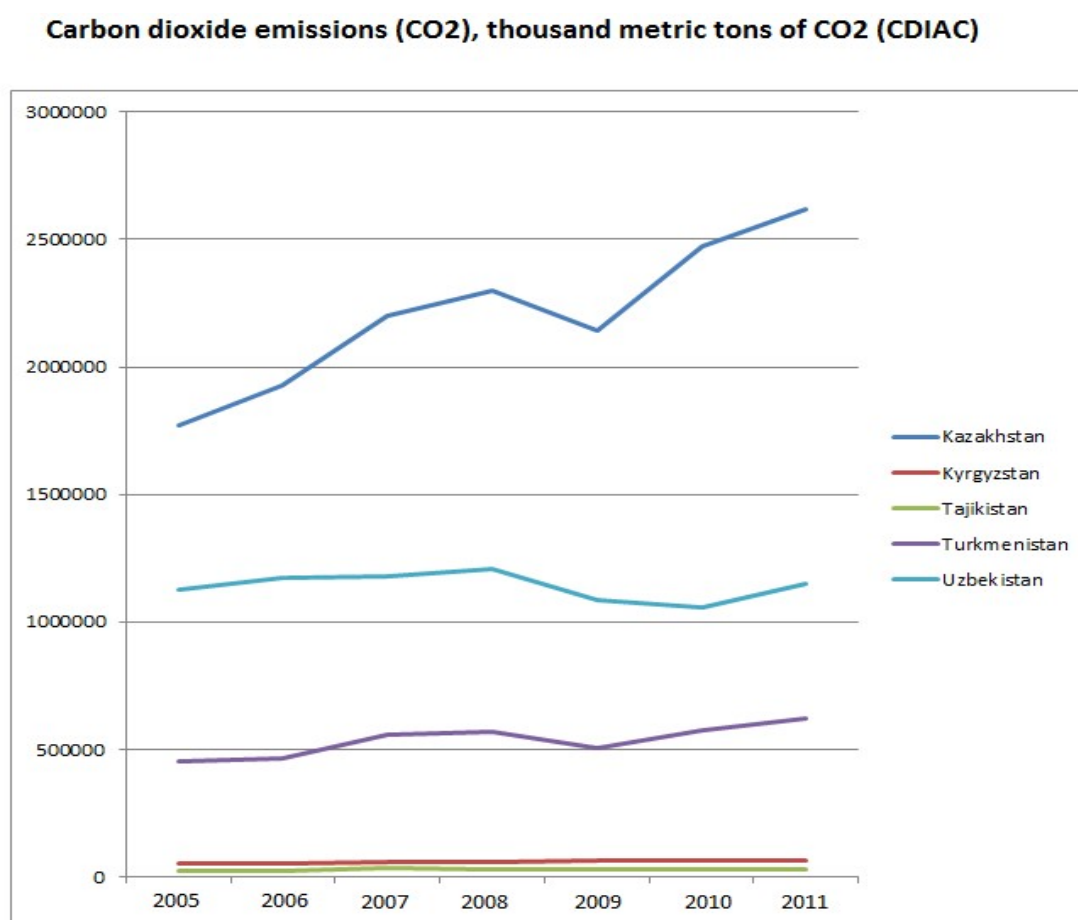
217. In order to implement the United Nations Framework Convention on Climate Change (UNFCCC) commitments and strengthen measures for climate protection and adaptation, three national Communications on climate change have been issued in Tajikistan. Tajikistan is a pioneer in the preparation of a National action plan for climate change mitigation (2003), within its territory. The plan includes adaptation measures, many of which are being implemented and recommendations are being developed based on an updated National Action Plan.

218. Tajikistan's contribution to carbon emissions in Central Asia is currently low, (see Figure 24). Despite the fact that the country does not have quantitative characteristics of the commitments of the UNFCCC to reduce emissions, the current level of emissions compared to 1990, decreased by one third, mainly due to the collapse of the Soviet Union and the structural changes resulting from the transition to a market economy and independence of the country. During the last decade, the level of carbon dioxide remains quite stable, but in the current decade emissions are expected to increase.

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<sup>44</sup> For example, the increase in intensity of precipitation will aggravate mudflow, landslides and avalanches.

Figure 24: Carbon Dioxide Emissions by Countries throughout the region



Source: Carbon Information Analytical Centre as quoted on the web page: <http://mdgs.un.org/>

219. From the late 1990s to the present, agriculture has been the main source of greenhouse gas emissions in Tajikistan. Given the low level of mechanization, under-feeding of livestock, as well as the limited use of fertilizers, emissions from the agricultural sector of Tajikistan are lower than in other Asian and European countries. The potential for any substantial reduction in agricultural carbon emissions is therefore limited, while other measures of economic sub-industries are promising, especially in energy and industry.

## 5.7 Natural Hazards

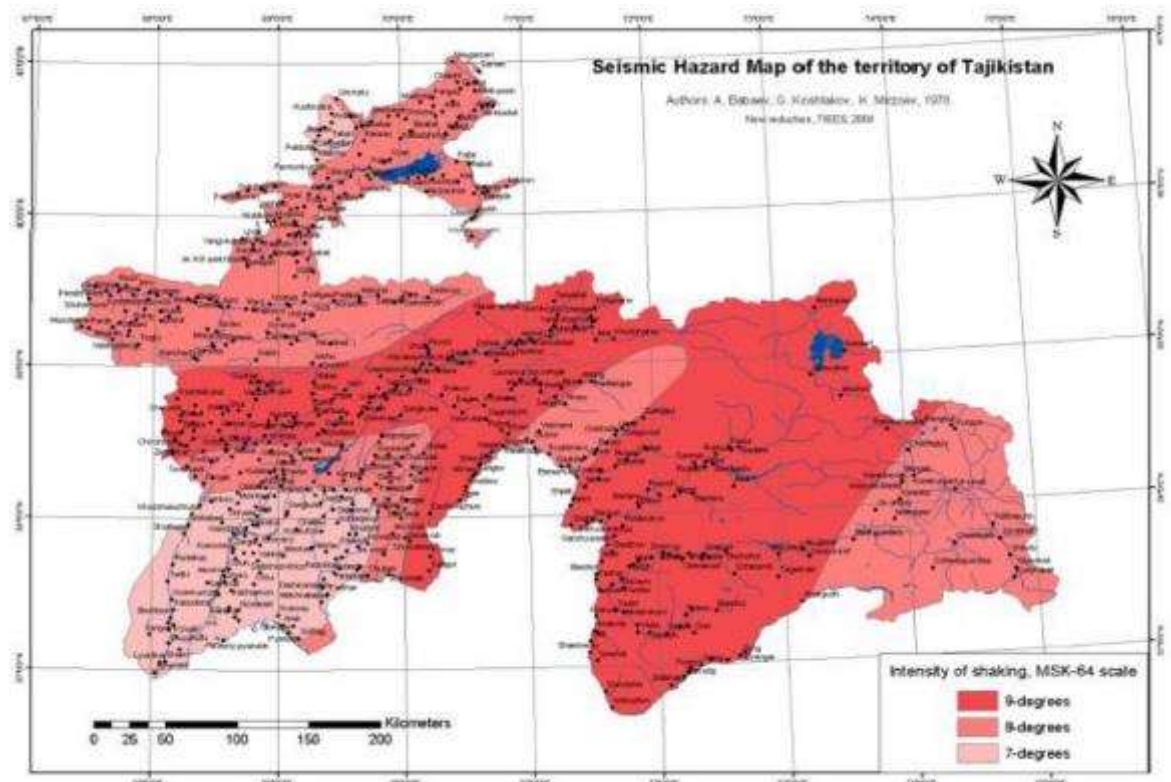
### 5.7.1.1 Seismic Conditions<sup>45</sup>

220. Tajikistan has a relatively high seismic potential due to the active tectonic structure and its location within the thrusting tectonic border between the Indian and Eurasian plates. From a seismological point of view, the project road is located in the zone of 9-magnitude earthquakes on the Medvedev–Sponheuer–Karnik (MSK-64) scale (see Figure 25). The region is seismically active and categorised as a very high seismic hazard zone of  $PGA > 0.4g$ . This seismic hazard is due to tectonic zones and is confirmed by a long history of earthquake events in the last centuries.

<sup>45</sup> Information taken from Technical Assessment Report (Working Draft 1) Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project, Mott MacDonald, 31 May 2019; and

<sup>45</sup> Avtostrada Report Ref 16-16-AS.T03-CS-EN, 2017

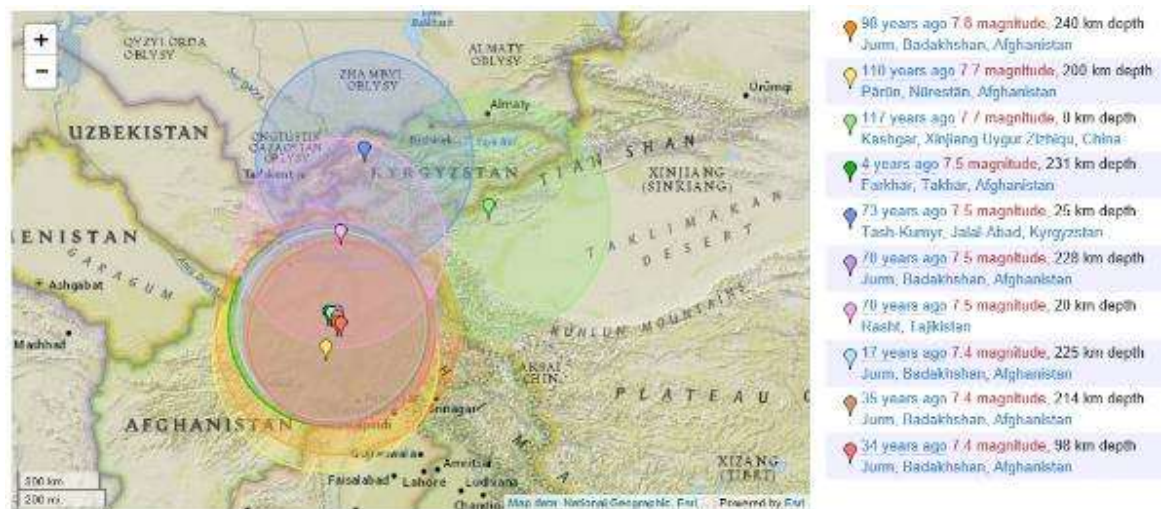
Figure 25: Seismic Conditions in Tajikistan



Source: A.M. Babayev, T.A. Kinyapina, K.M. Mirzoev, R.S. Mikhailova and G.V. Koshlakov, 1978

221. The epicentres of the earthquakes indicate two active tectonic lines as visible on next two maps. The first line (largest earthquakes) goes roughly in North – South direction and is close to the Road alignment (see Figure 26).

Figure 26: Historical large earthquakes in wider Central Asian region



Source: <https://earthquaketrack.com/p/tajikistan/biggest>

222. The second line goes in a northeast – southwest direction. It is located in the area where the Rasht earthquakes took place: the first one 70 years ago with the magnitude of 7.5 and the second one 112 years ago with the magnitude of 7.4 (see Figure 27).



Figure 27: Historical large earthquakes in Tajikistan



Source: <https://earthquaketrack.com/p/tajikistan/biggest>

223. The epicentres of these huge earthquakes are geographically close to the Project Area. In general, there are some natural periods between large quakes in the area; it is far from being precise but could be accepted as an indication of an increased risk. If the period between these two last earthquakes was 42 years and the time since the last one is 70 years, one can estimate a new earthquake is likely in the near future.
224. The territory of Tajikistan is still seismically active, and from January – May 2019, 9 earthquakes with magnitude above 4 were recorded.

Figure 28: Significant earthquakes with magnitude above 4 in Tajikistan in 2019



Source: <https://earthquaketrack.com/tj-00-rasht/recent>

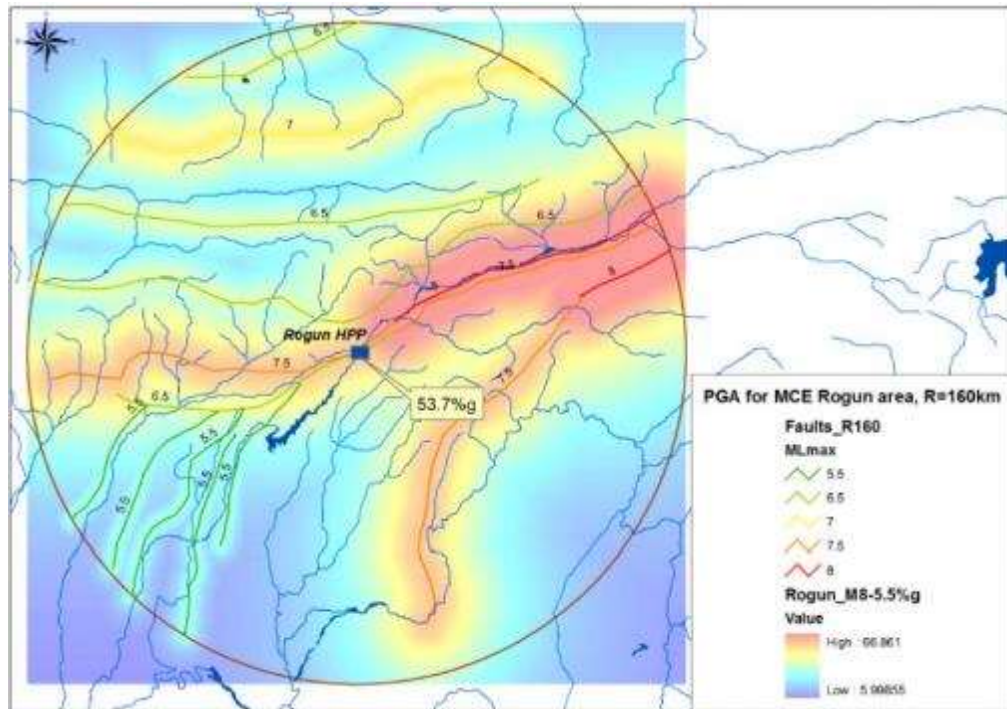
225. Engineering geological surveys<sup>46</sup> conducted by Avtostrada for the Tagikamar Tunnel indicate that the Vakhsh fault is located 8.0-8.1 km south of the tunnel and belongs to the active Holocene faults with a seismogenic structure of moment magnitude (Mw) 7.9-8.5. The estimated peak ground acceleration is 0.50 g (taking into account

<sup>46</sup> Avtostrada Report Ref 16-16-AS.T03-CS-EN, 2017

the 10 % probability of exceeding every 50 years). Figure 29 shows the seismic hazards in the project area.

226. In the zone of the tunnel, faults have been found that have radial cracks that intersect the axis of the tunnel, the main effect is caused by the surrounding rock and abundant infiltration of water.

Figure 29: Assessment of the seismic hazard of the construction area in units of maximum peak ground acceleration (PGA)



Source: Avtostrada Engineering Geological Survey (Tajikamar Tunnel) 2017

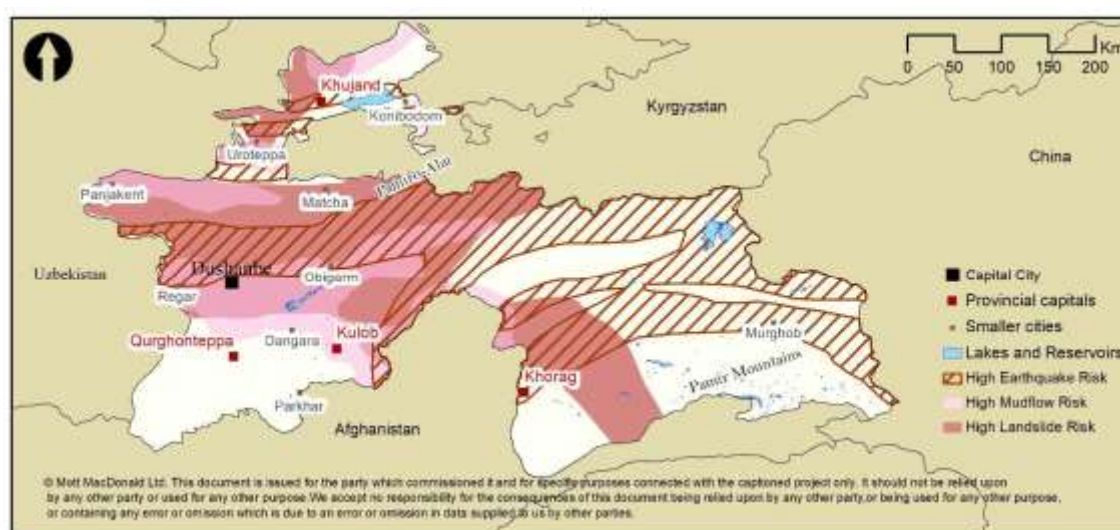
#### 5.7.1.2 Landslides, Mudflows and Floods

227. In the 1990s, about 50,000 landslides were recorded throughout the country, including seismically hazardous and non-hazardous areas, with the highest concentration occurring in the western and central parts of the country. Landslides as a result of earthquakes are caused by strong earthquakes, and they are much more powerful than landslides of other origin.
228. Figure 30 below shows areas most frequented by different types of seismological natural hazards. The most at risk region in Tajikistan is located in the west-central and northern parts of the country, including a broad belt extending from the western boundary through the capital Dushanbe towards the northeast, and including parts of the project area.<sup>47</sup>

<sup>47</sup> Country Note on Tajikistan (Final) Assessment of Risks to Transport Infrastructure of Climate Change in Central Asia, Mott MacDonald, 21 August 2018



Figure 30: Seismological natural hazards areas in Tajikistan



Source: Country Note on Tajikistan (Final) Assessment of Risks to Transport Infrastructure of Climate Change in Central Asia, Mott MacDonald, 21 August 2018

229. The Avtostrada Engineering Geology Surveys indicate that landslides of various types occur in the Project area. Landslides in bedrock are generally shallow but can cover a large area. The largest of them are confined to tectonic zones. Landslides are often flooded and on outlets of underground waters such as springs.

230. Landslides with fatalities have occurred, notably:

- Chainage 43+30-45+60 – In 1990 there was a slope slipping due to provocation by slope cutting
- Chainage 371+65-391+00 – In 1992, an active occurrence of a landslide with casualties among the population of a nearby village. Further activation of the landslide is possible. The slip step height is 18 m. The whole body of landslide is permeated by springs of underground action

231. Landslides of a complex type are also known in the area, either due to merging of old landslides, compounded types of displacement (e.g. a rockfall that falls into a landslide area), or ancient landslides the type of displacement of which cannot be currently determined. The surface of landslide bodies is diverse. The slip steps are clear. In the landslide bodies are often outlets of groundwater. The reason for the formation of these landslides is difficult to estimate.

232. Mudflow forming factors in the area are as follows:

- availability of steep-sided terrain with large slopes of riverbeds;
- large reserves of loose material on the slopes and river beds;
- significant rainfall in the spring; and
- all the rivers and gullies in the project road construction section are at risk of mudflows.

233. The Avtostrada Engineering Geology Surveys<sup>48</sup> identified locations along the route where there is potential for dangerous geological processes (landslides and mudslides). These are presented in Chapter 11 (Annex 3).
234. The Engineering Geology Surveys for Bridges 9, 11, 12 and 13<sup>49</sup> identified the following:
- Landslide processes appear at the site of Bridge 13 over the Kalod River. The pillars on the left, right banks and in the bed of the river are on the path of the mudflow of mud.
  - At the construction sites of Tegirmi-1 and Tegirmi-2 (Bridges 11 & 12), there are numerous outlets of springs. These locations are boggy, and standing water was present during the surveys.
  - On the left bank of Bridge 9 over the Mirzosharifon River, loam overburden deposits on a rocky foundation can slide onto the designed road.
235. The hydrology reports developed for Avtostrada<sup>50</sup> note the following with regards to mudslides along the alignment:
- Kandak / Guliston River – Bridge 1 – Erosion processes are mainly represented by earthflows, as well as landslides on the lower parts of the valley slopes. The existing bridge crosses the middle part of the river and the main supplier of solid material that provokes the formation of mudflows is the right slope and landslides.
  - Gazakiyon River – Bridge 2 – The slopes of the valley are steep, dissected by small gullies and erosion depths that form a debris cone as a result of avalanche and mudflow activities. These cones are the main source of solid material to the Gazakiyon River. Solid material, randomly deposited, form ridges characteristic of the mud deposits.
  - The Hakimi River – Bridge 5 – The main source of solid material, the accumulation of which provokes mudslides, is the lateral tributaries. Slope landslides block the river, creating a sub-reservoir which breakthrough resulting in significant material movement. The channel on the bridge section is weakly sinuous, with boulder-pebble material deposited on the extended sections, forming powerful ridges that prevent the passage of mudflow floods.
  - Tagikamar River – Bridge 6 – The surface of the catchment area is significantly eroded. The presence of sharp turns, landslides create conditions for mudflows. A powerful mud-stone flow in August 1961, formed after a landslide, destroyed the houses and gardens of Leiron village.
  - Chepakdara River – Bridge 7 – In the channel there are traces of small ridges of accumulations of channel sediments, which indicate the passage of mudslides along the river.

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<sup>48</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 424+80 To Chainage 759+14: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018; and Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 0 to Chainage 424+80: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018

<sup>49</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridges Nos 9, 11, 12, 13: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-EG-T, Dushanbe, 2018

<sup>50</sup> Report Reference 16-16-EGI (in 2 parts), undated

- Mujikharv River – Bridge 8 – The tributaries of the river are mudflows and almost all form debris cones from weakly bound rubble and boulder. With the passage of floods along the main river, the cone is easily eroded and can collapse into large channels in large blocks, replenishing the solid phase of the stream. With the passage of mudflows, tributaries directly deliver solid material to the mainstream. Frequency of passage along the river of powerful mudflows every 7-10 years. Of the intersected water courses, the Mudzhikharv River has the most mudslides.
- Tegermi River – Bridges 11 and 12 – An extreme mudflow event along the river occurred on the 6<sup>th</sup> June 1990 with a height of about 7 m and hit the village and causes significant damage to the upper parts. In the lower part, due to the expansion of the riverbed, the mudflow spread and caused silt deposits within the houses. The collapse is understood to have occurred in the upper reaches of the river, which blocked the narrow channel of the river, which led to a further breakthrough of the blockage. It is thought that significant damage could have been avoided if the restricted area had been observed by the residents, and housing was not built as close as it was to the river. The crowding of the buildings also caused channelling of mudflow which increased its power. The large-scale destruction caused is believed to be more of a result of unsuitable positioning of properties as opposed to the power of the mudflow itself.

236. Floods are probably the most frequent natural hazard within Tajik territory. Floods caused by snow and glacier thawing and late spring-summer heavy rains happen annually with increasing frequency. The regions around foothills, surrounding large rivers and lowlands are most prone to floods.

237. In Tajikistan, floods and associated debris flows are caused by intense rainfall greater than 20 mm per day. Debris flows most commonly occur in mountainous regions and foothills at altitudes usually up to 2,000 m asl. Debris flows are often generated in April-June in the snow-rain along with snow-glacier river watersheds. The latter have a shorter duration but cause great damage.

## 5.8 Noise and Vibration

### 5.8.1 Noise

238. The project road crosses a mountainous landscape, with small villages along the alignment. The project corridor does not have industrial sources of noise pollution, vehicle movements are rare and the noise environment is quiet, typical of a sparsely inhabited, rural upland area.
239. Villages on the alignment contain, residential buildings, schools and places of worship (mosques) that are particularly sensitive to noise pollution.
240. To determine actual conditions on the alignment, physical monitoring of the ambient noise has been conducted as part of this study. Site visits carried out in August and November 2018 had determined that the alignment was free from any sources of industrial pollution and that vehicle were almost absent from the alignment. The noise environment appeared homogeneous along the alignment. The only pollution sources were from villages on the alignment with limited noise.
241. To characterise the alignment noise environment, monitoring stations were identified.
- At the suburban areas close to Obigarm (Kandak)
  - At the suburban areas close to new town development at Darabad; and
  - Five intermediate points where there was a concentration of development – all in river valleys.
242. Sensitive sites along the alignment were identified, and ambient baseline monitoring was undertaken at these locations from 03 to 10 October 2018 :
- Jamoat Obigarm, Gurun village, school number 6;
  - Jamoat Sicharog, kishlak Lugur, 200 m from the alignment;
  - Khamimi Jamoat, Sadokat kishlak, 800 m from the alignment;
  - Jamoat Mudzhikharf, kishlak Mudzhikharf, 300 m from the bridge under construction number 8;
  - Jamoat Komsomolabad, Tutkhor village, 150 from the alignment;
  - Safedchashma Jamoat (Samsolik), Safedchashma kishlak, 100 m from the alignment; and;
  - The urban-settlement of Darband, at the eastern end of the alignment.

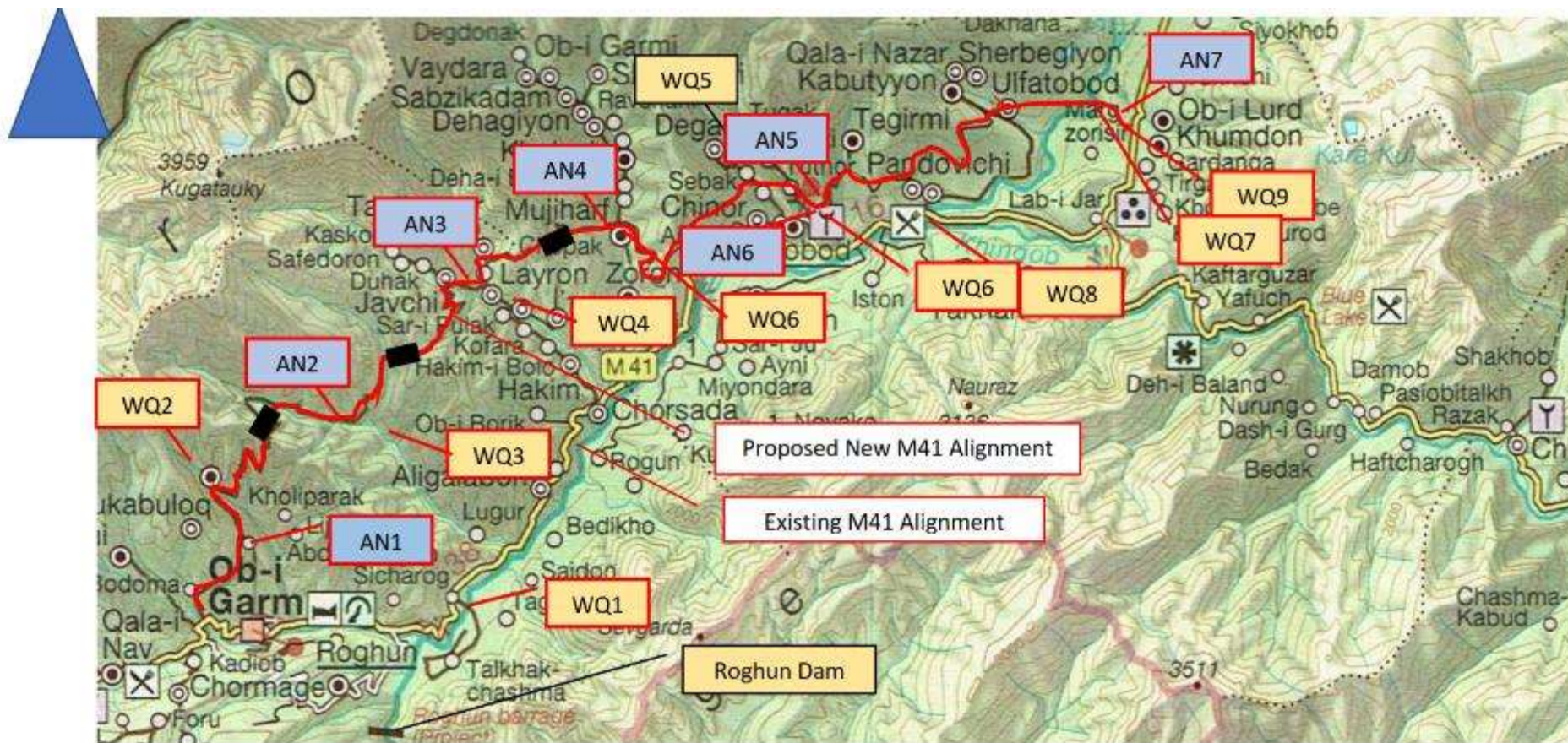
Table 18: Ambient Noise Monitoring Locations

No	Measurement points	Latitude	Longitude	Elevation, m
AN1	Near school №6 Gurun village	38°45'12.55"	69°42'8.25"	1778
AN2	Lugur	38°47'42.32"	69°45'3.43"	1641
AN3	Hakimi settlement Sadokat	38°50'35.77"	69°48'50.03"	1415
AN4	Mujikharf	38°51'59.41"	69°52'44.51"	1335
AN5	Komsomolabad, village Tutkhor	38°52'45.72"	69°57'45.82"	1333
AN6	Safedchashma	38°52'38.97"	69°57'40.89"	1459
AN7	Urban village Darband, 7 mkr	38°54'38.73"	70° 7'15.63"	1383

243. The location of the air quality monitoring points is shown on Figure 31.



Figure 31: Locations on Alignment of Noise, Air & Water Quality monitoring stations



Source: Southern Tajikistan – Tourist Map, Gecko Maps. [www.geckomaps.com](http://www.geckomaps.com)

244. Monitoring was carried out, every 3 hours for 24 hours.

245. The results of the noise level showed, as would be anticipated, that the noise level readings at night are lower than during the day. In the course of field research, 220 noise level measurements were carried out at 7 points. Average daily noise readings are shown in Table 19 and the full data set is presented in Chapter 12 (Annex 4).

Table 19: Results of the Noise Monitoring Exercise

	Location	Tajik Standards (dB(A))		Daily Average			Notes
		07:00 – 23:00	23:00 – 07:00	Daytime 07:00 to 19:00	Evening 19:00 to 23:00	Nighttime 23:00 to 07:00	
1	Jamoat Obigarm, Gurun village, school #6	55	45	42.3	39.9	38.5	Wind speed 0.8-1.2 m/s
2	Jamoat Sicharog, Lugur village, 200 m far from alignment			41.5	40.7	39.4	Wind speed 1.2-1.5 m/s
3	Jamoat Hakimi, village Sadokat, 800 m far from alignment			45.4	45.3	41.4	Wind speed: calm
4	Jamoat Mujiharf, village Mujiharf, 300 m far from the bridge No.8			47.0	47.6	42.6	Wind speed 1.8-2.3 m/s
5	Jamoat Komsomolabad, village Tutkhor, 150 m far from alignment			51.2	50.9	44.3	Wind speed 1.8-2.1 m / s
6	Jamoat Safedchashma (Samsolik), village Safedchashma, 100 m from alignment			46.3	44.15	44.1	Wind speed 1.5-1.8 m / s
7	Urban village Darband, eastern outskirts, km 152			50.35	56.7	54	Maximum wind speed of 5-7 m/s Note 1 Windspeed exceed allowable

Note 1) Noise monitoring is suspended when windspeed exceeds 5m/sec as the passage of air over the microphone generates "noise".

Note 2) A full set of noise data is included in Annex 5a



Based on the results of the monitoring exercise, the noise levels detected along the project corridor are “unaffected by noise sources”. The maximum of 60 dBA on the eastern outskirts of Darband was recorded at relatively high wind speed (5-7 m / s) and as such has been discounted.

#### 5.8.2 Vibration

2. At the west end of the alignment, close to Obigarm, there are buildings constructed in blockwork, in particular new government buildings e.g. schools at the east end of the alignment there were fewer concrete block buildings and more traditional mud brick construction. At Darabad, the new town at the east end of the alignment buildings were predominantly concrete blockwork. Many of the buildings are constructed within compounds of mud brick, blockwork or steel sheeting. Buildings were casually observed to be in good to fair condition and did not appear to be suffering from surface cracking due to ground settlement / poor foundations.

*Plate 1: Residential building - wood frame mud brick walls and steel roof*



*Plate 2: Buildings in Kandak - west end of the alignment (Nov 2018)*



*Plate 3: Buildings in Kandak are generally set back from the alignment (Nov 18)*



*Plate 4: School Building (no 6) Kandak village (Aug 2018)*



*Plate 5: Wood framed / mud walled building in Kandak (Aug 2018)*



*Plate 6: Blockwork construction in Darabad new-town - east end of alignment (Nov 18)*



## 5.9 Air quality

246. The project road crosses a mountainous landscape, with small villages along the road. The project corridor does not have industrial sources of pollution; therefore, the main source of air pollution in the region is the burning of fossil fuels for heating and cooking. Another source of emissions into the atmosphere can be divided into two categories: exhaust gases from motor vehicles and dust raised by motor vehicles, though site observations in August and September revealed few motorized vehicle movements on the alignment. Foot traffic and donkey carts were observed to be the favoured mode of moving on the alignment at this time.
247. Exhaust emissions to the atmosphere at the current level are relatively low. It should be noted, as shown in Figure 24, that Tajikistan's contribution to carbon dioxide emissions across Central Asia remains negligible. Any increase in emissions from vehicles as a result of operating the of the new alignment is unlikely to notably increase Tajikistan's contribution to emissions across the region.
248. The Law on the Protection of Atmospheric Air establishes the basic principles of the protection and rational use of the atmosphere in the country, economic mechanisms and responsibilities, as well as the directions of activity of state bodies.

Table 20: Tajikistan Air Quality Standards

Pollutant	Tajikistan Standard (mg / m <sup>3</sup> )*
Suspended particles	0.15
Nitrogen oxide (NO)	0.06
Nitrogen dioxide (NO <sub>2</sub> )	0.04
Sulphur dioxide (SO <sub>2</sub> )	0.05
Carbon dioxide (CO <sub>2</sub> )	3.00

\* See Table 7 for comparison between Tajik and international air quality standards

249. To determine actual conditions on the alignment, physical monitoring of the ambient air quality has been conducted as part of this study. Site visits carried out in August and November 2018 had determined that the alignment was free from any sources of industrial pollution and there were very few vehicle using the alignment. The air quality environment appeared homogeneous along the alignment. The only pollution sources were from villages on the alignment with limited air quality impacts from fuel burning.
250. Air Quality baseline monitoring was carried out from 03.10.2018. to 10.10.2018. Six parameters were monitored: Inorganic dust (TSP); nitrogen oxides (NO<sub>2</sub> + NO); Carbon monoxide (CO); Carbon dioxide (CO<sub>2</sub>); and Sulphur dioxide (SO<sub>2</sub>).
251. To characterise the alignment air quality, monitoring stations were identified.
- At the suburban areas close to Obigarm (Kandak)
  - At the suburban areas close to new town development at Darabad; and
  - Five intermediate points where there was a concentration of development – all in river valleys.
252. Sensitive sites along the alignment were identified, and monitoring was undertaken at these locations:
- Jamoat Obigarm, Gurun village, school number 6;
  - Jamoat Sicharog, kishlak Lugur, 200 m from the alignment;



- Khamimi Jamoat, Sadokat kishlak, 800 m from the alignment;
- Jamoat Mudzhikharf, kishlak Mudzhikharf, 300 m from the bridge under construction number 8;
- Jamoat Komsomolabad, Tutkhor village, 150 from the alignment;
- Safedchashma Jamoat (Samsolik), Safedchashma kishlak, 100 m from the alignment;
- The urban- settlement of Darband, eastern suburbs, km 152.

Table 21: Air Quality Monitoring Locations

Nº	Measurement point	Latitude	Longitude	Elevation (m)
AN1	School №6, Gurun village	38°45'12.55"	69°42'8.25"	1,778
AN 2	Lugur	38°47'42.32"	69°45'3.43"	1,641
AN 3	Khakimi s. Sadokat	38°50'35.77"	69°48'50.03"	1,415
AN 4	Mujikharv	38°51'59.41"	69°52'44.51"	1,335
AN 5	Komsomolabad, Tutkhor	38°52'45.72"	69°57'45.82"	1,333
AN 6	Safedchashma	38°52'38.97"	69°57'40.89"	1,459
AN 7	s. Darband	38°54'38.73"	70° 7'15.63"	1,383

253. The location of the air quality monitoring points is shown on Figure 31.

254. The main sources of emissions to the environment in the project area were observed to be from fuel for heating and cooking, and limited vehicle emissions.

255. The results of testing the quality of the atmospheric air for the period from 03 to 10 October 2018 are shown in Table 4-3. Testing times: 02:00, 04:00, 07:00, 10:00, 13:00, 17:00, 20:00, 23:00.

Table 22: Results of Air Quality Monitoring Exercise

#	Parameters	Tajikistan standard (PDK), mg/m <sup>3</sup> *	Baseline indicators		
			Daytime 06:00-12:00	Night time 12:00-05:00	Daily averages
1	Inorganic dust (TSP)	0.15	0.0075	0.0063	0.0069
2	Amount of nitrogen oxides (NO <sub>2</sub> + NO)	0.085	0.0107	0.0056	0.0081
3	Carbon monoxide (CO)	3.0	0.0033	0.0021	0.0027
4	Carbon dioxide (CO <sub>2</sub> )	3900	685,00	346,00	515,00
5	Sulphur dioxide (SO <sub>2</sub> )	0.05	0.0066	0.0056	0.0061

\* See Table 7 for comparison between Tajik and international air quality standards

256. Testing has shown that the concentration of harmful substances at night is relatively lower than during the day, which is likely to be due to fewer vehicle movements and less fuel usage. As can be seen from Table 22, the content of harmful ingredients in the project corridor of the Obigarm-Nurabad road is much lower than the permissible norms (MPC) of the standard of Tajikistan and also the international standards identified in Table 7.

## 5.10 Hydrology and Water Quality

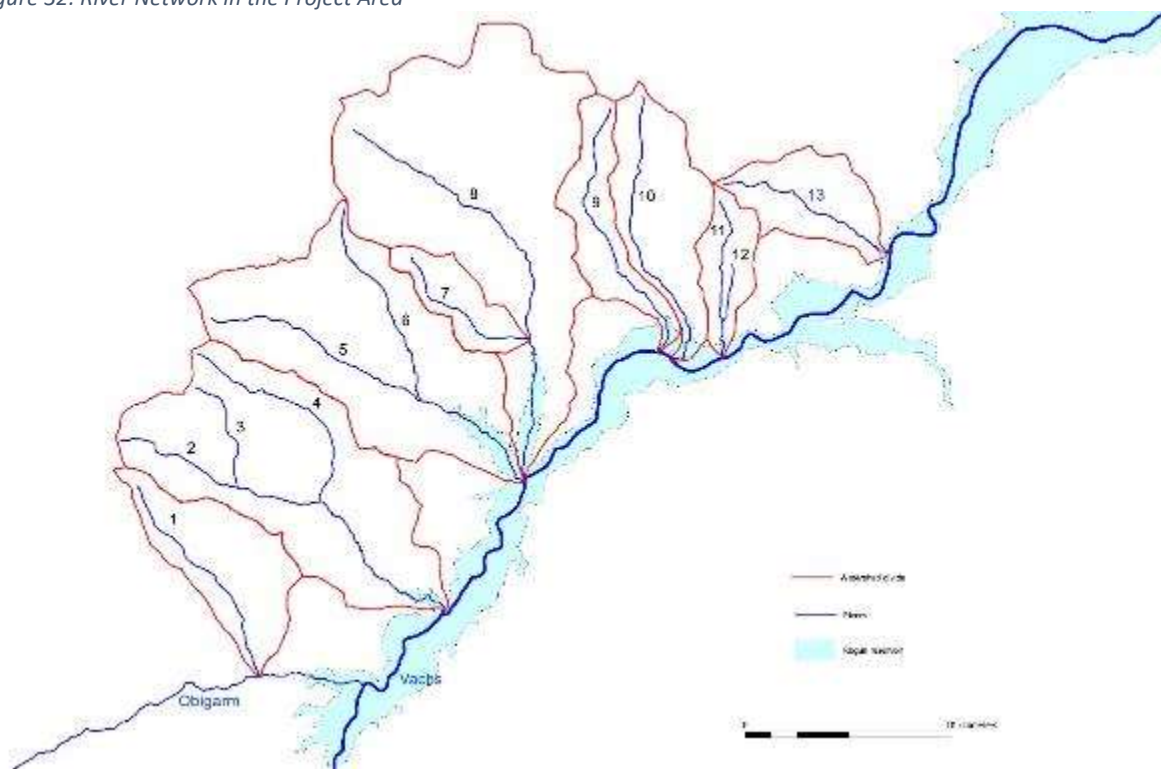
### 5.10.1 Hydrology

257. The entire hydrographic river network in Tajikistan belongs to two basins: the Amu Darya and the Syr Darya. The project road region belongs to the first basin – Amu Darya. The Vakhsh is the main river of the region, downstream of the project area it from the Amu Darya river, which flows into the Aral Sea.
258. The length of the Vakhsh river is 524 km. It is formed by the confluence of the rivers Kyzylsu (in the northern part), originating in the Alai valley of Kyrgyzstan, and the Muksu, originating in the centre of the Pamirs Fedchenko glacier. After the confluence of the rivers Kyzylsu and Muksu form the Surkhob River, which merges with the river Obihingou, called Vakhsh. The Vakhsh is fed by many tributaries, including the: Obi-kabud, Obi-Yasman, Kamarob, Mirzosharipov, Dasht Gorgan, Kalakan, Thermi, Lugur, Hakimi, Mujikharf etc. All these rivers are of a snow-glacial origin and therefore their greatest flows occurs at the end of June-July.
259. The alignment begins after Javoni River, and is located in the mountainous terrain on the northern side of the Vakhsh River valley, crossing the south-eastern and eastern spurs of the Karategin Range. The river network in this part of the Project Area is represented by the main tributaries of Vakhsh River, namely the: Dashtiguron, Mirzosharifon, Mudzhikharv, Hakimi, Tegermi, Kalot and their tributaries - permanent watercourses, and numerous gullies<sup>51</sup>.
260. The tributaries of these rivers are mainly temporary and the perennial flow on individual tributaries in the summer period is due to springs located in their basins.
261. In all the rivers, two periods are clearly distinguished in the annual flow: spring-summer high water and autumn-winter low water with the difference in the regime of the rivers being the predominance of the feed source. The high water flows in the rivers, depending on the altitude, begins in February - March, and ends due to snow cover in July and August. The length of the period of high water flow is approximately from 100 to 200 days, although this also depends on the catchment area. During this time, the majority of the annual runoff flows down the rivers. The highest annual discharges are in April-May and, as a rule, are of rainfall.
262. The main reason for the intense surface runoff and the large maximum discharges in the Project Area, is the intense heavy rainfall or prolonged wide-spread rains, turning into heavy rain.

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<sup>51</sup>Technical Assessment Report (Working Draft 1) Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project, Mott MacDonald, 31 May 2019

Figure 32: River Network in the Project Area



Legend: 1 Daraidegdon, 2 Gazakiyon, 3 Zuriyon, 4 Sebnok, 5 Hakimi, 6 Tagikamar, 7 Chepakdara, 8 Mujikharv, 9 Mirzosharifon, 10 Dastiguron, 11 Tegirmi I, 12 Tegirmi II, 13 Kalot

Source: Technical Assessment Report (Working Draft 1) Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project, Mott MacDonald, 31 May 2019

263. The area of the Surkhob and Vakhsh rivers basin is composed mainly of sedimentary rocks of clay slates with red sandstones.
264. In winter, the river Surkhob and Vakhsh do not freeze over. In general, it has a positive impact on the climate in the region, which is warming and increases the overall humidity. Thus, in winter the banks of the Nurek reservoir do not have snow cover.
265. Hydrology reports developed for Avtostrada<sup>52</sup> indicate that, in all rivers there are two distinct flow patterns; spring - summer high flows and autumn-winter low flows. The high flows start at slightly different times of the year depending on the altitude. The spring season typically starts between February and March in the form of snow fall. The highest flows typically occur in April – May as a result of rainfall. During this period, the risk of mudflows is increased. The minimum flow of the river is determined by groundwater reserves in the river catchment area and the conditions for its release into the river valley and channel. On permanently operating watercourses in the study area low flow rates vary between 0.20 and 1.0 m<sup>3</sup>/s.
266. These hydrology reports also provide the following summaries of the characteristics of each tributary at the locations where they cross the alignment. The information on mudflows is also summarised in the Natural Hazards baseline, section 5.7.

<sup>52</sup> Report Reference 16-16-EGI (in 2 parts), undated



267. Kandak / Guliston River – Bridge 1

- The left tributary of the Obigarm River originates on the south-eastern spur of the Karategin Range, called the Daraidegdon. The relief of the left slope is steep and uneven, but it is also characterised by relatively smooth relief forms. The soil cover is represented by mountain type soils (loamy in texture). Rocky outcrops are rare and do not form significant masses.
- Erosion processes are mainly represented by earthflows, as well as landslides on the lower parts of the valley slopes. Vegetation cover is represented by dense grass vegetation. Tree-shrub vegetation is sparse, but on the slopes of the northern exposures there are dense thickets of bushes.
- The existing bridge crosses the middle part of the river and the main supplier of solid material that provokes the formation of mudflows is the right slope and landslides.

268. Gazakiyon River – Bridge 2:

- This river originates from a group of springs located on the south-eastern slopes of the Karategin Range.
- The relief of the basin is mountainous and sharply dissected. Virtually the entire surface is covered with sodded loam, pierced, in places, by small rocky outcrops.
- The river has a well-developed V-shaped valley. The width of the valley along the bottom varies from 80 to 200 m. The slopes of the valley are steep, dissected by small gullies and erosion depths that form a debris cone as a result of avalanche and mudflow activities. These cones are the main source of solid material to the Gazakiyon River. Solid material, randomly deposited, form ridges characteristic of the mud deposits.
- On the bridge section, the left bank is represented by a terrace with a height of 8–9 m, the right one - by a low, narrow floodplain.

269. Zuriyon River – Bridge 3:

- The catchment is covered with loam. Small outcrops of rocks are registered in the watershed sections of the catchment.
- Along the entire length of the river, the valley is V-shaped, its slopes are weakly dissected and the main negative forms of relief are small gullies and denudation funnels.
- In the lower course the valley expands and its bottom is occupied by agricultural lands. The channel is deeply embedded in the bottom of the valley and pressed against the right bank. The banks of the channel bowl are steep, cliffed in some areas and subject to erosion.

270. Sebnok River – Bridge 4:

- The valley is covered with well-sodded loams. Dense forest vegetation is represented by spots on the left side of the valley. Outcrops of rocks are small in size and do not significantly affect the formation of runoff.
- In the upper and middle courses, the valley has a V-shaped form. The slopes of the valley are dissected by small gullies. The channel is deeply embedded in the valley floor. The banks of the channel are steep and they are both bare, often with outcrops of rocks.
- In the alignment of the bridge, the channel does not exceed 15 m, the banks are steep and tall.

271. The Hakimi River – Bridge 5:

- This river originates on the north-eastern slope of the Karategin Range from a snowfield located in a shaded part of the valley. The basin extends towards the south-east in a triangular shape.
- Most part of the valley is covered with loess-like loams. Outcrops of rocky soils are observed only along the very steep slopes of the side valleys. Small areas of trees and shrubs are located on the valley slopes.
- The floodplain of the upper reaches of the river are vegetated and covered with boulders. This gradually becomes more active downstream gradually tapering and with less vegetation.
- The river bed is full of non-branched, winding rapids.
- The main source of solid material, the accumulation of which provokes mudslides, is the lateral tributaries. Slope landslides block the river, creating a sub-reservoir which breakthrough resulting in significant material movement.
- The existing road crosses the river in the middle of its course. On the bridge section the river valley has an asymmetric shape. The right slope is steep with rock outcrops while the left slope in the lower part is terraced and in the upper part it is gentler. The surface of the slopes are mainly sandy sediments with rock outcrops.
- The channel on the bridge section is weakly sinuous, with boulder-pebble material deposited on the extended sections, forming powerful ridges that prevent the passage of mudflow floods.

272. Tagikamar River – Bridge 6:

- The valley is V-shaped, the slopes are steep, the surface of which is represented mainly by sandy deposits with outcrops of rocks in the upper part of the catchment. Grass and shrub vegetation grows only along the bottom of the valley.
- In the river valley contains numerous erosion deposit cones and scree. The floodplain of the river is made up of boulders and pebbles. The riverbed in the upper courses is sinuous and contains sections of rapids while the lower part obtaining a rectilinear outline and reduced slopes.
- The bed in the extended areas is cluttered with boulder material that prevents the passage of mudflows.
- The surface of the catchment area is significantly eroded. The presence of sharp turns, landslides create conditions for mudflows.
- A powerful mud-stone flow in August 1961, formed after a landslide, destroyed the houses and gardens of Leiron village.

273. Chepakdara River – Bridge 7:

- The lower part of the catchment area is a typical mountain river with a ravine valley. The slopes of the valley are relatively gentle and poorly dissected. The developed channel is weakly sinuous but not branched. The shores are low, steep and mostly earthen.
- When the river leaves the upper part of the catchment area, the slope of the valley increases sharply, this turns into a steep rocky canyon. The slopes of the canyon are steep and considerably dissected. The bed in this part of the catchment area is eroded to bedrock, it has a stepped longitudinal profile.
- The road crosses the river a few tens of meters below its exit from the canyon. The left bank is a scree-shaped steep debris cone under the rock. The right bank is rocky, covered with loams through which the bedrock is traced.

A rocky protrusion along the river divides the stream into two channels. In the channel there are traces of small ridges of accumulations of channel sediments, which indicate the passage of mudslides along the river.

274. Mujikharv River – Bridge 8:

- The river originates from a group of springs located on the south-eastern slope of the Karategin Range at the altitude of 3360 m and flows into the Vakhsh River near the village of Chorsada. The slope of the ridge is steep, devoid of vegetation, cut up by erosional depths and has small rocky outcrops, from which the debris creeps down.
- When exiting the mountainous terrain, the slopes of the valley sharply reduce with rocky slopes replaced by loam. The loessal karst phenomenon is developed in the river basin. Numerous craters and hollows associated with the circulation of groundwater are especially developed on the right side of the valley.
- The riverbed in the upper course is not branched, sinuous and stepped, in the lower course it obtaining more straightforward outlines and becomes somewhat quieter in the longitudinal profile.
- The tributaries of the river are mudflows and almost all form debris cones from weakly bound rubble and boulder. With the passage of floods along the main river, the cone is easily eroded and can collapse into large channels in large blocks, replenishing the solid phase of the stream. With the passage of mudflows, tributaries directly deliver solid material to the mainstream.
- Frequency of passage along the river of powerful mudflows every 7-10 years. Of the intersected water courses, the Mudzhikharv River is the most mudslide.
- The road crosses the river in its middle course, above the influx of the Chepakdara River. The channel here is not branched, the left bank is high and steep, the right one is represented by the Chepakdara fan and is lower and less stable.

275. The Mirzosharifon River – Bridge 9:

- This river originates at the altitude of 3450 m. The main tributary is Karchadara which flows adjacent to the village of Degon. The slopes of the valley are eroded and supply significant amounts of material into the river bed. The valley is largely narrow with settlements located in the middle and lower parts where the valley widens.
- The basin is fed by multiple springs, which ensures relatively steady flows throughout the year. The riverbed is well developed and rectilinear in short sections.

276. The Dashtiguron River – Bridge 10:

- The river flows through a wide mountain valley, nestling on the right slope and obtaining a V-shaped form in the lower reaches. The right slope is steeper. In some areas the slopes are terraced and covered by crops and trees.
- The riverbed is well developed and meanders along its length. In the lower reaches of the river is used for irrigation.

277. The Tegermi River – Bridges 11 and 12:

- This river originates at an altitude of over 2500 m and flows along a well-developed channel in the upper part of the basin. Significant amounts of

friable material (scree) covers the steep slopes of the valley. There is very little vegetation on the slopes which contributes to erosion and the formation of mudflows. The riverbed meanders but is relatively rectilinear just upstream of the village of Teghermi. In the village, the river abruptly changes direction and then flows through a wide scenic valley with spacious fields, gardens, and high grass pastures.

- In the wide part of the valley, the outcrops of springs partially swamp the terrain.
- An extreme mudflow event along the river occurred on the 6th June 1990 with a height of about 7 m and hit the village and causes significant damage to the upper parts. In the lower part, due to the expansion of the riverbed, the mudflow spread and caused silt deposits within the houses.
- The collapse is understood to have occurred in the upper reaches of the river, which blocked the narrow channel of the river, which led to a further breakthrough of the blockage. It is thought that significant damage could have been avoided if the restricted area had been observed by the residents, and housing was not built as close as it was to the river. The crowding of the buildings also caused channelling of mudflow which increased its power. The large-scale destruction caused is believed to be more of a result of unsuitable positioning of properties as opposed to the power of the mudflow itself.

#### 278. The Kalot River – Bridge 13:

- This river flows through multiple small channels along a V-shaped valley with steep slopes and a relatively wide valley bottom. The channels expand at the mouth of the valley.
- The river is winding, with steep coastal slopes covered with a small cover of loams and overgrown with grass and sparse bushes. The width of the channel varies between 15 m in the shallows and 3 m with a depth of up to 0.4 m. There are multiple groundwater springs at the bottom of the valley which has led to agricultural uses.

### 5.10.2 Water Quality

279. Table 23 sets out the water quality standards for surface waters in Tajikistan.

*Table 23: Tajikistan Water Quality Standards*

Parameter	Limit value (MPC)*
Oxygen	winter – 4.0 mg/l, summer – 6.0 mg/l
Ammonium salts	0.5 mg/l
BOD5	3.0 mg/l
Oil products	0.05 mg/l
Iron	0.05 mg/l
Copper	0.001 mg/l
Zinc	0.01 mg/l
Phenols	0.001 mg/l
Chlorides	300 mg/l
Sulphates	100 mg/l
Calcium	180 mg/l
Potassium	50 mg/l
Suspended particles	1000 mg/l
Coli index	1000 pcs/l

\* See Table 8 for comparison between Tajik and international water quality standards

Source: Goskomstat. *Environmental protection in Tajikistan, 1990-2000, 2002 (in Russian)*

280. To determine actual conditions on the alignment, physical monitoring of the water quality in streams has been conducted as part of this study. Site visits carried out in August and November 2019. The only pollution sources in these streams were from villages along the alignment, with some limited water quality impacts from domestic and agricultural waste discharges.

281. Water Quality baseline monitoring was carried out along the alignment, from 03.10.2018. to 10.10.2018, at the following nine locations:

- Vakhsh river, at the bridge of Sicharog;
- Jamoat Obigarm, Kandak kishlak, Kandak spring (Guliston);
- Jamoat Sicharog, kishlak Lugur, river Lugur, below kishlak Lugur;
- Jamoat Hakimi, the village of Hakimi, Sadokat-Hakimi, after the bridge
- Jamoat Mudzhiharf 500 m, below bridge No.8;
- Jamoat Komsomolobad, small river Dashti Gurgon, outside the village of Tutkhor;
- Jamoat Safedchashma, small river Kalakon – tributary of Surkhob river, after Ulfatobod bridge;
- Vakhsh river, after confluence of the rivers of Surkhob and Khingob; and
- Urban village Darband, 500 m below the bridge which is being constructed over Surkhob river.

282. The location of the water quality monitoring points is shown on Figure 31 and summarised in Table 24.

Table 24: Location of Water Quality Monitoring Points

No	Measurement point	Latitude	Longitude	Elevation (m)
WQ1	Vakhsh river	38°43'36.49"	69°48'30.65"	1,054
WQ2	settlement Kandak, spring Kandak	38°46'21.60"	69°41'13.77"	1,780
WQ 3	Lugur river, below the place of confluence of two rivers	38°47'34.87"	69°45'50.48"	1,532
WQ 4	Hakimi river, settlement Hakimi	38°50'2.63"	69°49'47.63"	1,296
WQ 5	Mujikharv river, village Mujikharvi Kalon	38°51'55.81"	69°52'44.19"	1,325
WQ 6	Dashti Gurgon river, Village Tutkhor	38°52'45.72"	69°57'45.82"	1,315

№	Measurement point	Latitude	Longitude	Elevation (m)
WQ 7	Kalakon river, tributary of Surkhob river	38°54'54.48"	70° 6'18.77"	1,193
WQ 8	Vakhsh river, after confluence of the rivers of Surkhob and Khingob	38°51'57.42"	70° 1'29.31"	1,160
WQ 9	Surkhob river, 500m below the bridge	38°54'38.73"	70° 7'15.63"	1,383



Table 25: Results of Water Quality Monitoring Exercise

	Parameter	MPC		Vakhsh river, near Sicharog bridge (WQ1)	village Kandak, spring (WQ2)	jamoat Sicharog, small river Lugur, 500m below village (WQ3)	jamoat Hakimi, village Hakimi, Sadokat-Hakimi, after the bridge (WQ4)	jamoat Mujikharv 500 m. below bridge №8 (WQ5)	small river Dashti Gurgon, outside village Tutkhor (WQ6)	tributary of Surkhob river, jamoat Safedchashma, after bridge Ulfatobod (WQ7)	Vakhsh river, after confluence of rivers Surkhob and Khingob (WQ8)	Surkhob river, 500 m below the bridge being constructed (WQ9)
		Domestic	Fishery									
				1	2	3	4	5	6	7	8	9
1	Temperature, °C			13.08	13.80	13.90	13.40	13.00	12.90	13,60	14,50	14,70
2	pH	6.5-8.5		8.86	8.86	8.87	8.77	8.45	8,92	8,96	8,89	8,85
3	Smell	Abs.	Abs.	0	0	0	0	0	0	0	0	0
4	Turbidity	1.5		153	3	6	7	3	6	3	160	175
5	Chromaticity			650	19	32	37	23	200	18	832	910
6	Mineralization, mg / l	1000	1000	425	160,00	156,00	186,00	183,00	200,00	270,00	487,00	498,0
7	Chlorides, mg / l	350	300	135,0	63,5	48,6	67,1	66,0	61,8	76,0	139,2	143,4
8	NITROGEN	-- ammonium, mg / l	2	0,39	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
9		-- nitrites, mg / l	1.0 (3.3 –NO <sub>2</sub> )	0,02	0.003	0,003	0.003	0,004	0,003	0,006	0,005	0,004
10		-- nitrates, mg / l	10.2(45-NO <sub>3</sub> )	9,1	0.019	0.020	0,010	0,020	0,020	0,020	0,030	0,020
11	Calcium, mg / l	-	180	93,5	48,1	46,1	57,1	60,3	59,1	62,1	97,0	96,6
12	Magnesium, mg / l	-	40	18,2	16,1	16,4	12,6	6,0	8,9	12,2	18,8	19,8
13	Divalent iron, mg / l	0.5	0,005	0,02	0,03	0,02	0,04	0,00	0,01	0,02	0,04	0,03
14	Salinity mg / l			0,33	0,11	0,11	0,13	0,13	0,14	0,19	0,34	0,35
15	Hardness mg-equiv./l	7		5,02	3,72	3,65	3,89	3,50	3,68	4,10	6,39	6,45
16	Alkalinity mg-equiv./l			29,41	20,04	26,21	36,07	28,87	35,50	35,00	19,45	19,40
17	Hydrocarbonate HCO <sub>3</sub> mg/l			1950,00	1 222,84	1 599,33	2 200,99	1 761,65	2 166,21	2 135,70	1 186,84	1183,79
18	Sodium+Potassium mg-equiv./l			950,85	611,62	794,73	1 099,65	883,71	1 081,00	1 070,70	637,58	654,39
19	Sulphates mg / l	500	500	52,00	1,00	4,00	1,00	6,00	2,00	4,00	65,00	98,0
20	Dissolved oxygen, mg / l	He менее 4-6	He менее 4-6	8,8	10,0	8,7	9,0	8,9	9,2	9,1	8,4	8,5

21	Phosphates mg / l (PO4 -3)	3,5		0,205	0,390	0,210	0,380	0,290	0,300	0,610	0,160	0,180
22	Specific electrical conductivity, Ohm / cm			0,593	0,225	0,220	0,262	0,280	0,280	0,380	0,687	0,700
23	Dry residue, mg / l	1000	1000	420,630	157,900	154,920	184,750	181,860	196,200	269,400	485,780	174,120
24	Oil products, mg / l	0,05	0,05	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
25	Manganese, mg / l	0,5	0,5	0,000	0,000	0,000	0,000	0,004	0,000	0,001	0,000	0,000
26	Copper mg / l	1,0	1,0	0,0010	0,000	0,030	0,010	0,030	0,040	0,020	0,000	0,000
27	COD mg / l			6,000	7,050	6,200	7.330	5,940	6,250	7,120	6,860	6,240
28	BOD <sub>5</sub> , mg / l	3,0	3,0	1,4	1,2	1,1	1,3	1,3	1,2	1,1	1,3	1,2
29	Suspended substances, mg / l	25	75	15	10	9	6	8	7	5	23	21
30	Coli-index, pcs / l	1000	1000	9	7	7	5	7	6	7	10	11

283. The results of chemical analysis show (Table 25) that the water quality of the Vakhsh and Surkhob rivers and their tributaries in the project area is good. The concentration of many parameters is an order of magnitude lower than the maximum permissible concentration (MPC). In the sample of water from the Vakhsh river taken from the bridge of Sicharog, the contaminant concentrations were relatively lower than in the sample taken after the confluence of the Surkhob and Hengov (the beginning of the Vakhsh river). This is due to the fact that the water tributaries of the Vakhsh river (PP. Safecase, mujiharf, Mirzosharipov, Hakimi, Lugur, Dasht Gorgan, Thermi, batters, etc.) are much cleaner than the Vakhsh river and its main tributaries, the Surkhob and Hengov, and because of the dilution of concentration of contaminants in the centre of the Jamoat Sicharog, is relatively lower than after the confluence of Surkhob and Khingov.
284. Long-term observations show that the concentration of suspended solids, mineralization and some other ingredients in the autumn-winter time (September-February) in the Vakhsh river near the town of Rogun is much lower than in the spring-summer period (March-July). In the season of intensive snow melting and heavy rains, the concentration of suspended solids in the Vakhsh river is much higher, and in some cases exceeds the MPC norm.

## 5.11 Habitats and Biodiversity

285. The project is located within an area characterized by habitats that exhibit signs of anthropogenic influence, to varying levels. Much of this is due to long-term grazing pressure and tree-clearance; this has resulted in a short grass sward, interspersed with herbs. Tree removal has also resulted in soil destabilisation and subsequent erosion.
286. The wider area is known to support ancient fruit/nut tree species, thought to be the ancestors of modern, commercial tree species. Elsewhere, cultivated fruit/nut trees are present within village gardens and smallholdings.
287. In areas where grazing pressure is reduced, more diverse habitat pockets exist, including meadow habitats, pockets of native woodland, and scrubby hillsides.
288. The Scheme also contains a number of riparian zones, of varying sizes (13 formal bridge crossings will be required as part of the Scheme, together with additional informal crossing points). The habitats here are relatively lacking in vegetation, reflecting the dynamic nature of the watercourses (i.e. subject to regular spate conditions).

### 5.11.1 Terrestrial Flora

289. Due to vertical zoning, scattered relief, diversity of climatic zones and soil cover in the country, there are more than 5000 plant species, and 7 geobotanical regions, in Tajikistan. All of them are confined to the absolute heights of the terrain, climate, orography of soil cover. In general, they coincide with the natural zoning of the country (Atlas of the Tajik SSR, 1968).
290. The project area is located within the lowlands belt. This belt is warm, and dominated by broad-leaved forests, shrubs, with areas of steppes and forest-steppe.
291. The most abundant flora across the project area are perennial grasses, generally of short sward, and indicative of ongoing grazing practice in the region. In areas where grazing pressure is less pronounced, a lush grass sward prevails, with herbs and shrubs also present.

292. Grass-bearing wheatgrasses dominates in the grassy cover. At higher altitudes, this gives way to tree-shrub vegetation, which consists of almonds (*Amygdalus bucharica*), hawthorn (*Crataegus pontica*), small-leaved maple (*Acer regelii*), carcase (*Celtis caucasica*), and chion (*Zuzyphus jujuba*). Grassy cover is completely dominated by wheatgrass (*Elytrigia trichospora*), barley (*Hordeum bulbosum*), viviparous bluegrass (*Poa bulbosa*), palate (*Cynodon dactylon*), bearded (*Bortriochloa ischaemum*). At lower levels (i.e. in the gorges and floodplains) walnut, apple, poplar and willow are common.
293. In the upper part, a belt of tree-shrub vegetation and juniper is suitable for this belt. In the valley of Vakhsh and Surkhoba a comb-dwelling, willow and sea-buckthorn grow.
294. On the territory of this belt many herbs of medicinal importance grow. Some of them are harvested, both by local residents and forestry workers. These herbs are milfoil (*Alhaha armeniaca*), Althaea officinalis (*Alhaha officinalis*), wormwood (*Artemisia absinthium*), shepherd's purse (*Capsela bursa-pastoris*), caraway (*Carum carvi*), Adonis turkestanica (*Adonis turkestanicus*) and many others.

#### 5.11.2 Terrestrial Fauna

295. Faunal diversity across the Scheme (and wider area) is diverse, with numerous animal groups represented. The presence of key faunal species (i.e. those of increased conservation concern) will vary through the year depending upon prevailing weather conditions, as well as other influences such as local livestock movement.
296. Amphibians - In Tajikistan, there are 2 species of amphibians - the green toad (*Bufo viridis*) and the lake frog (*Pelophylax ridibundus*). Both species are found in the Project area. The green toad (*Bufo viridis*) is spread quite widely and can live up to 4000 m, the project alignment is located at a height of approximately 1300 m to 1600 m asl. This species only needs water during the breeding season, in which it lays its eggs. For the habitation of the lake frog (*Pelophylax ridibundus*), year-round ponds with stagnant water are necessary and preferably warmed up in the warm season, where it constantly lives, hides, reproduces and spends its winters. Both species play an important role in maintaining the ecological balance and feed on invertebrates. Their extinction is a recognition of the violation of ecological equilibrium and both of these species are key in the country's existing ecosystems.
297. Reptiles - Around 47 species of reptiles are considered likely to inhabit the project area, including snakes, lizards, and a single tortoise species. Typical for this region are species such as Transcaspian bent-toed gecko (*Cyrtopodion russowi*), and Turkestan agama (*Laudakia lehmanni*) that live at altitudes up to 2000 m. In terms of snakes, water snake (*Natrix tessellata*), a multicolored snake (*Hemorrhois ravergieri*), sand boa (*Eryx miliaris*) and coluber (*Elaphe diene*) are all likely to be present. Furthermore, the venomous viper (*Macrovipera lebetina*), listed in the Red book of the Republic of Tajikistan (2015, 2017) may also occur. A single tortoise species – Russian tortoise (*Testudo horsfieldii*) was observed close to the project.
298. Birds - The bird fauna is extremely rich here. Of the 400 species of birds in Tajikistan, about 150 species can be found here, of which 56 species nest in the area. The characteristic nesting birds here are chukar partridge (*Alectoris kakelik*), blue-rock thrush (*Monticola saxatilis*), mountain swallow (*Ptyonoprogne rupestris*), rock nuthatch (*Sitta neumayer*), rock dove (*Columba rupestris*), and alpine swift (*Apus affinis*).

299. In the scree slopes, the colonially nesting pink starling (*Sturnus roseus*) can occur. In places where shrubs and trees are more common, blackbird (*Turdus merula*), daraba (*Turdus viscivorus*), Oriental turtle dove (*Streptopelia orientalis*), magpie (*Pica pica*), paradise flycatcher (*Terpsiphone paradisi*), the yellow-browed warbler (*Phylloscopus inornatus*), red-backed shrike (*Lanius collurio*), grey-headed goldfinch (*Carduelis caniceps*), streaked laughing thrush (*Trochaloxyton lineatum*), Cetti's warbler (*Cettia cetti*), golden oriole (*Oriolus oriolus*) and many others are all present. Predatory birds present within the project area include golden eagle (*Aquila chrysaetos*), Egyptian vulture (*Neophron percnopterus*), lesser kestrel (*Falco naumanni*), sparrowhawk (*Accipiter nisus*), hobby (*Falco subbuteo*), peregrine (*Falco peregrinus*), booted eagle (*Hieraaetus pennatus*). Additionally, during a cattle drive, species such as griffon vulture (*Gyps fulvus fulvus*), black vulture (*Aegypius monachus*) and sometimes bearded vulture (*Gypaetus barbatus*) will be present.
300. Mammals - There are 84 species of them in Tajikistan. And many of them live in the area of the project. The most common are the Turkestan rat (*Rattus turkestanicus*), forest dormouse (*Dryomys nitedula*), grey hamster (*Cricetulus migratorius*), juniper vole (*Microtus juldasschi*), forest mouse (*Apodemus uralensis*), tolai hare (*Lepus tolai*), badger (*Meles meles*), red groundhog (*Marmota caudata*), porcupine (*Erethizon Dorsatum*), fox (*Vulpes vulpes*), wolf (*Canis lupus*), brown bear (*Ursus arctos*), and pine marten (*Martes martes*). The upper part of the ridge (outside the project area) mountainous species such as Siberian ibex (*Capra sibirica*), and snow leopard (*Uncia uncia*) are known to be present.
301. There are eight bat species present in Tajikistan, and many of these will likely be present within the project area at times. Roosting opportunities exist within built structures and cliff/rock cavities, while an ample foraging resource is also present.
302. The rivers Surkhob and Vakhsh are home to 3-4 species of freshwater fish, of which rainbow trout is of particular importance.
303. The watercourses across the project site are very dynamic, with the steep overall gradient in the region resulting in high discharge levels and constant movement of substrate through the system. This reduces suitability for a wide range of aquatic flora and fauna, mainly as a result of very little aquatic plant life being able to survive in the relatively harsh conditions, and subsequently reducing opportunities for associated fauna. Overall this is reflected in the low numbers of fish present (3-4 species as likely being present). Regardless of this, the aquatic environment should be protected during construction and operation.

#### 5.11.3 Species of Concern

304. There are seven rare and endangered plant species listed in the Red Book of the Republic of Tajikistan (2015 and 2017 editions) and protected by the state (list 1) that grow in the project area, albeit on the slopes of ridges, scree, in the steppe or meadow zones, and generally outside the immediate project footprint. These species are as follows:

- *Cousinia corymbosa*
- *Alium Rosenbachianum*
- *Alium spittatatum*
- *Alium Suworovi*
- *Tulipa praestans*
- *Anemone bucharica*
- *Iris Haoliana*

305. Further to the above, there is also the potential for genetically valuable ancient fruit trees to be present across the project area. These include species such as pear (*Pyrus* spp.) and cherry (*Prunus* spp.).

#### 5.11.4 Protected Areas (Formal / Informal)

306. No protected areas are situated within the Zol. The closest such example is the Romit State Nature Reserve, which lies c. 25km to the north-west of the Scheme. This area was previously recognised by IUCN as a major biodiversity site, but has lost this status due to the value of the Reserve having been compromised by unregulated grazing, wood gathering, and illegal hunting<sup>53</sup>.

307. The next closest area is the Sari Khosor National Park, which lies c. 30 km to the south of the Scheme.

### 5.12 Cultural Heritage

308. The Academy of Sciences of the Republic of Tajikistan – Institute of History of Archaeology and Ethnography was contacted in June 2019, for information on the potential for cultural heritage locations to be present in the project area. Their response stated that that “there are no historical and archaeological monuments in the area where the route is laid”.

309. Several assets of local community value (mosques, tea houses etc.) were identified during the community consultations, these assets are listed in

310. A cemetery is present at km 70 +500, although the road alignment has been modified to avoid this location, as detailed in the alternatives Section 4.3.

### 5.13 Waste and Materials

311. The existing waste management provisions in the project area, and surrounding area, is generally limited to local municipal waste disposal sites. The Committee on Environmental Protection identified 69 disposal sites in 2016, and advised that the existing disposal sites at regional centres are overfilled<sup>54</sup>. A summary of municipal waste sites is presented in Table 26.

Table 26: Municipal Waste Disposal Sites

	Number	Area (ha)
Total	69	280.49
Dushanbe	1	20.00
Towns and districts under republican subordination	12	37.66
Sughd Oblast	24	130.17
Khatlon Oblast	24	83.86
Gorno-Badakhshan Autonomous Oblast	8	8.80

Source: Committee for Environmental Protection, 2016

312. There are no waste disposal facilities for hazardous wastes present in the project area, and there is limited provision for the management of hazardous waste disposal

<sup>53</sup> Ning, Wu; Rawat, GS; Joshi, S; Ismail, M; Sharma, E. 2013. High-altitude rangelands and their interfaces in the Hindu Kush Himalayas. Kathmandu: ICIMOD

<sup>54</sup> [https://www.unece.org/fileadmin/DAM/env/epr/epr\\_studies/ECE.CEP.180.Eng.pdf](https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE.CEP.180.Eng.pdf)



in Tajikistan. The current focus is on the management of pesticides and radioactive waste<sup>21</sup>.

## 5.14 Socio-Economic, Health and Community Safety

### 5.14.1 Introduction

313. Project-specific data presented in this section has been collected in a number of ways including:

- Desktop research and review of publicly available data;
- Consultation with directly Affected People (APs);
- Detailed Measurement Survey (DMS) to measure the areas of the affected land, buildings and number and type of affected assets;
- Valuation of replacement cost of the Affected Assets to identify the cost of compensation needed for loss of assets, income and other livelihood sources and allowances;
- Census survey to identify the number of Affected Households (AHs);
- Socio-economic survey (SES) to identify the current socio-economic condition of APs as well as their perceptions of the impact of the Project on their livelihood; and
- Consultation with the local communities along the alignment affected by the Project.

314. The socio-economic data was primarily collected for the development of the Land Acquisition and Resettlement Plan (LARP) required for the Project. A detailed description of the methodology adopted for completion of the above tasks is provided in the separate LAR.

315. The SES and census survey in the Project area were conducted in September and October 2018. The SES included renters and informal users of affected lands and buildings, in addition to owners and renters of permanently and temporarily affected businesses.

316. The surveyed population lives in villages located along the Project road. At the time of preparation of this ESIA, population living in villages in the vicinity and along the village access roads has not been surveyed as these were not part of the initial design. An Environmental and Social assessment of impacts to the areas and populations along village access roads, will be undertaken after the publication of this ESIA in July 2019, and will be publicly disclosed.

### 5.14.2 Population and demography

317. The Project is located in two Districts, Rogun (Роғун) and Nurobod (Дарбанд) spread across 500 and 900 km<sup>2</sup> respectively. They form part of the Districts of Republican Subordination - DRS (Ноҳияҳои тобеи ҷумҳурӣ) a region in [Tajikistan](#), consisting of 13 districts that are directly under central rule. The population count is 22,600 in Rogun and 66,000 in Nurobod<sup>55</sup> The largest city in the Project area is Roghun, the capital of Rogun province with an estimated 9,600 population as of 2007<sup>56</sup>.

318. A total of 16,438 people live in the 17 Project-affected villages located along the Project alignment. In total, there are 8,413 males and 8,038 females living in 2,007 households. The average family size in these villages ranges from six persons in

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<sup>55</sup> According to 2010 census.

<sup>56</sup> Population of the Republic of Tajikistan as of 1 January 2008, State Committee of Statistics, Dushanbe, 2008

Bozorak and Darband to ten persons per household in Siyagulak, Tuhtor and Gulmon villages.

319. According to the 1994 Constitution, Tajik is the state language and Russian a language of international communication and dialogue. Tajik is the language most widely used, although Russian continues to be used, mainly in urban areas. Uzbek is the main language for approximately 25% of the population. Other languages spoken by respective minority groups are Kyrgyz, Tatar, Turkmen, Uighur and Korean<sup>57</sup>. In the Project area, Tajik is the main language, and many people do not speak Russian, in particularly women in the remote mountainous areas.

#### 5.14.3 Social Organisation & Kinship

320. The social organisation in the Project affected areas follows a very traditional, patriarchal and male dominated model. For the most part, men earn the household income, the majority of them employed in Russia or other neighbouring countries. Division of work is gender based, and women are expected to perform domestic chores as well as field labour.
321. When decision-making processes are considered, the SES study indicated that women are consulted and take part in the decision-making processes in all major family activities, with the exception of a small percentage of women who reside in the more remote traditional villages.
322. Almost all (96.71%) of the surveyed people live in extended families. The remainder of those surveyed (3.29%) live within nuclear families. The household size of the sampled households ranges from one to thirty persons in a household. A total of 27 of the surveyed households have up to five persons living in the household, 76 (50%) have 6-10 persons, 49 (32.24%) households have 11-20 persons and 4 (2.64%) households have 21-30 persons living in one household. Married heads of households account for 92.76% of all heads of household, 5.26% are widowed and the percentage of unmarried heads of household is marginal (1.32%).

#### 5.14.4 Gender, Ethnicity, Indigenous People

323. In Tajikistan, the sex ratio (men per 100 women) is 99<sup>58</sup>, which is consistent with figures for the Project. However, in the surveyed HHs, the portion of male-headed households is 145 AHs (92.35%), while 12 (7.64%) of surveyed households are headed by a woman.
324. Ethnic groups present in Tajikistan are Tajik 84.3% (includes Pamiri and Yagnobi), Uzbek 13.8%, other 2% (includes Kyrgyz, Russian, Turkmen, Tatar, Arab)<sup>59</sup>. All the surveyed AHs in the Project area (157 households) identified as being
325. There are no indigenous people in the Project affected area.

#### 5.14.5 Religion

326. Islam is the prevailing religion in Tajikistan with 98% Muslim population (Sunni 95%, Shia 3%) other 2%<sup>60</sup>. In the Project area, all surveyed persons identified as are Muslim. There is a Mosque in each village along the alignment.

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<sup>57</sup> Khodjamurodov G, Rechel B. Tajikistan: Health system review. *Health Systems in Transition*, 2010, 12(2):1–154.

<sup>58</sup> 2018 est. according to CIA World Factbook

<sup>59</sup> 2014 est. according to CIA World Factbook

<sup>60</sup> Ibid.

#### 5.14.6 Age Distribution

327. Tajikistan has a very young population. Only 3% of the population is over the age of 65 in Tajikistan, well below the average for developing countries in Europe and Central Asia (ECA) (15%).
328. The age distribution of the surveyed population for the project LARP (Table 27) shows that the 18-35 age group was the most represented (35.94%). The profile of the youth community is even more pronounced if the 0-7, 8-17 and 18-35 age groups are combined. Such a comparison shows that 88% of the surveyed population is younger than 35. The 36-45 age group accounts for 5.79% and the 46-55 age group accounts for 2.94 %. The 56-65 and 66 and above age groups account for 2.69% and 0.59%, respectively. The head of households are almost equally spread in three age groups; 18-35, 36-45 and 56-65.

Table 27: Age Distribution of Population

Age	Household members		Head of AHs	
	No	%	No	%
0 - 7	311	26.11		
8 - 17	309	25.94		
18 - 35	428	35.94	25	16.45
36 - 45	69	5.79	36	23.68
46 - 55	35	2.94	38	25.00
56 - 65	32	2.69	35	23.03
66 and more	7	0.59	18	11.84
<b>Total</b>	<b>1,191</b>	<b>100</b>	<b>152</b>	<b>100</b>

Source: Land Acquisition and Resettlement Plans Obigarm-Nurobod Road, December 2018

#### 5.14.7 Infrastructure and Amenities

329. The Ministry of Water Resources and Land Reclamation is responsible for urban water supply and waste water. At present, water supply and sanitation facilities in Tajikistan are neither safe nor adequate. With an annual production of over 13 000 m<sup>3</sup> of water per capita, Tajikistan is one of the most wealthy states in the world in terms of water supply (UNDP, 2003), ranking third in the world in terms of water resources per head (EIU, 2006), yet in 2000 the country was able to provide just 59% of its population with access to safe drinking-water. In DRS, only 55% of the population has access to piped water or public taps. Only a couple of villages in the Project area have piped water while the majority rely on spring water and purchased bottled water for daily usage, costing TJS 100-120 per month.
330. A majority of schools and rural medical institutions lack proper sanitation and water facilities. Where piped water is not available, water is mostly collected by women<sup>61</sup>.
331. Small rural hospitals with 25–75 beds offer basic nursing care and some medical and obstetric services. They are staffed by one doctor. There were 153 rural hospitals in 2007. There were also 45 district hospitals reorganized from rural hospitals. These

<sup>61</sup> Khodjamurodov G, Rechel B. Tajikistan: Health system review. *Health Systems in Transition*, 2010, 12(2):1–154.

hospitals are in very poor condition and only active outside the autumn/winter season, with run-down buildings, unheated and without electricity in winter, few supplies or bedding, and very little diagnostic and therapeutic equipment. Most beds are unoccupied. All district, regional and national hospitals have ambulance services for emergency care, and there are also separate, specialized emergency hospitals. However, the ambulance fleet is old and incommensurate with requirements, and modern means of communication are lacking (Ministry of Health, 2005b)<sup>62</sup>.

332. Most of the Project villages have a mosque and a chaihona (tea house) where village men gather. In some villages there are small shops and businesses along the central village road. Other services such as larger markets and administrative services are available only in Jamoat and Hukumat centres. Facilities in villages on the alignment are presented in Table 28.

333. Electricity is available in all Project villages; however, energy supply is intermittent, especially in the summer period when water levels that feed water reservoirs used for production of electricity are low. Only a few villages have piped water while the majority rely on spring water and purchased bottled water for daily usage, costing TJS 100-120 per month.

334. Public transport along the Project alignment is intermittent and is based on independent operators/ taxi drivers using either small vans, minibuses or jeeps. There is no fixed schedule, and transport departs when full (from market places and other areas of congregation). There are no visible bus stations / stops with amenities along the road.

Table 28: Facilities in Villages on the alignment

District /Hukumat	Subdistrict/ Jamoat	Villages along the Project road	School	Med. Station/ hospital	Mosque	Special place for praying/ worship	Cultural center / chaihona
<b>Rogun</b>	Obi Garm	Bozorak	1		1		
		Kandak	2	1	2		1
	Sicharog	Shohi Aslon	1				1
<b>Nurobod</b>	Hakimi	Chavchii Poyon	1		1		1
		Sadokat			1		1
		Layron	1				1
		Siyagulak	1	1	1	Spring	1
	Muchiharf	Chepak	1		1		1
		Muchiharfi Kalon	1	1	2	Holy place for praying	1
	Komsomolobod	Degai	2	1	2		2
		Tuhtor	1		1		1
		Tegermi	2	1	1		3
		Pandovchi	2	1	1		1
	Safedcheshma	Dehi Tag	1	1	2		2
		Ulfatobod	1	1	2		1
		Gulmon	1		1		

<sup>62</sup> Ibid.

District /Hukumat	Subdistrict/ Jamoat	Villages along the Project road	School	Med. Station/ hospital	Mosque	Special place for praying/ worship	Cultural center / chaihona
	Darband	7th microrayon					
<b>Total</b>			<b>19</b>	<b>8</b>	<b>19</b>	<b>2</b>	<b>18</b>

Source: Land Acquisition and Resettlement Plans Obigarm-Nurobod Road, December 2018

#### 5.14.8 Health and Education

335. While the Government of Tajikistan remains the main provider of health care services, most health expenditure is covered through private out-of-pocket payments. In 2017, overall health spending was 2.3 percent of GDP. Tajikistan's population is facing a double burden of both noncommunicable and communicable diseases. Although the Ministry of Health and Social Protection of Tajikistan has reported that all demographic and health indicators such as maternal and child mortality, incidence of infectious diseases (tuberculosis, HIV/AIDS, malaria) and noncommunicable diseases (cardiovascular, oncological, endocrinological) are improving, infant and maternal mortality rates are among the highest in the World Health Organization European Region and malnutrition is a major public health concern (World Bank).
336. The Ministry of Health is responsible for national health policy, but has no control over the overall health budget, and directly manages only health facilities at the national level. Local authorities are responsible for most social services, including health and education.
337. There are 19 schools in villages on the alignment and 8 Medical Centres.
338. Physical barriers play an important role in remote mountainous regions, where road conditions are poor, means of transport limited and many communities cut off for months during the winter season.
339. While the Government of Tajikistan remains the main provider of health care services, most health expenditure is covered through private out-of-pocket payments. In 2017, overall health spending was 2.3 percent of GDP. There is an estimated 1.7 physicians/1,000 population (2014) and 4.8 beds/1,000 population (2013)<sup>63</sup>.
340. Tajikistan's population is facing a double burden of both noncommunicable and communicable diseases. The risk of major infectious diseases is high. Poor water quality, a result of lack of maintenance of the water supply system, and insufficient health education and health promotion among the population are mainly responsible for periodic outbreaks of infectious diseases. Prevalent food or waterborne diseases are bacterial diarrhoea, hepatitis A, and typhoid fever and malaria is present in areas below 2,000 m asl. In 2007, the morbidity rate for malaria was 9.5 cases per 100 000 population (Matthys et al., 2008; WHO Regional Office for Europe, 2010).
341. Infant and maternal mortality rates are among the highest in the World Health Organization European Region and malnutrition is a major public health concern (World Bank).

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<sup>63</sup> CIA World Factbook

342. Acute respiratory infections, diarrhoea and prenatal conditions are the main registered causes of infant mortality. Most of the infant deaths (71%) occurring the first week of life. The infant mortality rate is 30.8 deaths/1,000 live births (male: 34.8 deaths/1,000 live births and female: 26.5 deaths/1,000 live births)<sup>64</sup>.
343. Maternal health remains another major challenge. According to official data, maternal mortality has decreased by more than half from its peak at 124.4 per 100 000 births in 1993 to 43.4 in 2006 (WHO Regional Office for Europe, 2010). It is likely that these figures underreport actual maternal mortality, as there are a large number of home deliveries. It has been estimated that, in 1995, the actual maternal mortality rate was 123 per 100 000 live births (Hill et al., 2001) rather than the officially recorded 97.7 (WHO Regional Office for Europe, 2010).
344. According to UNICEF, maternal mortality in Tajikistan can be attributed to poor antenatal care, inadequate health services during delivery, and transportation problems, particularly in rural areas (Guerra et al., 2003).
345. There are 15,000 people living with HIV/AIDS and the HIV/AIDS adult prevalence rate is 0.3 %.<sup>65</sup> Intravenous drug use is assumed to be the major source of HIV transmission. Other groups at particular risk of HIV/AIDS include the large number of labour migrants and the growing number of commercial sex workers. There are an estimated 8000 commercial sex workers in the country.<sup>66</sup>
346. Tuberculosis re-emerged as a major public health threat during the 1990s. According to Ministry of Health data, the incidence rate skyrocketed between 1993 and 2007, increasing from 11.7 to 94.3 per 100 000 population (WHO Regional Office for Europe, 2010).
347. Since independence, the prevalence of diseases caused by micronutrient deficiencies (iron-deficient anaemia, iodine-deficiency disorders, vitamin A deficiency) has increased, as a result of deteriorating access to high-quality food and iodized salt, especially for vulnerable groups of the population. Poor intake of food, an unbalanced diet rich in animal fats and high infection rates (with resulting diarrhoea), particularly during the summer, are major causes of malnutrition. Poor nutrition is the result of the lack of food in some households particularly in rural and mountainous areas, and poor feeding practices for infants and young children<sup>67</sup>.
348. Project-specific health data was not compiled for this ESIA and the information presented above is a result of desk-based research of publicly available data sources. Further health data will be collected during the Community, Social and Health Review, and used to inform ongoing activities in the Social Risk Register.
349. Education expenditure amounts to 5.2% of GDP, and overall literacy<sup>68</sup> is 99.8% (male: 99.8%, female: 99.7%)<sup>69</sup>.
350. The expected years of schooling in Tajikistan is below the Europe and Central Asia average (10.8 in Tajikistan versus 12.6 in Kyrgyzstan or 13.3 in Kazakhstan and 12.4

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<sup>64</sup> 2018 est. according to CIA World Factbook

<sup>65</sup> 2017 est. according to CIA World Factbook

<sup>66</sup> Khodjamurodov G, Rechel B. Tajikistan: Health system review. *Health Systems in Transition*, 2010, 12(2):1–154.

<sup>67</sup> Ibid.

<sup>68</sup> Age 15 and over can read and write.

<sup>69</sup> 2015 est. according to CIA World Factbook



Europe and Central Asia average<sup>70</sup>). The indicator's value reflects low pre-primary enrolment rate (12.4 percent for 3–6-year-olds in 2016) and 9 years of mandatory education in school with high dropout rate after grade 9, especially for girls (World Bank).

351. Generally, the Project population is well educated, and the LARP surveys reveal a high level of literacy of heads of household with 66.45% having completed secondary education. A further 12.50% and 21.05%, respectively, obtained a college or university degree. Generally, the educational profile of other family members is lower in all educational categories than among the heads of households. There were no illiterate people in the surveyed sample. Educational levels are summarised in Table 29.

*Table 29: Education of Surveyed Population*

Education status	Head of the household		Other household members	
	Number	%	Number	%
Illiterate	0	0	0	0
Primary school	0	0.00	149	12.51
Secondary education	101	66.45	681	57.18
Technical/other college	19	12.50	23	1.93
University degree	32	21.05	61	5.12
School age children	0	0.00	277	23.26
<b>Total</b>	<b>152</b>	<b>100</b>	<b>1191</b>	<b>100</b>

*Source: Land Acquisition and Resettlement Plans Obigarm-Nurobod Road, December 2018*

#### 5.14.9 Employment and Livelihoods

352. The economy in Tajikistan is dominated by minerals extraction, metals processing, agriculture, and reliance on remittances from citizens working abroad. Mineral resources include silver, gold, uranium, antimony, tungsten, and coal. Industry consists mainly of small obsolete factories in food processing and light industry, substantial hydropower facilities, and a large aluminium plant - currently operating well below its capacity. The GDP in 2017 amounted to \$7.144 billion. GDP composition, by sector of origin is agriculture: 28.6%, industry: 25.5% and services: 45.9%<sup>71</sup>.
353. The 1992-97 civil war severely damaged an already weak economic infrastructure and caused a sharp decline in industrial and agricultural production. Less than 7% of the land area is arable and cotton is the predominant crop; Tajikistan imports approximately 70% of its food. Other significant agricultural products include grain, fruits, grapes, vegetables, cattle, sheep, goats.
354. Because of a lack of employment opportunities in Tajikistan, more than one million Tajik citizens work abroad - roughly 90% in Russia - supporting families back home through remittances that in 2017 were equivalent to nearly 35% of GDP<sup>72</sup>.

<sup>70</sup> Excluding high-income countries such as France, United Kingdom, and Finland.

<sup>71</sup> 2017 est. according to CIA World Factbook

<sup>72</sup> CIA World Factbook

355. The major economic activities in the Project villages are agriculture and animal husbandry. Wheat is the major crop in the area. Almost every household that has some land and livestock. Animals raised in the area include cattle, sheep, goats and horses. This is consistent with World Bank data which reports that agriculture accounts for more than 45%% of the employment in Tajikistan. Agriculture as a source of income was reported by 18 AHs.
356. The LARP derived data on income sources shows that 38.8% of the surveyed households have income earned from labour. Out 152 AHs, 90 AHs (59.2%) receives remittance from household members working mostly abroad, in Russia and other former Soviet countries. The sum they receive surpass all other sources of income. Business (self-employment) provides the highest average income per household (TJS 2,062.50/month) followed by remittance and paid labour.
357. Most of the households' income is concentrated in the three lowest categories: 300-1,000 TJS (11.92%), 1,100-2,000 TJS (54.97%) and 2,100-3,000 (21.85%) per month. The average monthly expenditure for the surveyed households is 1,696 TJS, with the largest portion (54.45%) spent on food.
358. Tajikistan has achieved a substantial reduction in its poverty rate since 2012. According to the national poverty line, the poverty rate fell from over 37% in 2012 to 29.5% in 2017. Rural poverty fell significantly from 36.1% in 2014 to 33.1% in 2017 across Tajikistan. The poverty rate in DRS is 37.3%<sup>73</sup>.
359. Tajikistan's average household size and dependency ratio are 6.43 members and 56%, respectively. With a high birth rate (3.82 births per woman) and a relatively low life expectancy (69.7 years at birth), the high dependency ratio is mostly driven by large numbers of children. Only 3% of the population is over the age of 65 in Tajikistan, well below the average for developing countries in Europe and Central Asia (ECA) (15%). There is a relationship between poverty status and household size. Poor households have, on average, 7.95 members and a dependency ratio of 62%, while nonpoor households have an average of 5.9 members and a dependency ratio of 53%.
360. In the Project area, women are underrepresented in the workforce. Overall, there are 70 registered female entrepreneurs in seven Project Jamoats. Out of these, 25.71% (18) are tailors working mostly from home. Others sell goods at the local bazaars and some in their kiosks/small shops. Sicharog Jamoat does not have any registered female entrepreneurs. The data obtained from the Jamoats is presented in Table 30<sup>74</sup>.

Table 30: Women-Entrepreneurs in Project Jamoats

Jamoat	No of women entrepreneurs	Type of business	Other remarks
Obigarm	5	One guesthouse owner/ manager, one tailor, three women sell toys and clothing for women at the bazaar.	Women travel to Dushanbe, purchase underwear and other clothing for women and resell in Obi Garm.
Sicharog	0		The village is located high-up on the mountains and there is

<sup>73</sup> 2017, World Bank

<sup>74</sup> Data from the Social and Gender Impact Assessment prepared by ADB in October 2018 for the project.

Jamoat	No of women entrepreneurs	Type of business	Other remarks
			no work for villagers. In addition, traditional and religious values prevent women from seeking employment.
Hakimi	4	Selling female underwear and groceries	
Komsomolobod	35	Work at a bazaar, selling handcrafts	Komsomolobod was an administrative and business centre of Nurobod.
Safedchashma	6	Two have small shops and four are tailors. One of the women makes traditional ornaments for bed linen, pillows and other dowry items.	Tailors usually work from homes and do tailoring work by order.
Mujiharf	6	Tailors	Women work in their home as tradition and religious values restrict them from working outside their homes.
Darband	14	Seven are tailors and seven run small shops	In Darband, women have a workshop where they work.
<b>Total</b>	<b>70</b>		

361. Total youth unemployment<sup>75</sup> in Tajikistan is 16.7% (male: 19.2%, female: 13.7%)<sup>76</sup>. Project-specific youth unemployment was not compiled for this ESIA.

#### 5.14.10 Transportation/traffic – Current and future traffic projections

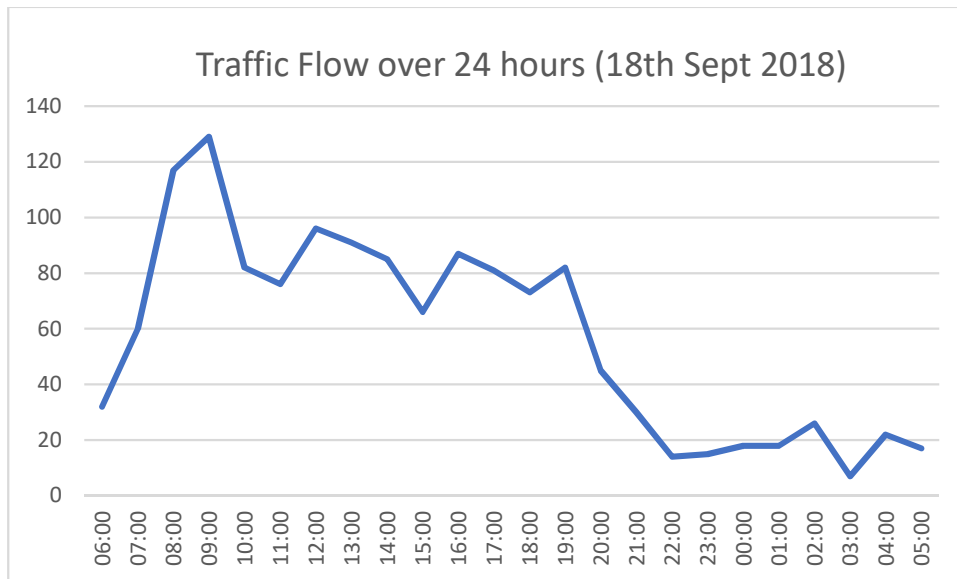
362. There are a few motorised and non-motorised vehicles using the proposed alignment. Site inspections in August 2018 revealed that the alignment was used by agricultural vehicles collecting harvested hillside grass, for use as winter animal feed (fodder) and foot traffic and donkey carts between villages. Traffic counts on the existing M41 were carried out in September 2018.

363. Classified traffic counts were undertaken on the M41 road at the village of Hakimi, approximately 10km south of Nurobod, and the results are presented in Figure 33. From the origin and destination (OD) survey results it was clear that substantially all traffic observed at this point would have to divert if the bypass (new alignment) did not go ahead. Traffic at Hakimi also represented substantially all through traffic that would use the proposed bypass. Counts were undertaken from Tuesday 18<sup>th</sup> to Saturday 22<sup>nd</sup> September 2018 inclusive. 24-hour counts were undertaken on the 18<sup>th</sup> and 22<sup>nd</sup>; 12 hour counts (from 06h00 to 18h00) on the other three days.

<sup>75</sup> Youth ages 15 to 24.

<sup>76</sup> 2009 est. according to CIA World Factbook

Figure 33: Traffic Flow over a 24 hour period (18th Sept 2018)

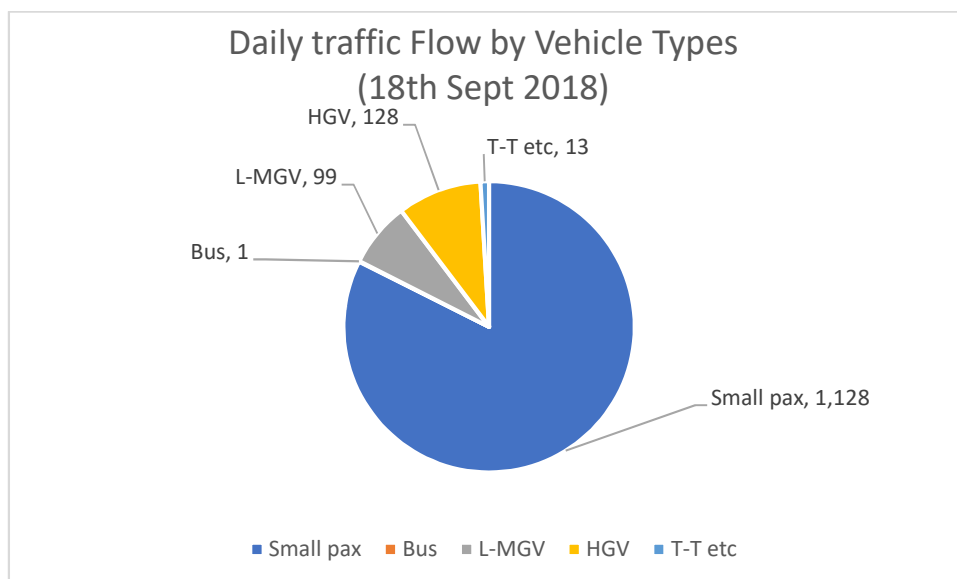


364. 12 to 24 hour expansion factors were derived from the two 24 hour counts and applied to the 12h counts (they differed very little: the expansion factors for all vehicles were 1.37 and 1.38 on Tuesday and Saturday respectively). There was no systematic difference between weekday and weekend traffic and a simple average was taken as representative of base year traffic. (Note that only one bus was observed during the counts. It has therefore been omitted as a separate vehicle class).

365. Small passenger vehicles account for 84% of observed traffic at Hakimi. Assuming the Karamyk border crossing remains closed (it was closed in 2012), future growth is expected to be closely related to growth in GDP per head.

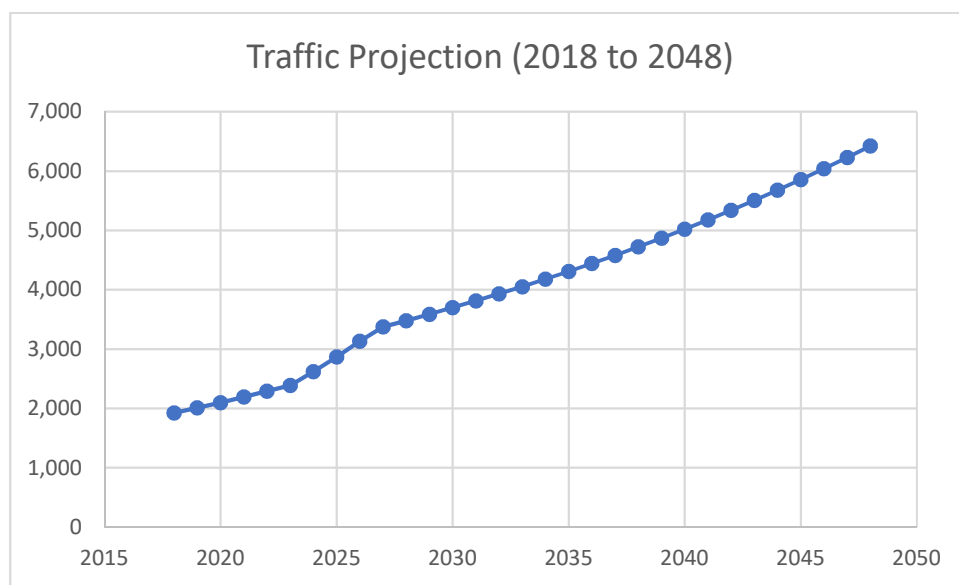
366. The results are summarized in the Figure 34.

Figure 34: Daily flow by vehicle types (Tuesday 18<sup>th</sup> September 2018)



367. Historic growth of GDP per head from 2008 to 2017 was 4.3%; ADB forecasts are for 3.3% in 2018 and 5.4% in 2019. Forecast normal passenger and light-medium goods traffic has therefore been assumed to grow at 4.3% per year from 2019 to 2026, thereafter falling to 3%. Heavy goods traffic growth is expected to be closely related to GDP growth. Annual GDP growth for 2008 to 2017 was 6.6%; ADB forecasts for 2018 and 2019 are 6.0% and 6.5%. For forecasting purposes 6.2% is adopted, falling to 4.3% from 2027. This is presented on Figure 35.

Figure 35: Traffic Growth Projection (2018 to 2048)



#### 5.14.11 Road Safety

368. According to WHO data<sup>77</sup>, reported road traffic fatalities in 2016 amounted to 427, of which 72% males and 28% females. The estimated mortality rate per 100,000 population was 18.1. Most deaths (40%) accounted for pedestrians, followed by vehicle passengers (36%). The average road traffic fatalities are 1 577.

369. In total, traffic incidents are estimated to cost the country around 4.4% of its annual GDP and result in total losses to the economy of around \$250 million annually<sup>78</sup>. However, trends in road traffic deaths have slowly been declining in the past 9 years.

<sup>77</sup> Global status report on road safety 2018. Geneva: World Health Organization; 2018. Licence: CC BYNC-SA 3.0 IGO

<sup>78</sup> Presentation of the Ministry of Transport at the Regional Meeting on Renewing Regional Road Safety Goals and Targets for Asia and the Pacific and the Third Traffic Safety Grand Conference held in July 2016 in Seoul

Figure 36: Trends in Reported Road Traffic Deaths



Source: Department of the State Automobile Inspection, Ministry of Internal Affairs.

## 5.15 Project Impact / Influence Area and Construction Footprint

### 5.15.1 Zone of Influence

370. The impact assessment considers a zone of influence surrounding the project, beyond which significant effects are considered unlikely to occur.

### 5.15.2 Factors influencing the zone of influence

371. **Materials and Waste:** The bulk earthworks carried out during the Soviet era and the availability of material from further slope excavations and rock from tunnel excavations means that there is likely to be a relatively small need for the development of off-site borrow areas. However, for the quantities of spoil produced there will be a need for the development of temporary and permanent off-site disposal areas.

372. **Water Quality:** Site observations suggest that Villages are generally developed downhill from the alignment so silty runoff from the construction works could enter streams used for washing and other purposes. It was noted during field visits that villages generally source water from locations uphill from the alignment<sup>79</sup>. Therefore access to potable water could be adversely impacted, but this risk will be mitigated to ensure uninterrupted supply.

373. **Access Roads / Routes:** Existing access roads will be upgraded to provide village access to the new alignment. Construction phase access routes will be used by the Contractor to bring plant and materials to the alignment from the existing M41 road, these construction access routes would be upgrade by the Contractor, where required, to ensure they are suitable for construction traffic, prior to the

<sup>79</sup> The village residents use narrow gauge plastic pipes (e.g. hose pipe) to bring water from the uphill locations to individual houses. The arrangement seems to be informal carried out by each household for their sole benefit. These pipes will need to be maintained and reprovisioned during the construction phase. This should include relocation of the pipes, where appropriate, to minimize the needs to local population to cross the alignment to fetch water.



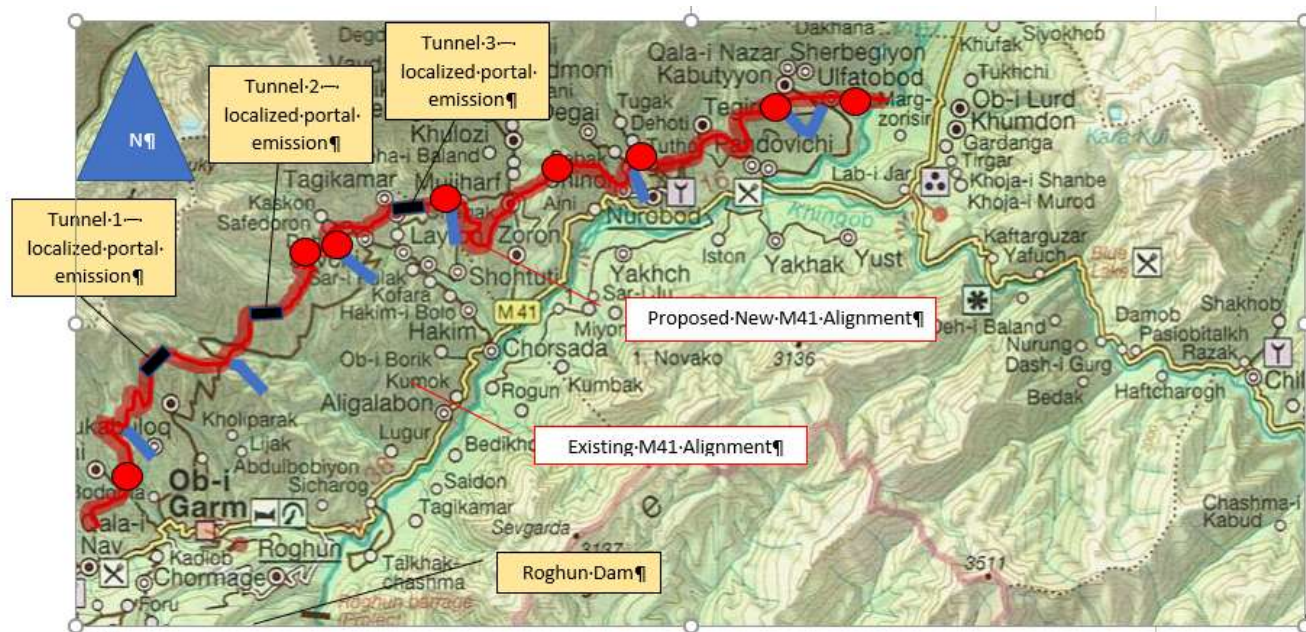
commencement of construction. In some cases, these may utilize the same routings at different phases of the project. The configuration of access roads / routes is still to be finalised.

#### 5.15.3 Zone of Influence

374. Figure 37 shows a zone of influence for the project based on:

- A construction and operation corridor of 60m from the centre line of the road to indicate how construction noise, construction dust and traffic noise may influence the surrounding environment. This is based on an analysis of likely equipment use, in the construction phase and traffic movements in the operation phase. Initial modelling exercise suggest that traffic noise impacts will occur within a “zone of influence approximately 60m either side of the road centreline”.
- Watercourses that could transport silty runoff, domestic (sewage) waste or oily waste to areas remote from the alignment (downstream only).
- Areas where there is residential development i.e. concentrations of population susceptible to construction and operation impact from the alignment.
- At tunnels there will be localized portal emissions. During construction, noise will be limited to the initial development of the portal. Once developed noise will be contained within the tunnel. Outlets for the dust extract fans can create localized air pollution, though there are no residential / sensitive areas close to the six tunnel portals. During the operation phase the tunnel ventilation system and vehicle movements will transfer the vehicle emission pollutants to the tunnel portals. There are no sensitive receptors close to the portals.

Figure 37: Project Zone of influence



Key

	Road alignment
	Zone of influence from construction and operational phase traffic movements (60m)
	Watercourses downstream from alignment (400m indicated)
	Centres of population on alignment (mainly in north / south trending river valleys)

Source: Southern Tajikistan – Tourist Map, Gecko Maps. [www.geckomaps.com](http://www.geckomaps.com) Prepared for this ESIA document

## 6 Consultation and Information Disclosure

### 6.1 Stakeholder Identification and Engagement

375. The census identified 157 Project-affected households, with a total of 1,395 household members. Detailed information on different categories of affected households (AHs) and displaced persons (DPs) by impact type, is provided in the impacts section of the LARP<sup>80</sup>. A summary of impacts is presented in Table E-2 of the LARP.

376. In total, 157 households (1,395 DPs) will be affected as follows:

- 87 residential land plots
- 3 commercial land plots
- 14 agricultural land plots
- 3,974 fruit trees, 1,925 fruit saplings and 6 pine trees and 6,372 other decorative trees
- 12 residential buildings (including 1 used as a cow shed)
- 77 ancillary residential structures
- 5 main non-residential buildings and 2 ancillary structures
- 136 AHs will lose 14 gates, 13 sheds, 1 basement 7 concrete/ clay outer walls and different types of fences and land improvements
- 4 operating businesses
- 3 petrol station workers will lose their employment as a result of the Project
- 17,057 m<sup>2</sup> of Dekhan farm land

377. In addition, 55,584 m<sup>2</sup> of jamoat' land, narrow strips of land, 2 fences and one advertisement board belonging to the communities/ local government, will be affected.

### 6.2 Consultations Undertaken

378. The Transaction Technical Assistance (TRTA) Consultant and the Project Implementation Unit for Road Rehabilitation (PIURR) conducted six consultations along the alignment (Figure 38) with the AHs and wider communities, seven consultations in Hukumat and Jamoat authorities, and four female focus groups discussion. In total, 19% of the total affected population (163 of 857 persons (131 men and 32 women)) participated in the consultations conducted in September and November 2018. Participants received information about the Project, LARP processes, bidding process and expected time for the beginning of the works, as well as the Project Information Brochure detailing the Project-specific entitlements, government decree on the cut-off date, MoT letter on the establishment of the GRM and details on the GRM procedure. Participants were supportive of the project and shared their concerns and suggestions on issues such as road safety, the need for animal underpasses and adequate compensation, among other issues. A summary of the outcomes of the consultations is presented in Table 31.

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<sup>80</sup> Chapter 2 of the project LARP



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Table 31: Summary of the 2018 consultations – places, participants and concerns

#	Date	Rayon	Jamoat	Villages	Attending		Discussion	
					M	F	Question	Response
1	30/08/18	Rogun	Obigarm	Kandak, Bozorak, Labijar, Sh. Aslon and Dehi Alisho	26	1	1) When will construction start 2) Water pipes on the alignment 3) Compensation for businesses	1) Q1 2019 2) Utilities will be relocated 3) New location, buildings and structures compensated.
1.1(f)	31/08/18	Rogun	Obigarm	Kandak	-	8	1) Water pipes on the alignment 2) Compensation for empty homes 3) How will cows cross the road 4) How will children cross the road	1) Utilities will be relocated 2) Replacement cost 3) No underpasses planned. We will recommend animal crossings 4) There will be a footpath, pedestrian crossing and speed bumps
2	1/09/18	Nurobod	Hakimi	Javchi Poyon	14	-	1) What will you look at during visit 2) When will construction start 3) We are looking forward to the road we think all will be better when it is completed 4) I am old, and I hope I will live long enough to see that road completed and to travel comfortably.	1) To give you information, methodology for compensation and answer questions 2) When studies are completed (Gender & Environmental) 3) n/a 4) n/a
2.1(f)	1/09/18	Nurobod	Hakimi	Yavchi Poyon and Siyagulak	-	6	1) I walked 7km to attend, where should I go? 2) May my husband phone from Russia to explain to him?	1) We will visit your house tomorrow. Compensation will be on replacement cost 2) Yes, no problem.

#	Date	Rayon	Jamoat	Villages	Attending		Discussion	
					M	F	Question	Response
							3) My husband is also in Russia. When compensation is paid should he come back? 4) We grow fruit in the village but have few visitors and they pay very little. We have honey but we rarely sell as there isn't enough for us.	3) This is not absolutely necessary. He may give authorization to collect compensation on his behalf 4) n/a
3	3/09/18	Nurobod	Mujiharf	Mujiharfi Kalon	22	1	1) When will construction start 2) What happens if something gets damaged during construction? 3) What should we do if the contractor deposits soil on our property 4) If we have a complaint about the Contractor who do we complain to?	1) Q1 2019 2) If property is damaged compensation is based on replacement value 3) The contractor will have to arrange and agree with local authorities about disposal spots. They will not be allowed to dispose without agreement of authorities and land owner. 4) There will be a GRC established at the Jamoat level when you can lodge complaints. There will also be a construction supervision company who can address complaints
3.1(f)	3/09/18	Nurobod	Mujiharf	Mujiharfi Kalon and Chepak	-	8	1) We are very happy that you came. We do not believe that the road will be constructed. We have been hearing about that road for years!	1) The road will be constructed. We expect construction to start in the first quarter of 2019. 2) The Jamoat will replace your land. The valuator will calculate



#	Date	Rayon	Jamoat	Villages	Attending		Discussion	
					M	F	Question	Response
							<p>2) You are acquiring my son's house. He will not have enough land to make a new house. When you pay compensation, will he be able to purchase an apartment in Dushanbe.</p> <p>3) There will be a lot of dust during the construction. You can see we have so much dust even without construction.</p> <p>4) If the contractor does not sprinkle water, what should we do? We saw on some other project how much dust they make</p>	<p>a replacement cost for a new house and other structures and assets affected. However, I am not sure if for the compensation amount your son could purchase an apartment in Dushanbe.</p> <p>3) The Contractor will be obliged to take positive action (sprinkle water) during the construction and thus, minimise the effects of dust.</p> <p>4) You'll have a GRC established at the Jamoat level and you can lodge your complaint there with your Rais or any other designated grievance redress committee member. In addition, there will be a construction supervision company and you may complain to the site engineer</p>
4	4/09/18	Nurobod	Komsomolabod	Deagi, Tuhtor, Bulbuldara, Tegermi and Pandovchi	16	-	<p>1) There were people before you. They came, asked the same questions and measured our properties.</p> <p>2) Some people that are affected are not on your list and some people who are on</p>	<p>1) Yes, you had a resettlement specialist from the design company. They made a general list of displaced persons and their assets. This team will measure exactly everything that is going to be affected by the project. You will be with us</p>

#	Date	Rayon	Jamoat	Villages	Attending		Discussion	
					M	F	Question	Response
							<p>your list, do not live in our village</p> <p>3) Will everything that is affected, be paid for?</p> <p>4) If we have a complaint should we go to the Raisi Jamoata?</p>	<p>when we measure affected land, structures, count affected trees, etc. A valuation will be done and compensation calculated based on our inventory of losses</p> <p>2) We have a topographer with us and we will determine what is going to be affected. Affected assets of those DPs who are not on the list will be documented and the DPs will be added to the list of displaced persons.</p> <p>3) Yes, except unauthorised use of land. However, any structure, land improvement or fruit trees on such land, will be compensated</p> <p>4) There will be a grievance redress committee at the Jamoat level and Raisi Jamoata, as well as Raisi Mahale. You may lodge your complaint to the GRC focal person or any other GRC member.</p>
5	6/09/18	Nurobod	Safedcheshma	Tag	20	-	1) During the SES and the DMS, who will be present?	1) Social safeguards specialists, Raisi Mahale and the Jamoat's representatives will be present.

#	Date	Rayon	Jamoat	Villages	Attending		Discussion	
					M	F	Question	Response
							2) How will you pay for the fruit trees? 3) If the water pipes are affected during the construction, who will pay for the damages?	2) All affected fruit trees will be compensated. Compensation will reflect income replacement. 3) All these amenities will be relocated where necessary. The contractor will repair any damage resulting from the construction activities.
6	30/10/ 19	Nurobod	Daraband	7 <sup>th</sup> Microrayon	17	-	1) When will the road construction start? 2) When will you pay us for our affected assets? 3) Will there be some opportunities for women to work as cooks, bread bakers, cleaners etc during the road construction?	1) We expect the works start around mid of 2019. 2) All compensation will be paid before the Contractor starts the works. 3) Yes. We will inform you about positions which will be needed by the Contractor
6.1(f)	30/10/18	Nurobod	Daraband	7 <sup>th</sup> Microrayon	-	7	1) When will the road construction start 2) Will there be some opportunities for women to work as cooks, bread bakers, cleaners etc during the road construction?	1) We expect the works start around mid of 2019. 2) Yes. We will inform you about positions which will be needed by the Contractor

### 6.3 Information Disclosure

379. After Government and IFI approvals, the implementation-ready LARPs for Packages 1 and 2 will be uploaded to the relevant IFI and MoT websites. As mentioned in Section 1.2 of this ESIA, the Project road is divided into three packages. Separate LARPs have been created for Package 1 by ADB/OFID, and for Package 2 by EBRD. No land acquisition or resettlement is expected for Package 3 of the Project, which is funded by AIIB.

### 6.4 Process for Consultation During Implementation

380. A Stakeholder Engagement Plan (SEP) has been prepared as a standalone document for the MoT to identify key stakeholders and define communication channels and plans regarding the Project. It provides an overview of relevant national legislation, the ADB Safeguards Policy Statement requirements, the EBRD ESP 2014, AIIB's Environmental and Social Framework, European Union (EU) directives and international best practice related to information disclosure and outlines the general approach to stakeholder engagement and public consultation.

381. The SEP is a live document that will be reviewed and updated periodically and in line with new activities, changes in Project design and newly identified stakeholders. The SEP summarises the methods, procedures, policies and activities that will be implemented by the PIURR to inform stakeholders in an inclusive and timely manner about the potential impacts of the Project. The public will be able to access and review this SEP at designated locations.

### 6.5 Grievance Redress Mechanism

#### 6.5.1 Overview

382. The scope of the Grievance Redress Mechanism (GRM) is to address issues related to involuntary resettlement, social and environmental performance, and information disclosure. AH will have the right to file complaints and/or queries on any aspect of the Project, including land acquisition and resettlement, and appeal any decision, practice or activity related to the Project. The PIURR will ensure that grievances and complaints about any aspect of the project are acknowledged and addressed in a timely and effective manner.

383. The Grievance Redress Committees (GRC) have been established at the Jamoat/village level in 17 of each project villages, by requirement of MoT Letter No. 872, issued on 27 August 2018, and will function for the duration of the project's implementation. There were 17 GRCs formed. A Focal Person (FP) was appointed at each village and at the MoT PIURR. The PIURR FP participated in all consultations with communities (held in September 2018) and shared contact details with participants for questions related to the Project and in the event of grievances for the entire duration of the Project, including the preparation and implementation of the LARP. All efforts will be made to settle issues at the Project level.

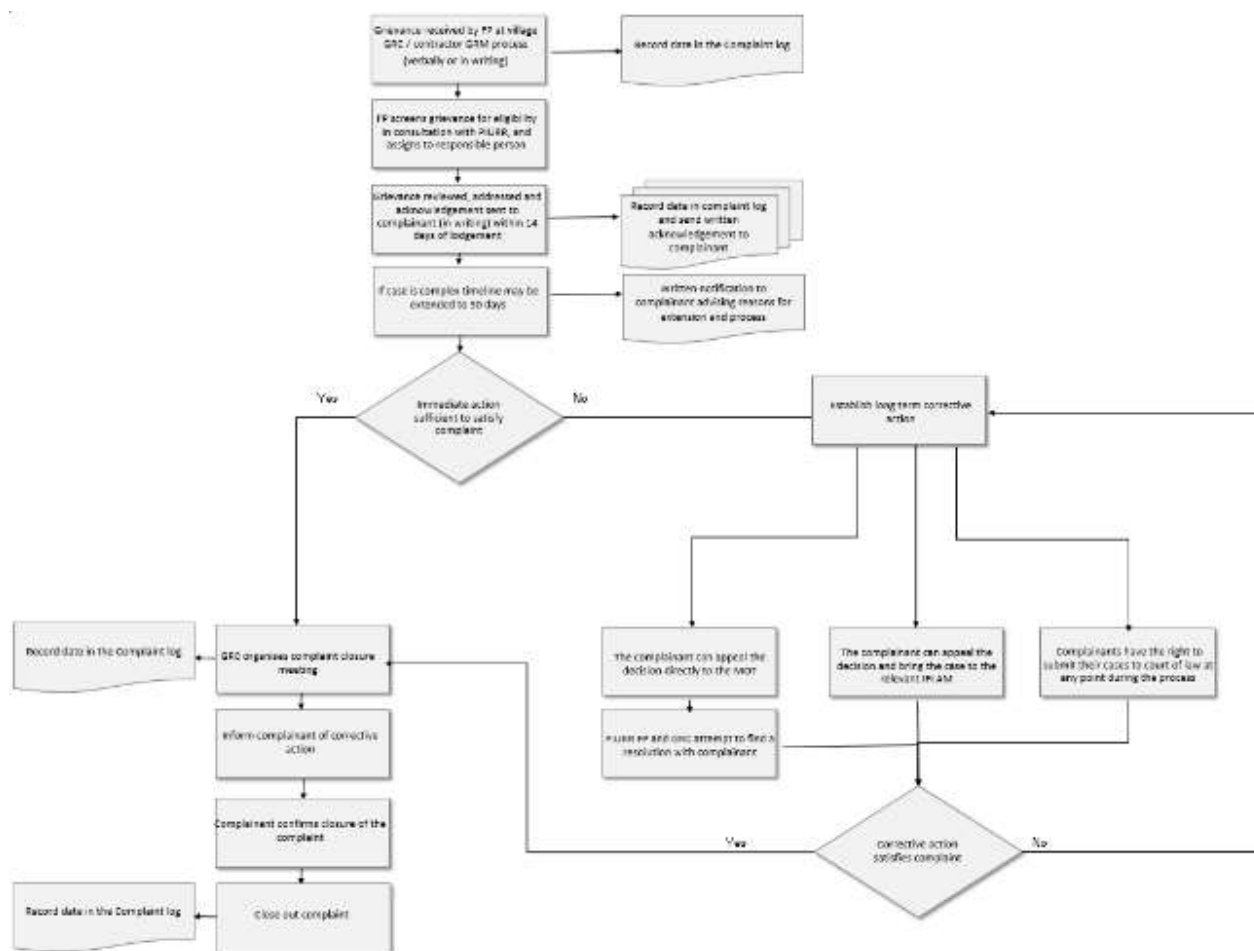
384. When and where the need arises, this mechanism will be used for addressing any complaints that may arise during the implementation of project. The grievance mechanism is scaled to the risks and adverse impacts of the project. It addresses affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily

accessible to all segments of the affected people at no cost and without retribution. The mechanism does not impede access to Tajikistan judicial or administrative remedies. MoT will appropriately inform the affected people about the mechanism before start of commencement of any civil works.

#### 6.5.2 Grievance Focal Points, Complaints Reporting, Recording and Monitoring

385. The process in the form of a flowchart is shown in Figure 39.

Figure 39: Grievance Redress Mechanism Process



386. The following are the procedural steps to file a complaint, pose an inquiry on matters relating to project implementation, environmental concerns and other issues regarding the Project.

387. It should be noted that multiple methods for raising grievances are highlighted below, and all grievances will be addressed in the same way via a process that is consistent across the Project alignment. The option to submit grievances anonymously should be available to complainants using the public grievance form.

388. The person affected by the Project should raise their suggestions / concerns / complaints via one of the GRMs available, at the first phase an attempt will be made to resolve complaints via the regional level grievance mechanism with the initial complaint

- lodged with the FP at the village GRC. The FP receives the grievance, while the FP and MoT PIURR representatives screen for eligibility. If eligible, the FP organises a meeting of the GRC.
389. The complaint should be reviewed, acknowledged, recorded on the complaints log and a decision made on the relevancy of the complaint within 14 days of initial lodgement (unless the case is complex, in which case the review period may be extended to 30 days). Full details can be found in the SEP.
390. If a DP is not satisfied with MoT's decision even after GRC review of the grievance, then s/he can lodge the grievance to the Tajikistan legal system for registration, revision and resolving the case. All efforts will be made to resolve grievances at the village/Project level through community consultation with the complainant. If this is not possible, attempts will be made to resolve the grievance at the PIURR level to avoid/minimise litigation. In addition, the complainant can appeal the decision and bring the case to the IFI's Accountability Mechanism (AM). The GRM at the Project level does not in any way impede the DPs' access to the IFI's AMs. If DPs want to register a complaint, the PIURR Focal Person will provide the complainants with the relevant contact information for each section.
391. Complaints may also be made directly to the contractor, using the contractors GRM process:
392. There is one woman and one DPs representative in each GRC.
393. All complaints regardless of the outcome and solutions will be properly documented by the MoT PIURR within the GRC Complaints Register, and made available to IFIs for periodic review, monitoring and evaluation purposes in line with the SEP.



## 7 Assessment of Environmental and Social Impacts

### 7.1 Assessment Process

394. This chapter sets out approach to impact assessment and mitigation that can be easily understood by design engineers, construction contractors and implementing agencies.

395. The ESIA document is designed to serve the objectives of a number of stakeholders, including:

- The public – including directly or indirectly affected individuals on the alignment, individuals and groups with interests for the population and environment along the alignment (Government agencies and NGO);
- The Government authorities in Tajikistan – to ensure that the project can be designed and constructed to meet all environmental legislation applicable to Tajikistan;
- International Financial Institutions (IFIs) – In this case the Asian Development Bank (ADB), the European Bank of Reconstruction and Development (EBRD) and the Asian Infrastructure Investment Bank (AIIB) who need to be assured that the project will be designed, constructed and operated within the policy requirements of the IFI in order that funds can be released for the design, construction and operation of the project.
- Construction Phase Contractors – A Contractor will be employed by the Government of Tajikistan to build each package of the project. The ESIA document will be used by the Contractor to confirm the environmental, social, health and safety factors that they must incorporate into their working processes. As part of this ESIA, an Environmental and Social Management Plan (ESMP) has been prepared, that will be updated during the construction and operational phases as further details are made available. It will identify the environmental and social issues that will need to be addressed.
- In turn, as part of the Contract requirements, the Contractor will prepare a Contractor Environmental and Social Management Plan (CESMP) that will detail how the contractor will carry out the works in accordance with the ESMP. This Contractor generated document will be approved by the client and become part of the construction contract and environmental performance will be audited against this document.

396. In terms of the assessment the public, Government authorities and the IFIs look to confirm that environmental “aspects” are addressed i.e. noise and air quality impacts, water quality impacts, ecological impacts, etc. Therefore the impact section assesses the project under these topics. However, the Contractor looks at the project in terms of processes i.e. setting up and operating a construction camp, setting up and operating processing facilities (quarries for material, crushing and grading facilities and concrete and bitumen manufacturing and the road construction process of filling, rolling and grading and forming the base and running surface of the road and erecting road safety element. The impact assessment reports under these headings which are taken forward into the ESMP.

397. The sections of the Assessment Process are:

- Baseline data collection – Site visits, document review, preparation of an REA, and a scoping exercise to identify key environmental, social and safety issues;
- Design Phase mitigation – environmental, social and safety elements that the design consultant needs to incorporate into the design.
- Construction Phase impacts and effects – identification of the environmental, social and safety impacts and effects during the construction phase.
- Construction Phase mitigation – Mitigation measures that need to be undertaken by the Contractor during the construction phase;
- Operation Phase impacts and effects– identification of the environmental, social and safety impacts and effects during road operation
- Operation Phase mitigation – Mitigation needed during the operational phase of the road.

#### 7.1.1 Risk Matrix Approach for Impact Assessment

398. The assessment of impact will follow a risk matrix approach where the likelihood of an environmental, safety or social impact occurring is matched with the consequence (severity) of the impact occurring. The matrix ranks potential risks as low, medium, high or extreme, identifying the need for mitigation, and incorporation into the ESMP. The assessment of potential severity of the impacts takes into consideration the presence and vulnerability of sensitive receptors, and adopts a precautionary approach.
399. All risks classified as medium or higher are considered significant, and require mitigation.
400. Figure 40 sets out the risk matrix derived for this project. This matrix approach should be adopted by the Contractor when they are developing their own CESMP.

RISK RATING		LOW 0 to 3 ACCEPTABLE  OK TO PROCEED	MEDIUM 3 to 6 UNDESIRABLE  TAKE MITIGATION EFFORTS (good site practice)	HIGH 7 to 10 UNACCEPTABLE  CLEARLY IDENTIFIED MITIGATION WILL BE REQUIRED IN ESMP	EXTREME 11 to 12 INTOLERABLE  PLACE EVENT ON HOLD
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		CONSEQUENCE / SEVERITY OF IMPACT			
		<b>INSIGNIFICANT / MINOR</b> <ul style="list-style-type: none"> <li>Easily handled within the normal course of operations with no additional costs</li> </ul>	<b>MODERATE</b> <ul style="list-style-type: none"> <li>Immediate time / resource reallocation will be necessary with a moderate estimated cost</li> </ul>	<b>MAJOR</b> <ul style="list-style-type: none"> <li>Environmental conditions disrupted but can be reversed.</li> <li>Potential for serious injury / fatality</li> <li>Significant disruption to community</li> <li>Require significant resources to rectify</li> </ul>	<b>CRITICAL</b> <ul style="list-style-type: none"> <li>Catastrophic environmental damage. Fines likely.</li> <li>Potential for multiple fatalities</li> <li>Significant irreversible disruption to community</li> <li>Significant resources needed to rectify.</li> </ul>
		>>>>>>>>>>>> Environmental / safety / social impact increasing in severity <<<<<<<<<<<<<<			

<b>RISK / LIKELIHOOD OF IMPACT</b>	<b>IMPROBABLE</b>	<<<<<<<<<<<<<<  Likelihood of impact increasing<<<<<<<<<<<<<<	<b>LOW</b> <b>1</b>	<b>MEDIUM</b> <b>4</b>	<b>MEDIUM</b> <b>6</b>	<b>HIGH</b> <b>10</b>
	<b>POSSIBLE</b>		<b>LOW</b> <b>2</b>	<b>MEDIUM</b> <b>5</b>	<b>HIGH</b> <b>8</b>	<b>EXTREME</b> <b>11</b>
	<b>PROBABLE</b>		<b>MEDIUM</b> <b>3</b>	<b>HIGH</b> <b>7</b>	<b>HIGH</b> <b>9</b>	<b>EXTREME</b> <b>13</b>
	<ul style="list-style-type: none"> <li>Environmental / safety / social impact is unlikely to occur (&lt;20%)</li> </ul>					
	<ul style="list-style-type: none"> <li>Environmental / safety / social impact is likely to occur (20% to 90%)</li> </ul>					
	<ul style="list-style-type: none"> <li>Environmental / safety / social impact almost certain to occur (&gt;90%)</li> </ul>					

401. The potential adverse environmental and social impacts for each of these construction and operational phase impact areas are described in the following sections..

## 7.2 Design Phase Mitigation – Design Standards and Contract Documents

402. The design consultants have reviewed the works carried out during the Soviet era and concluded that modification was needed to bring the road design (primarily road safety and engineering design requirements) up to current standards. This required modifications to cut slopes (flatter slopes for slope stability), road curvature (to maintain safe design speeds on the alignment) and the modification / reconstruction of bridges that had suffered from lack of maintenance creating structural safety (durability) issues. The two soviet era tunnel sections (Kandak and Karagach) and the new tunnel section (Tagikamar) are all new designs.

403. A number of modifications of the design have been made since the original specification, largely to reduce potential environmental, social and safety impacts from the project. These include:

- Realignment to avoid a cemetery on the original routing (km 70 +500);
- Addition of the Tagikamar tunnel, tunnel no 3, (Package 2) to eliminate a stretch of winding road, improving journey times and road safety;

404. Asphalt and concrete pavement types have been considered. Priority was given to asphalt. This type of pavement has been chosen because there is:

- less noise during operation, compared to concrete (less noise nuisance for nearby residents and wildlife);
- less vibration compared to concrete (many buildings along the alignment are observed to be of mudbrick construction);
- better visibility of road markings on black asphalt (edge and lane markings – so improved road safety);
- better in winter snow/ice melt – it absorbs more heat from the sun causing snow and ice to melt much quicker, and is not affected by frost heave, or road salt;
- it can be recycled more easily than concrete and is generally cheaper to maintain.

405. A number of design amendments were made to improve road safety on the alignment, as a response to community consultations and a road safety audit conducted in November 2018<sup>81</sup>, as follows:

- An advisory 40 km/h speed limit in villages will be applied. This may be made mandatory subject to approval by the MoT and the Tajik Traffic Police.
- At the location of the crossings in villages, there will be a raised “island” across the parking lanes, which means that although the parking lanes will increase the road width to 4 lanes in the villages, the raise islands will reduce it back to 2 lanes at these locations, so pedestrians will only need to cross a maximum of 2 lanes at any location.
- The provision of parking lanes in villages may provide an economic opportunity, as they provide a location for drivers to stop and rest, and a location where local people can sell produce;
- Crossing points will be moved away from the apex of intersections and – away from the path of turning traffic – to reduce the potential for accidents;
- Warning signs will be installed at all pedestrian crossings;
- Various improvements to road markings and signage; and
- Modifications to proposed tunnel control offices to improve operator safety during access / exit.

406. Provision will be made for the installation of 6 inch pipes at intervals below the carriageway in residential areas to allow passage of water pipes and other village services. The location of the pipes will be finalised in discussion with the local communities. The 6 inch pipes would provide a conduit for water pipes, and ensure they can be maintained and replaced without excavating the carriageway. This design solution would avoid the need to excavate the carriageway to maintain the water pipes.

407. The designer will aim to maximise the operational lifespan of the project and minimise the need for maintenance and refurbishment (and all associated emissions). Highly efficient mechanical and electrical equipment, such as light emitting diode (LED) lighting will be used within the designs.

408. The environmental, social and safety design elements outlined above, and the mitigation measures set out in the Environmental and Social Management Plan (ESMP), will be incorporated into the tender specifications for the construction Contractors, in line with

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<sup>81</sup> Detailed design stage road safety audit report for the proposed Obigarm-Nurabod Highway, northern Tajikistan, Road Safety International

the relevant procurement processes of each IFI. Contractors will be obliged to include provisions for developing and implementing these actions and management plans.

### 7.3 Construction Phase Impacts and Mitigation

409. The following paragraphs identify the potential impacts and effects from the construction of the project. The information is entered into a risk matrix (likelihood of an event occurring against the consequence / severity of an event) to give a risk rating ranging from Low (low likelihood and little effect up to Extreme (where the event has a high possibility of occurring with irreversible and resource consuming consequences).

#### 7.3.1 Degradation of Landscapes and Soil Erosion

##### 7.3.1.1 Impacts

410. Some areas are sensitive to soil erosion, particularly when surface vegetation is removed, and when this is combined with rain events. Large expanses of open ground (cuttings and embankments) are not visually attractive. When undertaking earth works and levelling areas anti-erosive measures should be implemented and speedy re-cultivation should be followed to stabilise the soil and reduce the visual impacts.

##### 7.3.1.2 Mitigation

411. Excavation of borrow pits will be avoided where possible by reuse of existing spoil in construction (see Section 7.3.13), and locations will be selected in a manner that aims to minimise visual impacts.

412. The road width and the temporary construction working areas adjacent to the road alignment, that will require clearing to construct the road, will be clearly demarcated on ground, using marker posts at regular intervals. The Contractor will take measures to ensure the construction works are restricted to the demarcated construction working areas.

413. During land clearing operations, topsoil will be collected, preserved, store using good practice measures, and reused as a base for turfing of embankment slopes or development of barren areas along the road side.

414. After completion of construction and rehabilitation works, and after the use of borrow pits, the landscape shall be restored to a standard that is of equal quality to its original condition. Plant species that are native to the project area shall be used.

415. The need for on-site environmental action to preserve landscapes and minimise soil erosion are identified in the ESMP section of this ESIA. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:

- Landscape and Visual Management Plan
- Soil, Erosion and Topsoil Management Plan
- Waste and Materials Management Plan (particularly with regards to borrow pits)

416. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans

- Construction Plans and Method Statements
- Method Statements for Temporary Activities

417. With mitigation in place the post mitigation risk is assessed as “low”, and effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Degradation of landscapes and soil erosion	MINOR	IMPROBABLE	LOW	NO

### 7.3.2 Soils, Geology and Hydrogeology

#### 7.3.2.1 Impacts

418. Soil and water contamination can occur as a result of accidental spillages, such as oil leakage from machinery and stock piled construction materials and asphalt, oil products and chemicals, penetrating into the soil and/or surface or ground water.
419. The construction process can result in adverse impacts away from the alignment, through migration of spilled liquids, silty run-off and oil leakage from poorly maintained mechanical plant or during refuelling. This run-off can enter soils and potentially migrate to groundwater or, via underground flow, to surface water bodies, and adversely affect downstream communities and aquatic ecology.

#### 7.3.2.2 Mitigation

420. Mitigation is generally in the form of good site practices implemented by the contractor and checked during periodic audit by the supervising engineer. Mitigation measures include using bunds to guide unpolluted water generated upstream from the alignment around construction works areas, to the downstream unpolluted, silt traps and bunds on the downstream side of the site. Together with sumps for settlement before discharge, drip traps and good maintenance of equipment.
421. This will require management by the contractor in the relevant management plans in their CESMP. It has been incorporated into ESMP for contractor implementation, which should be secure via their contract. With these mitigation measures adopted by the contractor in the CESMP, impacts can be reduced to an acceptable level. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:
- Water Resources Management Plan, including:
    - Ground Water Management
    - Waste Water Management
  - Emergency Response Plan, including:
    - Spill Management Plan
  - Waste and Materials Management Plan (WMMP), including:
    - Spoil Disposal Plan
    - Asbestos Management Plan
  - Soil, Erosion and Topsoil Management Plan



422. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction plans and Method Statements
- Method Statements for Temporary Activities

423. Landslide and erosion impacts are covered in Section 7.3.6.

424. With mitigation in place the post mitigation risk matrix is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Pollution of soils, geology and hydrogeology by construction runoff and accidental spills	MINOR	POSSIBLE	LOW	NO

### 7.3.3 Climate Change - GHG Emissions Due to Construction

#### 7.3.3.1 Impacts

425. This ESIA chapter refers to the EU EIA Directive, because all EBRD Category A projects require an EIA aligned with EU legislation. The requirement to consider climate change in EIA, results from the 2014 amendment to the EIA Directive (2014/52). This requires “a description of the likely significant effects of the Proposed Scheme on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the Proposed Scheme to climate change.”

426. To meet this requirement an assessment of GHG emissions arising due to construction has been undertaken. This is because the impacts of GHGs directly contribute to climate change. These impacts are global and cumulative in nature, with every tonne of GHGs contributing to impacts on natural and human systems. GHG emissions result in the same global effects wherever and whenever they occur, therefore the sensitivity of different human and natural receptors is not considered.

427. GHGs are natural and anthropogenic gases that occur in the atmosphere and absorb and emit infrared radiation thereby maintaining the Sun’s energy within the Earth’s atmosphere. There is an scientific consensus that the major increase in the concentration of GHGs from man-made sources is contributing to global warming and climate change.

428. The seven main GHGs defined by the Kyoto Protocol are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons, perfluorocarbons, Sulphur hexafluoride and nitrogen trifluoride. In combination, these GHG emissions are commonly expressed in terms of carbon dioxide equivalents (CO<sub>2</sub>e) according to their relative global warming potential. For this reason, the shorthand ‘carbon’ may be used to refer to GHGs.

429. The first step in this assessment of GHG emissions was to set the scope of the assessment. Emissions sources were included or excluded from the assessment, based

on their potential to result in significant emissions. The scope of this assessment has been informed by professional judgement and is summarised in Table 32.

430. Table 32: Scope of Construction Greenhouse Gas (GHG) Assessment

<b>Emissions source</b>	<b>PAS2080 Ref<sup>82</sup></b>	<b>Scope</b>	<b>Justification</b>
Emissions 'embodied' within the construction materials	A1-3	In	Emissions from the construction materials of the Project are expected to have a large magnitude.
Transport of materials to site	A4	In	Emissions from the transport of materials to site are expected to have a large magnitude
Plant use on site	A5	Out	Emissions from the use of plant on site are expected to have a small magnitude compared to other emissions sources based on professional judgement based on previous project experience.
Transport of construction waste	A5	Out	Emissions from the transport of construction waste Project are expected to have a small magnitude.
Disposal of construction waste	A5	Out	Emissions from the disposal of construction waste, which is expected to be predominantly inert, are expected to be small.
Land use change – removal of Biomass	A5	Out	Emissions from the removal of biomass are expected to be negligible

431. Having set the scope of the assessment, the next step was to quantify the magnitude of emissions. This was undertaken using Project design information, and emissions factors available from publicly available sources. Assumptions were used where data was unavailable. This assessment limitation means that there is a very high level of uncertainty associated with the results published in this chapter. As such it is recommended that this assessment, and its scope, is reviewed and updated once further information is available. The design information, assumptions and emissions factors used in this assessment are presented in Table 33.

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<sup>82</sup> PAS2080 Refs are lifecycle reference codes used to consistently define construction Project lifecycle stages – BSI (2006) PAS2080: Carbon Management in Infrastructure  
<https://shop.bsigroup.com/ProductDetail?pid=000000000030323493>

Table 33: Design Information, Assumptions and Emissions Factors Used in the GHG Assessment

Description	Data type	Value	Unit	Source
Total bridge length	Design information	1,057	m	Inception Report (draft 2) Assessment of Climate Change Risks to Vahdat-Kyrgyz Border Rehabilitation Project
Bridge material	Assumption	100% Steel	N/A	Assumption - based on design of longest bridge
Bridge material quantity	Assumption	35	t/m	Assumption - Other bridge examples
Steel emissions factor	Emissions factor	1.46	tCO <sub>2</sub> /t	Hammond and Jones 2011 Inventory or Carbon and Energy
Total tunnel length	Design information	5901	m	Inception Report (draft 2) Assessment of Climate Change Risks to Vahdat-Kyrgyz Border Rehabilitation Project
Tunnel external diameter	Design information	11	m	Inception Report (draft 2) Assessment of Climate Change Risks to Vahdat-Kyrgyz Border Rehabilitation Project
Lining thickness	Assumption	0.5	m	Assumption - Other tunnel examples
Tunnel material	Assumption	100% tunnel lining	N/A	Assumption
Concrete emissions factor	Emissions factor	0.107	tCO <sub>2</sub> /t	Hammond and Jones 2011 Inventory or Carbon and Energy
Total length of new road	Design information	75.85	km	Inception Report (draft 2) Assessment of Climate Change Risks to Vahdat-Kyrgyz Border Rehabilitation Project
Road works	Assumption	100% new road	N/A	Assumption
Road surface width	Design information	12	m	Design drawing
Road base width	Design information	14	m	Design drawing

Description	Data type	Value	Unit	Source
Road surface depth	Assumption	0.1	m	Assumption - standard road construction
Road base depth	Assumption	0.5	m	Assumption - standard road construction
Road surface material	Assumption	Asphalt	N/A	Assumption
Road base material	Assumption	Aggregate	N/A	Assumption
Asphalt	Density	2300	kg/m <sup>3</sup>	Hammond and Jones 2011 Inventory or Carbon and Energy
Aggregate	Density	2240	kg/m <sup>3</sup>	Hammond and Jones 2011 Inventory or Carbon and Energy
Asphalt	Emissions factor	0.086	tCO <sub>2</sub> /t	Hammond and Jones 2011 Inventory or Carbon and Energy
Aggregate	Emissions factor	0.0052	tCO <sub>2</sub> /t	Hammond and Jones 2011 Inventory or Carbon and Energy
Transport Distance	Assumption	50	km	RICS 2017 Whole life carbon assessment for the built environment
Transport emissions factor	Emissions factor	0.203	t.km	GHG Protocol 2017

432. Using the above information and assumptions, it was possible to quantify emissions from construction materials and transport for the Project. The results of this assessment are presented in Table 34.

*Table 34: Results of GHG Assessment*

Emissions source	Emissions embodied in the materials(A1-3) - tCO <sub>2</sub>	Emissions from Transport of Materials (A4) - tCO <sub>2</sub>	Total - tCO <sub>2</sub>
Bridges	54,000	400	54,000
Tunnels	23,000	2,000	25,000
Road surface	15,000	18,000	34,000
Total	92,000	21,000	113,000

#### 7.3.3.2 Mitigation

433. The contractor will maximise the use of construction materials and products with recycled or secondary and low carbon content, from renewable sources, and offering sustainability benefit. The contractor will use locally-sourced materials where available and practicable will be used to minimise the distance materials are transported from source to site. Efficient construction plant and delivery vehicles, and / or those powered by electricity from alternative / lower carbon fuels will be used during construction, where possible.

434. With mitigation in place the post mitigation risk is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Climate change – GHG emissions	MINOR	POSSIBLE	LOW	NO

#### 7.3.4 Climate Change – Adaptation and Resilience of the Project

##### 7.3.4.1 Impacts

435. Climate change and associated natural hazards is a key issue affecting road infrastructure during both construction and operation. The climate change and seismic risks to the project were assessed under separate dedicated assessments which aimed to identify material climate change related risks to the project and propose mitigating structural and non-structural improvements to increase the project’s resilience. “Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project” contracted by EBRD covers the climate risks to package 2, and a Climate Risk and Vulnerability Assessment screening contracted by ADB was undertaken for package 1. The assessments identified the following relevant hazards to the project:

- Increasing ambient average temperature and temperature ranges;
- Increasing average precipitation and short-term heavy rains;
- Increase in melted water coming from higher altitudes resulting in an increase in slush flows on the Road or around the Road;
- Increasing average levels of wind and short-term stronger winds;
- Changes in seismicity.

##### 7.3.4.2 Mitigation

436. Relating to impacts identified during the construction phase the ESMP section of this ESIA outlines the actions that will be included in a Climate Resilience Construction Management Plan<sup>83</sup>, to be developed by the PIURR and approved by Supervising Engineer. Contractors will be required to develop and implement measures to comply with this plan.

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<sup>83</sup> In this case, the management plan covers the pre-construction (design) phase in addition to the construction phase impacts

437. With mitigation in place the post mitigation risk is assessed as “medium” and is recommended to be monitored throughout construction.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Climate change resilience	MODERATE	POSSIBLE	<b>MEDIUM</b>	<b>YES</b>

### 7.3.5 Natural Hazards – Seismic Conditions

#### 7.3.5.1 Impacts

438. The project road is located in region that is seismically active and categorised as a very high seismic hazard zone of  $PGA > 0.4g$ . It is in a zone subject to 9-magnitude earthquakes on the Medvedev–Sponheuer–Karnik (MSK-64) scale. The project will be result in the creation of a new road and structures in this area that have the potential to be vulnerable to these natural hazards.

#### 7.3.5.2 Mitigation

439. To mitigate this potential vulnerability, the road and associated structures have been designed in accordance with the Tajik Seismic Code GNIP RT 22-07-2015<sup>84</sup>. The factor used on the MCK 64 scale is 9 (the highest), to ensure the road and associated structures are able to withstand seismic activity of this scale.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Natural Hazards – Seismic Hazards	MAJOR	IMPROBABLE	<b>MEDIUM</b>	<b>NO</b>

### 7.3.6 Natural Hazards – Landslides, Mudslides and Floods

#### 7.3.6.1 Impacts

440. The project area is susceptible to landslides, mudflows and floods. The project road has the potential to increase the likelihood of landslides and mudflows occurring, due to the construction works, such as cuttings, embankments, tunnelling, bridge foundations and vegetation clearance.

441. The project also has the potential to be vulnerable to landslides, mudslides and floods, with associated risks to construction workers, and the surrounding communities.

#### 7.3.6.2 Mitigation

442. A Slope Stabilisation Plan will be developed and will determine the specific areas of slope stabilisation works ahead of construction, reducing the risk of landslides, mudslides, and therefore the risk to construction workers and surrounding communities. The Water Resources Management Plan will prevent the construction activities increasing the risk of floods occurring, and the severity of the consequence.

<sup>84</sup> Architecture and Construction Committee Under the Government of the Republic OF Tajikistan – City Construction Norms and Rules Republic of Tajikistan GNIP RT 22-07-2015 Earthquake Resistant Construction



The Construction Plans and Method Statements Plans will outline the specific construction techniques for each element of the Project to ensure the construction activities do not increase the risks associated with natural hazards. A Tunnel Construction Plan and Blasting Management Plan will also be developed to minimise the risk of the construction works resulting in these hazards, or being affected by them. All Construction Plans will cross reference relevant; environmental, social and health and safety sub-plans.

443. The Avtostrada Engineering Geology Surveys<sup>85</sup> identified locations along the route where there is potential for dangerous geological processes (landslides and mudslides) and recommended specific mitigations for each location. These are provided in Chapter 11 (Annex 3). These will be implemented as appropriate during construction.

444. On-site analysis will also be conducted and additional stabilisation measures applied as necessary, including facing unstable slopes with rock mortar, reinforcing walls, gabion walls, smaller reinforced concrete walls to stop erosion of poorer materials, rock mortar facing to prevent erosion.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Natural Hazards – Landslides, Mudslides & Floods	MAJOR	IMPROBABLE	MEDIUM	NO

### 7.3.7 Construction Noise

#### 7.3.7.1 Impacts

445. Noise will be generated in the course of the works and in the transportation of construction materials and haul truck traffic.

446. In assessing construction phase noise impacts this ESIA focuses on four areas of potential impact:

- Noise from ground breaking
- Noise from asphaltting
- Noise from drilling and blasting (associated with slope stabilization and development at tunnel portals)
- Noise from camp activities and transportation

447. Noise generating Powered Mechanical Equipment (PME) has been identified for each major activity. Sound Power Levels (SPL) have been assigned based on Appendix A of the Australian Standard AS 2436—2010 Guide to noise and vibration control on

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<sup>85</sup> Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 424+80 To Chainage 759+14: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018; and Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section From Chainage 0 to Chainage 424+80: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-Egs, Dushanbe, 2018

construction, demolition and maintenance sites which lists typical noise levels generated by construction plant.

448. There are discrete areas of residential development along the alignment. At these points an adverse impact from construction noise can be expected. Adverse impact is therefore expected and will require management by the contractor.

#### 7.3.7.2 Mitigation

449. During noisy activities the contractor shall minimise noise impact by use of natural topographic barriers or by placing physical barriers between noise generating activities and sensitive uses and only work during daytime hours, unless dispensation is arranged. To minimise noise impacts on nearby residents all vehicles will be equipped with exhaust mufflers and regularly inspected to ensure they are operating efficiently. In addition, works sites will only operate during daytime hours. Blasting, or other high noise activities (such as asphalt plants, cement plant, and stone crushers) should not be carried out in the early morning or evening when background noise levels are low. All residents that will be affected should be informed of the date and time of blast well in advance. Blasting should preferably be carried out at the same time each day.
450. Noise impacts along construction access routes will also need to be considered during route selection.
451. Noise standards to be applied during construction are presented in Table 35. In these criteria draw from a review of Tajik and international standards. These levels should be applied at receptors in the vicinity of the Project. The derivation of these standards is described in more detail in Section 2.8.1 of this ESIA.

Table 35: Noise Standards for Construction

Receptor Type	Noise Standard dB(A)		
	Daytime (0700-2300)*	Night time (2200-2300)**	Night time (2300-0700)*
Wards, operating rooms, clinics, consultation rooms, dispensaries in hospitals and sanatoriums	35		30 <sup>‡</sup>
Recreation areas on the territory of hospitals and sanatoriums	35		30 <sup>‡</sup>
Classrooms, teachers' general office, school and other conference rooms of other educational organizations, as well as public reading rooms	40		30 <sup>‡</sup>
Living quarters in apartments, rest houses, boarding houses, homes for the elderly and disabled, sleeping quarters in kindergartens, as well as residential schools	40		30
Rooms in hotels and hostels	45		35
Halls in cafeteria, restaurants, tables	55	45	
Shops trading halls, passenger halls at airports and train stations, consumer services centres	60	45	

Receptor Type	Noise Standard dB(A)		
	Daytime (0700-2300)*	Night time (2200-2300)**	Night time (2300-0700)*
Recreation areas, directly adjacent hospital buildings and health centres	45		35
Areas directly adjacent to residential buildings, clinics, dispensary, rest homes, homes for the elderly and disabled, kindergartens, schools and other educational institutions, libraries	55	45	
Territories directly adjacent hotels and hostels	60	45	

\* - Tajik standards

\*\* - IFC Standards<sup>86</sup>

‡ - No specific standard identified. Standard for living quarters has been applied.

452. The requirements for noise mitigation are identified in the ESMP section of this EIA. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:

- Noise and Vibration Management Plan (NVMP)
- Traffic Management Plan (TMP)
- Blasting Management Plan

453. Additionally, location specific noise mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction plans and Method Statements
- Method Statements for Temporary Activities

454. With mitigation in place the post mitigation risk is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Construction noise	MINOR	IMPROBABLE	LOW	NO

<sup>86</sup> <https://www.ifc.org/wps/wcm/connect/06e3b50048865838b4c6f66a6515bb18/1-7%2BNoise.pdf?MOD=AJPERES>

### 7.3.8 Construction Phase Vibration

#### 7.3.8.1 Impacts

455. The Project road passes through a number of discrete village developments on the alignment. Buildings within these settlements can be located close to the alignment and during construction phase could be affected by vibration due to the construction process (vibrating rollers). Therefore an assessment of the potential magnitude of vibration impacts is presented in this section.
456. Tajikistan has no national standards for vibration.
457. Baseline measurements vibration levels should be monitored during the construction phase within the settled areas crossed by the alignment. Vibration impacts along temporary access routes will also need to be considered during route selection.
458. Vibration caused by construction can cause disturbance to residents close to the works and damage to property. The effects of vibration on structures depends on the construction machinery and equipment used (emission source) and on the structural conditions of the potentially affected building structures (receptors).
459. The buildings within the Project area are relatively old structures, generally formed in locally sourced materials (wood and mud brick). At the west end of the alignment, close to Obigarm, there are some buildings constructed in blockwork, in particular new government buildings e.g. schools this is also the case at Daraban new town at the east end of the alignment. Many of the buildings are constructed within compounds of bud brick, blockwork or steel sheeting. Buildings were casually observed to be in good to fair condition and did not appear to be suffering from surface cracking due to ground settlement / poor foundations.

*Plate 7: Buildings in Kandak - west end of the alignment (Nov 2018)*



*Plate 8: Buildings in Kandak are generally set back from the alignment (Nov 18)*



*Plate 9: School Building (no 6) Kandak village (Aug 2018)*





Plate 10: Wood framed / mud walled building in Kandak (Aug 2018)



Plate 11: Blockwork construction in Darabad new-town - east end of alignment (Nov 18)



460. As there are no standards for vibration in Tajikistan threshold criteria recommended by USA CALTRANS (2013)<sup>87</sup> were used for the assessment of vibration on building structures. These criteria draw from a large review of international standards including, the American Association of State Highway and Transportation Officials (AASHTO), Swiss Association of Standardization, and British Standards. The cited threshold criteria are shown in Table 36.

Table 36: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08

<sup>87</sup> California Department of Transportation (2013): Transportation and Construction Vibration. Guidance Manual.



Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1	0.5
Modern industrial/commercial buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

461. Existing buildings along the project road are predominantly buildings with plastered walls, wooden ceilings and walls in mud brick or blockwork. A conservative approach was adopted with older buildings taken as a reference for the assessment (worst case). This categorisation was based on the field observations, not a full structural survey. There are no facilities with equipment sensitive to vibration in the immediate vicinity of the alignment.
462. For historic and old buildings the given threshold (acceptable) value is 0.25 in/sec for continuous or frequent intermittent sources typical of construction vibration.
463. For the various type of construction machinery the average vibration levels at a distance of 25 feet (approximate 7.5 m) from the emission source are indicated in Table 37 (Caltrans 2013)<sup>88</sup>:

Table 37: Vibration Source Amplitudes for Construction

Equipment	Reference PPV at 25 ft./ approximate 7.5 m (in/sec)	Reference in dB
Vibratory roller	0.210	106
Large bulldozer	0.089	98
Caisson drilling 0.089 98	0.089	98
Loaded trucks 0.076 97	0.076	97
Jackhammer 0.035 90	0.035	90
Small bulldozer 0.003 69	0.003	69

464. Using these source levels, vibration from the equipment can be estimated by the following formula:

- $PPV_{Equipment} = PPV_{Ref} * (25/D)^n$  in/sec
- Where:  $PPV_{Ref}$  = reference PPV at 25 ft.
- D = distance from the equipment to the receptor in feet.
- N = 1.1 (the value related to the attenuation rate through ground)<sup>89</sup>

<sup>88</sup> California Department of transportation (2013): Transportation and Construction Vibration

<sup>89</sup> The value 1.1 for n is suggested in CALTRANS (2013). It is used for class III soils which are defined as Hard Soils, such as: dense compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock (cannot dig with a shovel, need a pick to break up)

465. By transposing this formula the required minimum distance can be calculated as follows:

$$D = \frac{25}{n\sqrt{\frac{ppv\ equipment}{ppv\ ref}}}$$

466. By applying this formula and using as threshold values for  $PPV_{Equipment}$  and  $PPV_{Ref}$  0.25 in/sec the calculated minimum safe distance for the fragile buildings adjacent to the project road is 25 feet (7.5 meters). The threshold value used for the building structures is valid for historic and old buildings and emission from a continuous source<sup>90</sup>. The reference PPV applied for the construction machinery (0,25 in/sec) is slightly above the standard  $PPV_{Ref}$  of the vibratory roller in Table 37. Hence the assessment can be considered to be conservative.

467. It is therefore be concluded that fragile buildings closer than 7.5 m to the future road edge are at risk of damage. There are discrete areas of residential development along the alignment. At these points an adverse impact from vibration may occur. Adverse impact is therefore expected and will require management by the contractor. The clauses identified here will be incorporated into the construction contract and are identified in the ESMP.

#### 7.3.8.2 Mitigation

468. The Contractor shall undertake a precondition survey along the alignment, as required under the contract, identify vibration sensitive sites and vulnerable buildings and identify the precautions to be adopted. These may include reduced pace of construction activity, low vibration plant and machinery and, as a last resort, at receptor mitigation e.g. insulation at affected SR / dwellings.

469. As good practice, a preconstruction survey should be jointly conducted by the Contractor and the Engineer to document the pre-construction condition of the structures, including all the defects and existing damages. Preconstruction surveys will also be required on the selected temporary access routes. Pre-construction surveys should have the following characteristics:

470. The surveys should be conducted in the presence of and with the permission of the property owners. The survey reports should also be verified by the property owners. Secondary purposes of the pre-construction surveys include answering any questions the building owner may have regarding the project and looking for anything that might require correcting before construction starts. Most building owners do not have experience with construction vibration, and may have concerns about their own safety and the safety of their structures.

471. Knowledgeable persons should attend to adequately answer questions. If the situation warrants, ad-hoc meetings should be held and a presentation made that explains the reason for the project, that construction will be necessary, what the residents can expect to hear and feel from the construction, any specific warning signals that will be used, and the intent of the pre-construction surveys.

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<sup>90</sup> Threshold criteria according to table 48 (Table 19 in CALTRANS (2013))

472. For purpose of assessment the magnitude of impact both elements, the type of receptor (structural condition of the potentially affected building) and the type of machinery (emission source) need to be considered.
473. Based on the survey results, the Contractor shall identify vibration sensitive sites and vulnerable buildings and identify the precautions to be adopted. These may include reduced pace of construction activity, low vibration plant and machinery and, as a last resort, at receptor mitigation e.g. insulation at affected SR / dwellings.
474. The following mitigation measures will be implemented before the commencement of the construction phase<sup>91</sup>.

*The bidding documents for civil works will require that the Contractor submit to the Engineer for review and approval a written Construction Vibration Management Plan (CVMP) detailing the procedures for vibration monitoring and control. The CVMP plan will include the requirement for trial construction sections to determine the likely magnitude of vibrations at defined distances from a vibration source. These programs would be reviewed and approved by the Engineer to ensure compliance with contractual specifications, including the ESMP. The maximum permissible vibration limit set at 0.25 inch/s (para 421) must not be exceeded within the defined contour (7.5m from the road edge) where houses may be at potential risk of damage (as defined by the condition surveys).*

*Where the results of the vibration monitoring, or from a trial construction section, show that the specified construction vibration limit is reached at a particular location, the Contractor would be directed by the Engineer to suspend the construction activities that generate the excessive vibration at such location, and with the approval of the Engineer take mitigative actions necessary to keep the construction vibration within the specified limit.*

*Such actions may include, alternative construction methods such as: (i) decrease of vibration emission from the particular equipment item; (ii) substitution of the particular equipment item at such location by other equipment capable of variable vibration control; (iii) use of smaller equipment; (iv) compaction without vibration rollers; (v) decreasing the thickness of material layers below the maximum thickness permissible under the specification; (vi) building wave barriers (trench or ditch) where appropriate; (vii) change the pavement type for example from flexible to rigid pavement, (viii) any other method of Contractor's choice that may be used while ensuring compliance with the specification for the material that is being compacted.*

475. Once work in a particular section of the road has been scheduled, nearby residents and property owners should be notified about the specific times and dates that vibration generating activity will occur.

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<sup>91</sup> Extracted from the approved IEE for Dushanbe – Kurgonteppa Road Project (KOCKS 2018) Para 430

476. The general requirements for vibration mitigation are identified in the ESMP section of this ESIA. The precise mechanisms will be identified in the CESMP, but will include the following management plans:

- Noise and Vibration Management Plan (NVMP)
- Traffic Management Plan (TMP)
- Blasting Management Plan

477. Additionally, location specific noise mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction plans and Method Statements
- Method Statements for Temporary Activities

478. With mitigation in place the post mitigation risk is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Construction vibration and damage to buildings / structures	MINOR	IMPROBABLE	LOW	NO

### 7.3.9 Construction Air Quality – Dust and Other Air Emissions

#### 7.3.9.1 Impacts

479. Adverse air quality impacts can occur due to: emission of inorganic dust from digging /loading works; emission of harmful substances; dust from combustion of diesel used by transportation vehicles and manufacturing machinery (crushers / asphalt/ concrete batching plants); as well as smoke arising from road construction works during asphalt works. Welding works cause welding aerosol and manganese monoxide emissions.

480. Concrete work for bridges can result in cement dust emissions. If mobile asphalt plants are used, they could cause negative impact on surface water, groundwater and air quality, if not properly managed. For this reason, mobile asphalt plant should be avoided, and static plants used instead, where feasible. All asphalt plants should be certified and inspected according to Tajikistan norms before they are allowed to be used for the works. Dust arising from construction works will have negative impact on the ambient air quality, and it is necessary to take effective protective measures to minimize the negative impact, especially near settlements

481. During construction, air pollution in the form of dust from earthworks and vehicle emissions will increase. Deterioration of air quality during pre-construction and construction works can be due to the following:

- Dust emissions during earthwork and from stockpiles;
- Dust from loading, transportation and unloading of soil and other friable materials;
- Dust from the demolition of the houses subject to acquisition;
- Emissions from operation of construction machinery, asphalt plant, concrete batching plant, etc.;

- Dust and emissions from onsite and offsite traffic, vehicles moving across unpaved or dusty surfaces.

482. Dust is a problem for a variety of reasons, including:

- Inconvenience to local people, including re-wash of laundry put outdoors to dry, re-wash of windows, curtains and vehicles. Dust can contaminate food left in the open air in homes and shops and be ingested during meals.
- Health and safety. Dust may affect health by irritating eyes and worsening the health of people with bronchial conditions (e.g. asthma). Dust can reduce visibility for drivers on roads, creating a road safety issue.
- Crop damage. Even low concentrations of dust can affect plant and fruit growth. Plant growth is particularly susceptible to dusts that are highly alkaline, for example limestone and cement dust. Dust deposited during light rainfall can cause the soil surface to form a crust increasing run-off.
- Impact on ecology. Dust blowing onto watercourses may damage ecology by increasing sedimentation, reducing sunlight and suffocating marine fauna. It may also affect plant growth and change the species of plants growing in an area.
- Impacts to businesses. Bee keeping and selling local produce are noted as an economic activity within the Project area.
- Damage to plant and equipment. Within the construction site, dust can cause mechanical or electrical problems in sensitive equipment, such as computers. It can also increase abrasion of moving parts in equipment and clogging of air filters.

483. The amounts of vehicle-emitted pollutants will depend on the technical condition of the Contractors vehicles, fuel quality and travel speed. Older vehicles usually have lower fuel consumption efficiency and cause higher emissions of combustion by-products. Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants. The contractor should pay attention to the age and status of technical maintenance of vehicles/machinery used during construction. Where feasible, preference could be given to electric powered equipment.

484. There are no substantial industrial sources of air pollution in the area and there is currently very little traffic along the existing alignment.

485. The scale of dust and exhaust emissions related impacts will depend on the prevailing wind direction in the Project area, traffic speed and the status of technical maintenance of the vehicles/machinery and organization of works.

486. The location of the construction camp and laydown sites (including topsoil, spoil disposal areas) is not confirmed. The location, layout and technical parameters of the camp will be defined by the Contractor in a Camp Management Plan. Several areas have been proposed by the Design team for spoil disposal. The final locations of the temporary (camp, laydown areas) and permanent (spoil disposal) sites will be identified and specified by the Contractor with consideration of the recommendations provided in this ESIA, including development and implementation of all plans and sub-plans required by the ESMP. Locations will be agreed and approved by MoT. The location of the spoil disposal sites is subject to a separate approval procedure.

487. There are areas of residential development along the alignment. At these points an adverse air quality impact from construction activity can be expected. For this reason

the consequence of construction air quality impact is considered to be “medium” and the likelihood of impact “probable”, in the absence of mitigation. Adverse impact is therefore expected and will require management by the contractor in the form of an air quality (emissions and dust) management plan included in their CESMP and identified in the ESMP / contract for contractor implementation.

#### 7.3.9.2 Mitigation

488. Dust-suppression measures aimed at prevention of air pollution will include watering of construction access roads, site roads and construction sites. Regular water sprinkling and enforcement of reasonable vehicle speeds during construction will alleviate dust impacts. The capacity of available water supplies along the alignment will need to be checked to confirm sufficient water is available for watering, and that existing supplies used by the villages will not be adversely affected. It will also need to comply with the measures in the Water Management Plan. Dust at construction sites will be minimised by using closed / covered trucks for transportation of construction materials (especially loose construction materials such as gravel, sand, soil, etc.) and debris.
489. Other measures planned to maintain good air quality include locating asphalt plants, crushing plants, concrete mixing sites and stockpiles at least 1 km from sensitive receptors, as well as confining working vehicles to designated routes away from sensitive receptors. Stockpiles will be covered or dampened if local conditions (e.g. strong winds) give rise to significant dust emissions. All plant will be maintained in good working order, including any dust suppression / collection equipment (filters, etc.) that is fitted.
490. Prior to commencement of works likely emissions from crushers, concrete production facilities and other emissions generating facilities must be determined and agreed with the MoT.
491. The Contractor will develop an Air Quality Management Plan. The plan shall provide details of mitigation measures, specific location, and schedule where such measures shall be implemented. This is required to minimise impacts to sensitive receptors due to: the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities. Recommendations provided in this ESIA should be included in the plan.
492. The general requirements for air quality mitigation are identified in the ESMP section of this ESIA. The precise mechanisms will be identified in the CESMP, but will include the following management plans:
- Air Quality Management Plan
  - Waste and Materials Management Plan
  - Traffic Management Plan (TMP)
  - Blasting Management Plan
493. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:
- Camp Management Plan
  - Concrete and Asphalt Production Management Plans
  - Construction Plans and Method Statements
  - Method Statements for Temporary Activities



- Bridge Construction Plan
- Tunnel Construction Plan

494. These method statements will include sections relating to the management of air quality, including dust control. The method statements shall be reviewed by the Contractors Environmental Officer before submittal to the Supervising Engineer for review and approval. All method statements must be prepared and approved before any works can start in the planned areas. The method statements shall also include a record of consultations undertaken with all neighbouring land users and road users including their agreements for the use of these areas, roads.

495. The post mitigation risk is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Dust and other emissions to air	MINOR	IMPROBABLE	LOW	NO

### 7.3.10 Hydrology and Water Quality

#### 7.3.10.1 Impacts

496. Water will be required for construction activities, including water required for:

- Construction (e.g. concrete mixing);
- Dust suppression;
- Cleaning equipment;
- Potable water for construction workers; and
- Use in construction camps

497. If water resources are not managed appropriately by Contractors during construction, there is potential for depletion of the resource and adverse impacts on water availability for the local community, including for potable supply, domestic uses, agricultural irrigation, stock watering, etc.

498. Water resources are at risk of contamination during construction, due to accidental spillage of construction liquids and materials, from activities (e.g. refuelling), poorly maintained mechanical plant or poor storage of liquids.

499. There is also the risk of deposition of airborne contaminants, and other contaminants being mobilised in surface water runoff, and being washed into watercourses, with adverse effects on downstream communities and aquatic ecology.

500. There is a potential risk of contamination due to sewage treatment facilities at construction camps. This risk will be managed by either treating the sewage to the required standards, prior to discharge of treated wastewater to surface watercourses, or the collection of sewage in septic tanks, and its disposal by licenced sewage disposal companies. This will require appropriate management and monitoring to ensure that discharges are within acceptable levels, based on permit requirements and Tajik / international standards.

501. There is a risk that the construction activities could result in the pollution of watercourses that may be used by the community, and have adverse impacts on stream ecology, if not appropriately managed. This will require management by the contractor.

#### 7.3.10.2 Mitigation

502. The Contractor will prepare a Water Resources Management Plan, that must provide details on predicted waste water (sewage) volumes, disposal scheme, information on capacity and type of waste water treatment facility, location of the discharge point/points with indication of coordinates. A discharge permit will be sought from the CEP and Maximum Allowable Discharge Limits (MADLs) will be set which the project must then comply with. The plan should include measures to minimise water usage in the first instance, and also opportunities for reuse of water where possible.
503. The Contractor will undertake a capacity study of available water resources along the alignment, including the location and quality of water resources used by the villages, to identify the capacity of resources. with the Contractor must assess the availability and current usage of current supplies, to avoid any impact on the availability of resource to communities and businesses along the alignment. If existing groundwater or surface water resources are not appropriate (quantity or quality), alternative sources of water will be identified by the Contractor, to ensure the available resources used by the local communities are maintained at all times. The Contractor will liaise with the community to understand seasonal water demand constraints, and periods of high water volumes / increased erosion.
504. Water abstraction should also be designed in accordance with the requirements of the Biodiversity Management Plan to minimise impacts to habitats reliant upon surface and ground water.
505. The potential pollution impacts will be mitigated through the implementation of good site practices by the contractor, and checked during regular audits by the supervising engineer. This will include: material storage and spill prevention measures set out in the Water Resources Management Plan and Emergency Response Plan, respectively,
506. All camp sewage treatment plants must be managed in accordance with manufacturer's instructions by competent personnel, and discharges regularly monitored. If discharges cannot be treated to an acceptable standard, liquid wastes must be removed by an authorised company and disposed in an environmentally responsible manner in accordance with the Waste and Materials Management Plan.
507. The potential risk of construction activities resulting in increased flood risk, of being adversely effects by flooding will be managed though measures set out in the Water Resources Management Plan.
508. This will require management by the contractor in the form of a management plan in their CESMP and needs to be incorporated into ESMP / contract for contractor implementation. Provided these mitigation measures are adopted by the contractor in the CESMP, the impacts can be reduced to an acceptable level. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:
- Water Resources Management Plan, including:
    - Ground Water Management
    - Waste Water Management

- Emergency Response Plan, including:
  - Spill Management Plan
- Waste and Materials Management Plan

509. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction Plans and Method Statements
- Method Statements for Temporary Activities

510. The post mitigation risk is assessed as “low” , and the effect is not considered significant

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Adverse impacts on water quality and quantity, and flood risk, due to construction activities	MINOR	POSSIBLE	LOW	NO

### 7.3.11 Biodiversity

#### 7.3.11.1 Impacts

511. The potential impact of the project on biodiversity is relatively low, due to the road being developed within an already disturbed alignment, and situated within a degraded environment that has been subject to anthropogenic pressures for many years (in particular livestock grazing). Ecosystems have been substantially transformed since the previous construction activities were undertaken in the Soviet era, and already carry a significant anthropogenic footprint.
512. During construction, the main impacts will comprise direct habitat loss in the immediate vicinity of the project alignment, within the construction working areas adjacent to the alignment, and the locations of new tunnelling. There will also be disturbance associated with construction activities, mainly noise and vibration impacts.
513. Habitat loss will generally impact areas of relatively low biodiversity value (i.e. as is present on the existing alignment, or adjacent grazed areas).. The greatest impact will occur where individual stands/areas of increased biodiversity interest, most notably any remnant ancient fruit trees, Red Book plant species, and native woodland, are situated within the construction footprint. At present it is not considered that the scale of this impact will trigger any significant effects upon biodiversity; however, mitigation will be implemented to further ensure this.
3. Disturbance impacts will affect fauna making use of features for sheltering purposes, foraging, or undertaking other activities, within disturbance distance of the construction activities. Most notably this will include roosting bats, nesting birds and hibernating/sheltering reptiles and amphibians, all of which are sensitive to such disturbance while using these features. It is possible that some of this fauna will include Red Book species, although most likely at very low levels, due to the high levels of

disturbance that are already present. Mitigation will be implemented to prevent any significant effects as a result of this impact.

514. Construction impacts will comprise increased risk of wildlife road traffic accidents with construction vehicles, and increased pressure from hunting and collecting of fruit / seeds / medicinal herbs due to the influx of construction workers.

515. Road traffic accidents will affect all fauna, but have the potential to affect Red Book (and otherwise rare) large carnivores such as snow leopard, wolf and brown bear, which will occasionally roam across the project area for foraging purposes (i.e. especially when snow levels at higher altitudes make foraging there difficult). Given the level of presence of such species, together with the traffic volumes and prevailing speeds, it's considered unlikely that a significant effect will result. However, this will be prevented through measures in the Traffic Management Plan and Code of Conduct.

#### 7.3.11.2 Mitigation

516. The project's potential impact on biodiversity is considered to be limited, however, mitigation measures should be adopted to ensure this. These are detailed within the project ESMP (and ESAP); in summary, these comprise the following:

- Walkover survey of full route to explicitly identify features/species/areas of particular conservation interest (i.e. ancient fruit trees, native woodland stands, suitable bat roost/bird nest features, Red Book plants, etc.).
- Implementation of the Biodiversity Management Plan (BMP), that will document the findings from the walkover survey, and detail measures to be adopted to protect these features.
- Timing of works to avoid most sensitive windows for sheltering species. Where this is not possible, pre-construction checks of features immediately in advance of works, and subsequent fencing and exclusion of workers and construction activities, from area where these features are present, during construction until naturally no longer in use.
- Programme of education/awareness-raising of workforce to prevent hunting/poaching/collecting of rare seeds, etc.
- Monitoring of construction wildlife road traffic accidents, and concurrent liaison with state forest authorities to inform changes to supplementary feeding should large carnivores be at risk of continued impacts in this regard.
- Sympathetic restoration of temporary construction areas – i.e. comprising re-planting of native plant species of increased biodiversity value (as informed through consultation with local experts).

517. With mitigation in place, the residual effect to biodiversity is considered to be not significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Adverse impacts on Biodiversity, flora and fauna, due to construction activities and illegal poaching /gathering.	MINOR	IMPROBABLE	LOW	NO

### 7.3.12 Historic-Cultural and Archaeological Monuments

#### 7.3.12.1 Impacts

518. No archaeological or cultural resources are expected to be encountered during project implementation, since no findings have been reported and the majority of the works are on a corridor where excavations have been conducted before, so any resources that may have been present are likely to have been damaged by the previous works, and be in a poor state of preservation..
519. An enquiry regarding cultural heritage locations in the project area was made to the Academy of Sciences of the Republic of Tajikistan – Institute of History of Archaeology and Ethnography in June 2019. The response was that that *“there are no historical and archaeological monuments in the area where the route is laid”*.
520. During the consultations carried out for the LARP, no cultural heritage sites were identified as being affected by the alignment works. However, there are mosques in the villages that are of local cultural value, and the measures that will be undertaken to reduce the risk of adverse impacts on residential buildings, will also be applied to the mosques.

#### 7.3.12.2 Mitigation

521. A chance find procedure will be implemented during construction. In the case of discovery of buried archaeology during construction activities, the works shall be immediately stopped and the relevant authority is to be informed. Works will proceed following discussion and guidance obtained from the Ministry of Culture or their respective subordinate or regional unit.
522. The need for a Contractor chance find procedure is included in the ESMP for this ESIA and the Contractor will include their procedure in the Cultural Heritage Management Plan.
523. The post mitigation risk is assessed as “low” ”, and the effect is not considered significant

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Impacts on historic cultural and archaeological monuments	INSIGNIFICANT	IMPROBABLE	LOW	NO

### 7.3.13 Waste and Materials

#### 7.3.13.1 Impacts

524. The construction phase of the project will generate wastes including the following anticipated waste streams:
- Demolition debris (brick, asphalt, concrete, etc.) will be generated during the rehabilitation / construction works on road and associated infrastructure.
  - Tunnelling spoil and excavated subsoil;
  - Green waste will be generated during site clearance;

- Waste water treatment sludges from operation of camp sewage treatment plants. If wastewater from these plants does not meet acceptable discharge standards, this may also become classified as a waste;
- Hazardous wastes, including oils, lubricants, oil filters, absorbents and rages, paints / solvents, and batteries.
- Asbestos containing materials, from demolition activities (pipes and roofing materials) and vehicle brakes;
- Soil polluted with petroleum hydrocarbons from fuel / oil spills or leaks;
- Tyres;
- Scrap metal;
- Potentially recyclable materials (cardboard, plastics, etc.); and
- Mixed municipal wastes from construction camps and worksites.

525. The estimated quantity / volume of the key waste streams, based on experience from similar projects, is presented in Table 38<sup>92</sup>.

*Table 38: Description of Construction Waste Material, Approximate Volumes of Waste*

	Waste Material	Description	Approximate quantity	Characteristics
1	Waste paints that may contain organic solvents or other hazardous substances	liquid	1,650 -2,000 kg	H3B – ignitable; H5 – harmful
2	Oils and oily lubricants	liquid	120-150 kg	
3	Absorbents, overalls and rugs, contaminated with hazardous matter	Solid	50-70 kg	
4	Waste tyres	Solid	3,000 -3,500 kg	-
5	Oil filters	Solid	20-25 kg	H5 – harmful
6	Brakes and other materials that contain asbestos <sup>93</sup>	Solid	50- 70 kg	H7 - Carcinogens
7	Lead containing batteries	Solid	360-450 kg	H6 - Toxic
8	Metals (various)	Solid	500- 1,000 kg	-
9	Mixed municipal waste	Solid	225 kg	-

526. The amount of domestic waste will depend on the number of the staff (a staff level of 500 at each camp has been identified in this ESIA based on information from other road projects in Central Asia). Assuming that the quantity of domestic waste generated per capita per year totals 0.7 m<sup>3</sup>, the approximate total amount of domestic refuse produced during construction will equate 500 x 0.7=350 m<sup>3</sup>/year for each camp.

527. Poorly managed solid and / or liquid waste can result in contamination impacts on the water environment and soil, leading to impact on flora and fauna and health risks to local residents.

<sup>92</sup> EIA for the Kvesheti-Kobi Road, Roads Department of Georgia by ANAS INTERNATIONAL ENTERPRISE, GPINGEGNERIA, IRD Engineering, October 2018 Table 126

<sup>93</sup> Asbestos containing brakes and construction materials should be avoided on site



528. The scheme will require materials to create the new infrastructure including carriageways. This may include the use of primary materials, for example aggregates, or secondary recycled materials e.g. recycled concrete sourced on site, or recycled materials brought in from off site, produced by another nearby construction project. The project will require concrete, iron and steel for the bridges and tunnels, and stone, asphalt and soil for the road and adjacent landscaping

#### 7.3.13.2 Mitigation

529. The Contractor will prepare a Waste and Materials Management Plan to ensure the impact of waste disposal and the use of materials is reduced to an acceptable level. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:

- Waste and Materials Management Plan
- Water Resources Management Plan, including:
  - Ground Water Management
  - Waste Water Management

530. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction plans and Method Statements
- Method Statements for Temporary Activities

531. The Waste and Materials Management Plan requires the adherence to the waste hierarchy<sup>94</sup> to prevent or reduce the generation of waste where possible, and then to reuse / recycle wastes where possible, in preference to disposal.

532. Agreements / contracts will be signed and maintained with the appropriate authority authorised company to ensure timely transportation and disposal of waste. Contractors will be responsible for maintaining these contracts and ensuring that all wastes are disposed in an environmentally responsible manner in accordance with the Waste and Materials Management Plan and Tajik regulations. The Contractor shall audit waste disposal companies used to dispose of wastes from the Project.

533. The Camp Management Plan sets out measures to manage camp sewage, and domestic waste.

534. Tunnelling spoil, excavated subsoil and demolition wastes will be reused as construction material in the Project, or during post-construction maintenance, where possible. Such materials will be returned to construction locations or MoT depots for reuse. The reuse of materials will reduce the need to extract new materials from borrow pits.

535. Tunnelling spoil and excavated subsoil, that is not used as fill material, will be disposed to agreed spoil disposal areas, that have been approved by MoT. The Design consultant has proposed potential spoil locations sites which are discussed in Section 7.3.23. The

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<sup>94</sup> Waste prevention→Reuse→Recycling→Other recovery→Disposal

Contractor may choose to use these locations, or alternative locations provided they obtain the appropriate approvals. To ensure that these locations are suitable from an environmental and social perspective a Spoil Disposal Plan must be prepared by the Contractor as part of the CESMP and submitted to the Supervising Engineer for review and approval by MoT before any site can be used. The Contractor will be required to prepare an EIA for any spoil disposal site to meet national requirements.

536. There are no waste disposal facilities for hazardous wastes present in the project area, and there is limited provision for the management of hazardous waste disposal in Tajikistan, so this category of waste must be handed over to an authorised contractor for disposal. Any hazardous waste agreement with a company authorised for treatment (deactivation, incineration) or re-use in other technological processes must be signed and made available to the Engineer for approval. Treatment, utilisation, disposal of waste shall be carried out only by authorised contractors. The area allocated for temporary storage of hazardous waste shall have special preventive measures implemented, in particular, containers shall have secondary containment and no mixing of hazardous waste with any other waste shall be allowed. Hazardous waste containers shall be checked for tightness. The staff involved in hazardous waste management shall be trained in waste management and safety issues.
537. If there are no suitable disposal options available for hazardous waste, then there may be a need to manage this waste on-site, though interment in lined pits. However, this is not a recommended option and would only be used if all other options were unfeasible. In this case, any proposed location will require adequate environmental assessment, design and management.
538. While the waste impacts could be considered undesirable the risk severity is considered to be “moderate” and the likelihood of the event happening “possible”. The Risk matrix suggests a Risk level of “medium” – needs to be incorporated into ESMP / contract for contractor implementation.
539. The post mitigation risk is assessed as “low”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Impacts due to the use of materials or the disposal of construction waste	MINOR	IMPROBABLE	LOW	NO

#### 7.3.14 Socio-Economic Impacts –Labour Conditions

##### 7.3.14.1 Impacts

540. The construction of the project will create jobs for an influx of construction workers. The workers will be employed by the main Contractors who will be instructed by the PIURR on each Package.
541. A lack of appropriate HR policies and procedures could lead to workers being unfairly treated and dismissed, which could lead to workers loss of income, livelihood and potentially poverty.

542. The construction workers may have adverse impacts on the local community, though negative interactions, and illegal poaching / gathering of fruit, medicinal herbs etc.

#### 7.3.14.2 Mitigation

543. The precise mechanisms for the management of labour conditions will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:

- Labour and Working Conditions Management Plan
- Local Employment and Procurement Plan (LEPP)
- Social Risk Register
- Code of Conduct (CoC)
- Grievance Redress Mechanisms (GRM)
- Camp Management Plan

544. Additionally, the Project Stakeholder Engagement Plan (SEP) will be implemented via a Contractor SEP.

545. The Contractor will be responsible for ensuring that worker's working conditions and those adopted by their sub-contractors (including working terms, wages, equal opportunities, benefits, GRM, accommodation provision, etc) comply with Tajikistan and IFI requirements.

546. The Contractor will be required to prepare a code of conduct that enshrines the commitment of the project to meet employment and labour standards. Environmental and social protection and anti-bribery and corruption controls. Requirements and training to manage the behaviour of construction workers. HR policies and procedures will be developed and implemented as required under the ESMP.

547. The post mitigation risk is assessed as "medium" and the effect is considered to be not significant, following the implementation of the proposed ongoing mitigation.

RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	SIGNIFICANT?
Inadequate labour conditions	MODERATE	POSSIBLE	<b>MEDIUM</b>	<b>NO</b>

#### 7.3.15 Socio-Economic Impacts – Workplace and Community Health and Safety

##### 7.3.15.1 Impacts

548. Construction activities are inherently hazardous, due to the activities they involve, and the constantly changing nature of operations, work locations and site conditions. The large size of the work sites on road construction projects present an additional risk factor. Risks to safety can occur due to violation of proper health and safety practices and may lead to injuries and accidents.

549. Risks from construction activities apply to both to Project personnel and the community in the areas near the Project.

550. Hazards associated with construction activities include:

- Construction traffic and mobile work equipment;
- Lifting operations;
- Interaction between vehicles and pedestrians;
- Deep excavations;
- Temporary works;
- Work at height, particularly on temporary access structures;
- Exposure to noise, dust, vibrations and other hazardous agents;
- Hazardous materials, including fuels and bitumen;
- Exposure to heat, cold and extreme weather conditions;
- Work in confined spaces;
- Use and storage of explosives (for tunnels);
- Collapse of tunnels and other structures;
- Electrical and other equipment; and
- Unauthorised access – a particular hazard in work sites with a large area.

551. Additionally, the remote location of the work sites presents an additional risk factor, as assistance would take longer to arrive in the event of a medical or other emergency. The restricted institutional capacity, and limited equipment available, at existing emergency services, is a further risk.

552. The project may result in impacts on the health and safety of the community as a result of: noise, dust and other emissions from earthmoving, blasting, piling, and operation of equipment and vehicles.

553. Failure to implement robust safety procedures and develop a positive safety culture could lead to injury and illness and therefore health and safety will require robust management by though the Contractor through the measures in the Health and Safety Management Plan.

#### *7.3.15.2 Mitigation*

554. Safety impacts will require management by the contractor in the form of a management plan in their CESMP and needs to be incorporated into ESMP / contract for contractor implementation. The precise mechanisms will be identified in the CESMP, but Contractors will be required to develop and implement the following management plans, which will be approved and monitored during construction by the PIURR and Supervising Engineer:

- Health and Safety Plan, including:
  - Specific measures for the construction of bridges and tunnels
- Emergency Response Plan, including:
  - Natural Disaster Response Plan
  - Spill Management Plan

555. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including:

- Camp Management Plan
- Concrete and Asphalt Production Management Plans
- Construction Plans and Method Statements

- Method Statements for Temporary Activities

556. Implementation will be enforced by suitable qualified H&S personnel and by robust monitoring of the required measures. On site support from an international consultant specialising in health and safety, providing additional technical support and advice, and building the capacity of the Contractor will be engaged. The consultants will assist the Contractors in developing, implementing and monitoring the Health and Safety Plan.

557. The Emergency Response Plan will include measures and resources for prevention, mitigation and response to all foreseeable emergency scenarios (road traffic accidents, spills, fire, etc.) associated with construction activities, and should consider the suitable response resources (medical, fire fighting, etc) for all related foreseeable emergencies, which are necessary to mitigate the remote location of the work sites and consequent increased response times. It likely to be necessary to provide equipment and facilities within the construction camps.

558. With the management plans and mitigations in place risk is assessed as “medium” and the effect is considered to be not significant, following the implementation of the proposed ongoing mitigation. However, particular focus will be placed on monitoring of the risks and ensuring that mitigation measures are rigorously applied throughout construction.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Inadequate safety controls and risks to workers and the community	MODERATE	POSSIBLE	MEDIUM	NO

### 7.3.16 Socio-Economic Impacts – Utilities and Infrastructure

#### 7.3.16.1 Impacts

559. There is limited utility provision except at the villages at Kandak at the west end of the alignment where there is: water, gas and electric utility pipework and cabling. There are no fibre optic cables, wastewater pipes, irrigation systems, storm water sewers, pedestrian crossings or passes for cattle and agricultural machinery, etc.

560. The villagers along the alignment generally harvest water from locations upslope from the alignment, it is then transferred by ditches and pipework to individual houses downslope from the alignment.

561. The construction of the road has the potential to interrupt access to water and utilities, due to planned service interruptions, blockage of access routes to the services, or due to accidental damage caused by construction activities (particularly excavation works).

#### 7.3.16.2 Mitigation

562. Safe access to utilities should be provided throughout construction. The early construction of culverts or pipework, installed beneath the road, near these sources of water may enable villagers to run water hoses through the pipes. This will ensure that local villagers will not need to cross the road, or construction working areas, to access water.

563. Measures to prevent damage to buried or above ground utilities will be included in the Worker and Community Health and Safety Plan.

564. . With mitigation in place the post mitigation risk is assessed as “medium”, and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Impacts on utilities and infrastructure	MODERATE	POSSIBLE	<b>MEDIUM</b>	<b>NO</b>

### 7.3.17 Socio-Economic Impacts – Resettlement, Land Acquisition and Economic Displacement

#### 7.3.17.1 Impacts

565. The design philosophy has been to avoid or, at least, minimise, project-induced resettlement. However, based on the final design and decisions to be made with respect to bringing the existing road up to necessary national standards, some land acquisition and resettlement will be necessary.

#### 7.3.17.2 Mitigation

566. The Project is the subject of a detailed Land Acquisition and Resettlement Plan (LARP) for each Package and the reader is referred to the Package 1 LARP (December 2018) which will be disclosed on the ADB website, and the Package 2 LARP (July 2019) for which will be disclosed on the EBRD website and the MoT website.

567. Potential for physical and economic displacement associated with the construction of village access roads and construction site access roads, when selected, will also need to be assessed and managed via the same process as for the main alignment, and the LARP extended to include these additional features of the Project.

568. With implementation of the LARP and ongoing liaison with affected community members, the risk is assessed as “low” and the effect is not considered significant, following the implementation of the proposed ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Impacts on population - Resettlement, / Land Acquisition and Economic Displacement	MAJOR	POSSIBLE	<b>LOW</b>	<b>NO</b>



### 7.3.18 Socio-Economic Impacts –Other Impacts

#### 7.3.18.1 Impacts

569. The project is anticipated to have a number of positive impacts on population and economic development providing job opportunities for local men and women. In particular, the construction camps can have a beneficial impact on a local community providing the opportunity for employment for both local men and women. There is also the opportunity for the local business to sell their goods and services leading to increased household income and livelihood for the local AHs. However, these local opportunities will need to be encouraged during the procurement and construction processes.
570. The project will expose some village populations to traffic for the first time, and will raise safety issues for the residents close to the alignment. Additionally, there are impacts associated with dust, noise, water, landscape, etc. from construction as discussed in previous sections. There will be in-migration of construction workers into the Project-affected area, which can subsequently lead to increased health risk to the local community (i.e. the potential for transfer of communicable or infectious diseases, such as hepatitis, polio, influenza, HIV/AIDS, malaria, etc), crime levels , instances of alcoholism and drug use amongst others. This has the potential to result in increased impacts to women, including the possibility of gender based violence.

#### 7.3.18.2 Mitigation

571. A Stakeholder Engagement Plan (SEP) has been developed for the Project and will be implemented throughout to ensure continual consultation is undertake during construction. A Community Liaison Officer (CLO) will be engaged to manage and implement the SEP. In addition, other initiatives will be carried out during the works to raise awareness of road safety and other aspects within the local community, particularly to the local women and children. Such initiatives have been identified within the Project ESMP.
572. To mitigate the disturbance to the population, appropriate information on the project (including location and duration of construction works) shall be regularly provided to affected communities in accordance with the developed project-specific SEP. The local population should be appropriately informed about the commencement of construction works (information on construction activities should be available on the website of the Ministry of Transport, local authorities, and also through community newsletters, local TVs and from community leaders). Notification on commencement of construction works, limitation of vehicle movement, alternative access and detour arrangements shall be provided to affected communities in advance.
573. The project shall have an established grievance redress mechanism that will allow affected parties to raise their concerns and obtain feedback, as specified in the CESMP.
574. The contractor will be required to develop a Local Employment Procurement Plan, the ESMP (Chapter 8) outlines the measures to be taken to promote local procurement and employment.
575. The contractor will also implement a Gender Action Plan (GAP) which will describe affirmative measures to be taken to promote women in construction and gender-sensitive construction practices. The key actions are set the ESMP (Chapter 8).

576. With implementation of the SEP and other public awareness raising and consultation, the risk is assessed as “Low” and the effect is considered not significant, following the implementation of the proposed ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Other non-specific - Impacts on population	MAJOR	POSSIBLE	LOW	NO

### 7.3.19 Site Specific Impacts - Site Construction Access Routes

#### 7.3.19.1 Impacts

577. Two types of road providing access to the alignment will be developed. These are:

- Site construction access routes - these will be temporary access roads to the alignment for use by construction traffic during the construction period.
- Village access roads – these will be permanent access roads, connecting villages to the alignment.

578. Site construction access routes will be developed and used to access the alignment and construction camps from Road M41. They will also provide access to construction materials storage and waste disposal sites, asphalt and concrete plants, and storage facilities. These will be temporary access roads to the alignment for use by construction traffic during the construction period. The locations of temporary access routes have yet to be finalised, but anticipated routes are shown in Figure 12 & Figure 13.

579. The Contractor will select the construction access routes they wish to use, and will implement measures to ensure the roads are suitable for use by construction traffic, and are suitable from an environmental, social and safety perspective. These will be set out in the Construction Access Road Management Plan, which will include measures for the establishment, operation and timely reinstatement of the roads. Disruption to villagers along the construction access roads must be minimised at all times. The use of unmade roads can exacerbate soil erosion, and degrade the landscape as well as generating localised traffic noise, vibration and air quality (dust) issues, and introducing traffic hazard to local communities. Additionally, roads in their current state may be unsuitable for passage of heavy vehicles (bank / bridge strength, width, limited space between buildings, etc.). The Plan will set out measures to manage these risks, and will require approval by the Supervising Engineer, approval by MoT, before any route can be used for construction access.

580. The village access road will be permanent roads that provide access from the villages along the new alignment to the new alignment. The locations of the village access roads have been determined, and these are shown in Figure 9 & Figure 10. The required standard that the roads will be built to is set out in Figure 11.

#### 7.3.19.2 Mitigation

581. A supplementary impact assessment of the proposed village access roads will be conducted as a supplement to this ESIA. This assessment will include consultation with stakeholders, including regarding any proposed land acquisition.

582. With these mitigation measures the risk is assessed as “low” and is considered not significant, following the implementation of the proposed ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Impacts from the temporary construction and permanent village access roads	MINOR	POSSIBLE	LOW	NO

### 7.3.20 Site Specific Impacts - Construction camps

#### 7.3.20.1 Impacts

583. The Contractor will be expected to source construction workers locally in the first instance. However, it is unlikely that the number of locally-skilled people in the area will be sufficient for the project, and additional construction workers will be employed outwith the area within Tajikistan, and further afield. This being the case, accommodation camps will be required.

584. Camps will contain offices and accommodation for works staff<sup>95</sup>, maintenance areas and manufacturing areas crushing plant and asphalt and concrete batch plant and storage areas. Environmental impacts include noise from maintenance areas and any crushing plant, dusty works (from vehicle movements and operation of manufacturing equipment, rock crushers and concrete batching plant) and potential for adverse water impact due to runoff from unmade roads, oily runoff from manufacturing and storage areas and sewerage discharges from poorly maintained septic tanks / waste water treatment facilities.

585. The in-migration of construction workers into the Project-affected area, can subsequently lead to increased health risk to the local community (i.e. the potential for transfer of communicable or infectious diseases, such as hepatitis, polio, influenza, HIV/AIDS, malaria, etc), crime levels, instances of alcoholism and drug use amongst others.

4. The risk of adverse effects to due to the location, development, operation and decommissioning of construction camps will be managed though the Contractor’s implementation of a Camp Management Plan and Social, Community and Health Review, followed by the development and implementation of a Health Plan, incorporated in the Health and Safety Plan.

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<sup>95</sup> Based on experience of operating projects in Central Asia (Kyrgyzstan and Azerbaijan) it is anticipated that each construction contract could contain up to 400 staff (made up of management, international and local labour). Therefore camps of up to 400 persons should be planned for when considering water usage and waste generation and disposal.

#### 7.3.20.2 Mitigation

586. Prior to start of site works, the Contractor shall develop a Camp Management Plan. The Camp Management Plan will cross reference other sub-plans including; Water Resources Management Plan, Spill Management Plan, Air Quality Management Plan, Noise and Vibration Management Plan, Waste and Materials Management Plan, and others as required.
587. All camp sewage will be managed in accordance with the measures in the Water Resources Management Plan.
588. The Contractor will be responsible for maintenance and clean-up of campsites and respecting the rights of local land users.
589. A Social, Community and Health review will be conducted by the PIURR, and must be approved by the Supervising Engineer. In order to develop a project-specific health plan that can be incorporated into the overarching Occupational and Community H&S Plan.
590. Camp activities will be included in the Emergency Response Plan, and suitable response resources (medical, fire fighting, etc) necessary to mitigate the remote location of the work sites and consequent increased response times. The construction camps will be staffed and equipped with a health clinic for all workers.
591. The Camp Management Plan will incorporate and reference the requirements of the Local Employment and Procurement Plan and Gender Action Plan.
592. With these mitigation measures the risk is assessed as “medium” and the effect is considered not significant, following the implementation of the ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Site specific impacts – construction camps	MODERATE	POSSIBLE	MEDIUM	NO

#### 7.3.21 Site Specific Impacts - Bridges

##### 7.3.21.1 Impacts

593. In addition to the long bridge at the eastern edge of the project road, there are: ten bridges to be constructed along the alignment, and three bridges to be rehabilitated, as well as culverts along the alignment. Table 39 is a schedule of bridges recording the construction type, number of spans, work in river, etc.
594. These sites have the potential to result in adverse impacts on the rivers that they cross, due to construction material being deposited in the river during works within the river. The current construction design has avoided works within the watercourses, where possible. However, there is a requirement for works for columns and rip rap protection to reduce erosion effects in the watercourse at the bridge sites.
595. The watercourses across the project area are very dynamic, with the steep overall gradient in the region resulting in high discharge levels and constant movement of

substrate through the system. They provide a water resource for local villages, but the value of their aquatic ecology is constrained by their dynamic nature.

596. Other impacts include general construction noise and dusty works (particularly as most bridge crossings occur in the major river valleys where village developments are concentrated), and potential for both silty and oily runoff.
597. Bridge construction works are hazardous if not conducted in a safe and controlled manner. In addition to the standard safety risks from construction, there are additional hazards created by work at height, and work over water. These risks will require controls to mitigate potential impacts to workers and the community, as set out in the Health and Safety Plan.

#### 7.3.21.2 Mitigation

598. Much of the works will be precast, which will reduce the need for concrete batching near the bridge construction sites, and therefore potential for releases to watercourses.
599. Regardless of the relatively low sensitivity of the aquatic environment, it should be protected during construction through implementation of standard pollution prevention measures (including steps to prevent sedimentation of the watercourses. Prior to start of site works, the Contractor shall develop Construction Plans and Method Statements, including a Bridge Construction Plan, which will set out measures for the bridge works, detailing the specific controls to be implemented at each bridge location.
600. The method statements will cross reference other sub-plans including; Water Resources Management Plan, Emergency Response Plan, Safety Management Plan, Spill Management Plan, Air Quality Management Plan, Waste and Materials Management Plan, and others as required.
601. With these mitigation measures the risk is assessed as “medium” and the effect is considered not significant, following the implementation of ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	SIGNIFICANT?
Site specific impacts – bridge sites	MODERATE	POSSIBLE	MEDIUM	NO

Table 39: Schedule of Bridges and Characteristics

	No	Works	Chainage	Crossing	Spans (m)	Construction Method	Work in Watercourse	
Package 1	1	New	Km 77 +86.38	Kandak River	3 (24/34/24)	Composite concrete / steel	Yes, 2: each 12 piles 1 pile cap	Rip rap protection
	2	New	Km 130 +97.01	Gazaklyon River	4 (4x24)	PSC beams with concrete deck & asphalt cover	Yes, 3: each 12 piles 1 pile cap	Rip rap protection
	3	New	Km 135 +50.00	Zurion River	3 (15/24/15)	PSC beams with concrete deck & asphalt cover	Possible, 2: each 12 piles 1 pile cap	Rip rap protection
	4	New	Km 209 +10.14	Sebnok River	3 (34/33/32)	Composite concrete / steel	Possible, 2: each 12 piles 1 pile cap	Rip rap protection
	5	Rehab, new deck	Km 271 +05.57	Hakimi River	3 (15/24/15)	PSC beams with concrete deck & asphalt cover	Possible, 2: piers with flat foundation	Rip rap protection
	6	Rehab, new deck	Km 282 +62.00	Tagikamar River	3 (12/33/12)	Retain existing piers. New composite concrete / steel	1 pier	
	7	New	Km 331 +20	Chepak River	3 (24/32/24)	Composite concrete / steel	Possible, 2: piers with flat foundation	Rip rap protection
	8	New	Km 359 +99.54	Mudjiharf River	7 (24)	PSC beams with concrete deck & asphalt cover	Yes, 4 & 2 possible	Rip rap protection
Package 2	9	New	Km 492+55,50	Mirzosharifon River	5x32	Not available	Not available	
	10	Rehab, new deck	Km 523 +50.00	Dashtiguron River	24/426/24	2 x PCS, 1 PCB	Unlikely	Rip rap protection
	11	New	Km 565 +45	Tegermi River 1	1 PSC 24.5	PSC beams with concrete deck & asphalt cover	Yes, rip rap	Rip rap protection
	12	New	Km 571 +45	Tegermi River 2	1 PSC 33	PSC beams with concrete deck & asphalt cover	Yes, rip rap	Rip rap protection
	13	New	Km 679 +40	Kolot River	1 PSC 24	PSC beams with concrete deck & asphalt cover	Yes, rip rap	Rip rap protection
	Temporary			Surkhob River	2 or 3 (TBC)	Bailey or calendar hamilton (steel truss / framed)	1 or 2 piers	Removed when Br 14 completed

Package 3	14	New		Surkhob River	Not available	Not known design and build from design brief	Design to be done	
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PCB = Precast concrete beam

CCS = Composite concrete steel



### 7.3.22 Site Specific Impacts – Tunnels.

#### 7.3.22.1 Impacts

602. There are three tunnels on the alignment (two in Package 1 and one in Package 2). Although there was limited work in the Soviet era the tunnels are effectively “new construction”. The locations of the tunnels are shown in Figure 42 and a tunnel cross section is shown in Figure 41.

603. Environmental impacts from tunnelling operations include

- general construction noise at the portals during “mucking out” (removal of rock spoil) and vehicle movements (removing spoil),
- noise and vibration during the drill and blast work (though generally confined to the works developing the portal area),
- dust generating works (particularly portal emissions from extraction fans);
- potential for both silty and oily runoff; and
- Disturbance to fauna, particularly nesting birds and roosting bats, etc. from blasting noise and vibration.

604. Tunnel sites are remote from any residential development and, therefore are unlikely to result in significant noise and dust impacts to sensitive receptors.

605. There are safety risks specific to tunnel construction activities, including potential for rockfalls / collapse, storage and use of explosives, restricted access and escape routes for collapse, and work in enclosed spaces with potentially inadequate lighting and ventilation. These will need to be assessed and controlled for each work location, through the implementation of the Safety Management Plan.



АВТОМОБИЛЬНАЯ ДОРОГА ВАХДАТ-РАШТ-ДЖИРГИТАЛЬ-ГРАНИЦА КЫРГЫЗСТАНА (ОТ 72КМ ДО 158КМ).

Map showing the road route from Vahdat to the Kyrgyzstan border, including various bridges (Mосты) and geographical features like mountains and rivers. Key locations marked include Vahdat, Rast, Dzhirgatal, and the border area. The map also shows the locations of several bridges (Mосты) and the road's path through the region.

#### 7.3.22.2 Mitigation

606. A Tunnel Construction Plan will be developed to manage the impacts to
607. The Contractor shall develop a Blasting Management Plan for the construction of tunnels, including management of safety risks, particularly to workers. This will cross reference the Health and Safety Management Plan. The Contractor must appoint an authorised blasting contractor.
608. The Blasting Management Plan will also cross reference other sub-plans including; Water Resources Management Plan, Emergency Response Plan, Spill Management Plan, Air Quality Management Plan, Waste and Materials Management Plan, Stakeholder Engagement Plan, Biodiversity Management Plan and others as required.
609. With the management plans and mitigations in place risk is assessed as “medium” and the effect is considered to be not significant, following the implementation of the proposed ongoing mitigation. However, particular focus will be placed on monitoring of the risks and ensuring that mitigation measures are rigorously applied throughout construction.

RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	SIGNIFICANT?
Site specific impacts – tunnel sites	MODERATE	POSSIBLE	MEDIUM	NO

#### 7.3.23 Site Specific Impacts – Borrow Pits and Waste Disposal Areas.

##### 7.3.23.1 Impacts

610. Bulk earthworks for the project alignment were carried out in the Soviet era, so the need for new borrow areas is expected to be limited. Although, the need to adopt current design standards for the alignment means that additional material will be generated from material produced during cut slope trimming. Material from the cut slopes can be used in additional embankments on the alignment but a cut to fill calculation prepared by Avtostrada suggests an excess of 550,000m<sup>3</sup> needing disposal<sup>96</sup>.
611. Environmental impacts associated with the operation of borrow and disposal areas include: noise and dust impact, silty runoff and loss of habitat. In addition to the “soil” produced there will be around 4.5 million m<sup>3</sup> of rock generated from slope cutting and a further 0.5 million m<sup>3</sup> generated from the tunnels. Some rock material can be processed for use in the engineered sections of the road pavement, but this would use only a relatively small proportion of the available cut material. Table 40 sets out the presently estimated cut fill situation.
612. The Design Consultant has investigated potential locations for disposal sites on the alignment, and the sites are identified in Table 41.

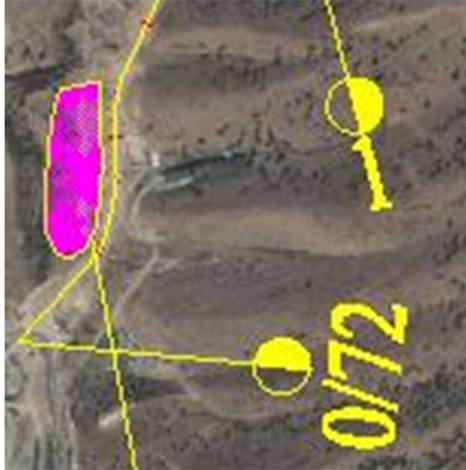
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<sup>96</sup> This “unbulked” quantity is a volume 300m x 300m x 6m high

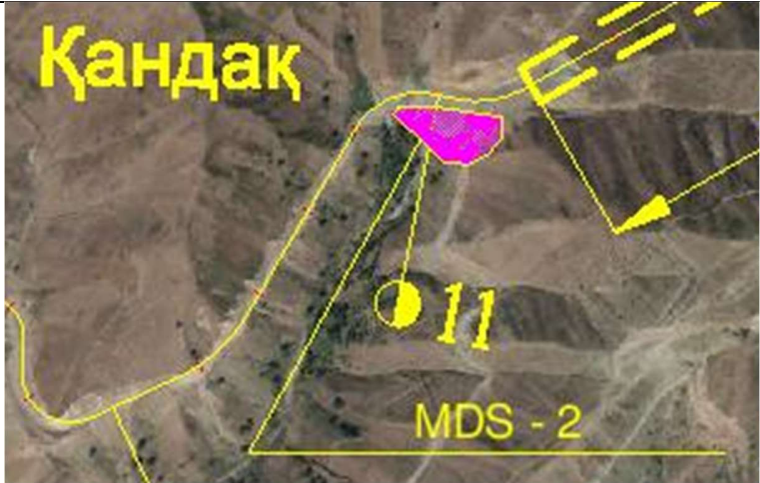
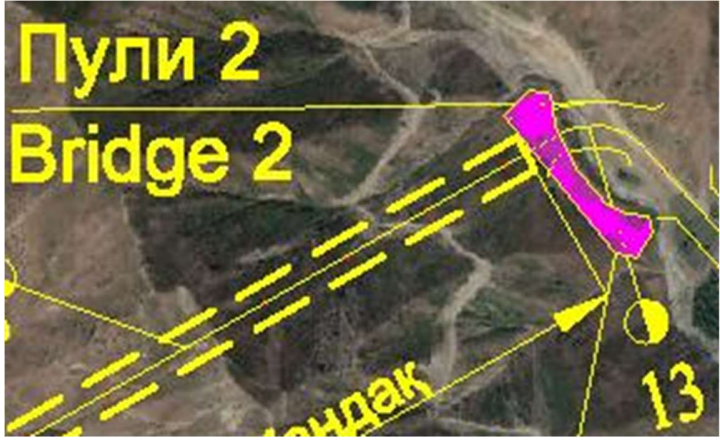
Table 40: Cut to Fill calculation indicating excess needing disposal

		On the Road			Off Ramps		Approaches		TOTAL						
		Excavation		Embankments	Excavation	Embankments	Excavation	Embankments	Excavation	Embankments		Excess			
		Rock	Not Rock		Non Rock		Non Rock		Non Rock						
Phase 1 Upto Bridge 3	1	932,169	860,464	336,972	35,042	31,410	1,756	2,381	897,262	370,763					
	2	959,226	106,581	217,827	57,620	25,319	0	1,687	164,201	244,833					
	3	660,409	125,792	188,516	6,746	16,021	833	605	133,371	205,142					
Total Rock Phase 1		2,551,804	m3 excess rock for disposal						1,194,834	820,738		374,096	m3 excess earth for disposal		
			137	m x m x m									72	m x m x m	
	6 m high		652	m x m x 6m								6 m high	250	m x m x 6m	
	10 m high		505	m x m x 10m								10 m high	193	m x m x 10m	
		On the Road			Off Ramps		Approaches		TOTAL						
		Excavation		Embankments	Excavation	Embankments	Excavation	Embankments	Excavation	Embankments					
		Rock	Not Rock		Non Rock		Non Rock		Non Rock						
Phase 2: Tunnel 3 upto Durobod	4	143,033	878,629	356,859	4,374	6,625	2,843	48,101	885,846	411,585					
	5	770,414	630,339	417,440	8,196	4,014	91	84	638,626	421,538					
	6	717,793	587,286	766,237	52,165	35,946	116	976	639,567	803,159					
	7.1	244,781	416,790	338,997	38,875	42,282	0	0	455,665	381,279					
	7.2	0	15,971	380,873	0	0	0	0	15,971	380,873					
	8	78,777	76,549	137,571	0	0	1,427	2,024	77,976	139,595					
Total Rock Phase 2		1,954,798	m3 excess rock for disposal						2,713,651	2,538,029		175,622	m3 excess earth for disposal		
			125	m x m x m									56	m x m x m	
	6 m high		571	m x m x 6m								6 m high	171	m x m x 6m	
	10 m high		442	m x m x 10m								10 m high	133	m x m x 10m	
Combined Phase 1 and 2 quantities															
	Total Phase 1 and 2	4,506,602	m3 excess rock for disposal								Total Phase 1 and 2	549,718	m3 excess earth for disposal		


Table 41: Spoil Disposal Sites (Provisional)


ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-1	0/72	West side of alignment	Depression	600 000	✗ No	No above alignment	




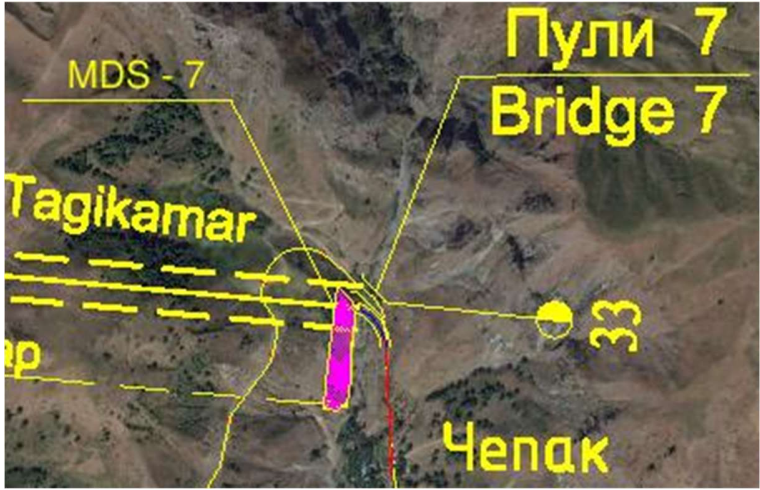
ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-2	11	Kandak Tunnel West Portal	Top of river valley	450 000	✗ No	Upstream of	
MDS-3	13	Kandak Tunnel East portal	On hillside immediately o/s portal	500 000	✗ No	Upstream of	

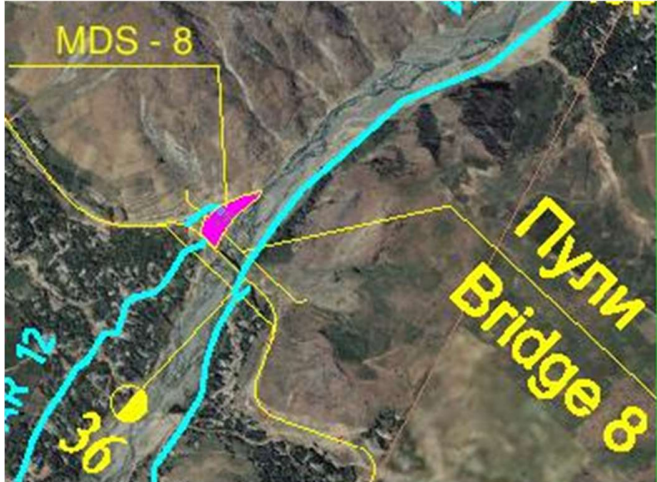


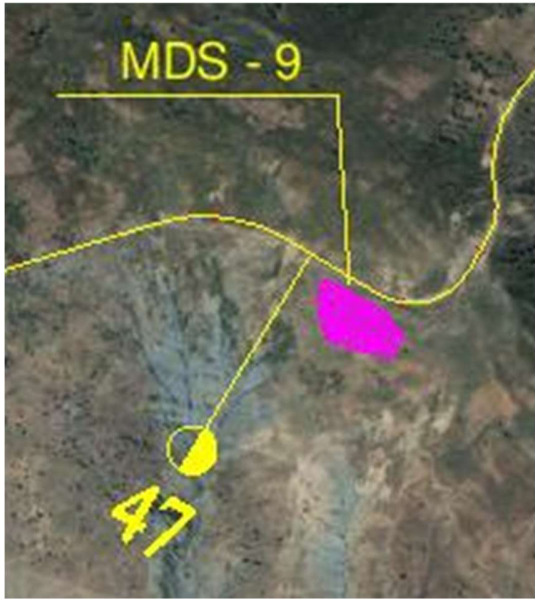
ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-4	21	At Bridge 4 west abutment / Karagach Tunnel West Portal	In River valley d/s from alignment	300 000	✗ No	Upstream of	

ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-5	23	Karagach Tunnel East Portal	Small site immediately outside portal	160 000	✗ No	Remote	

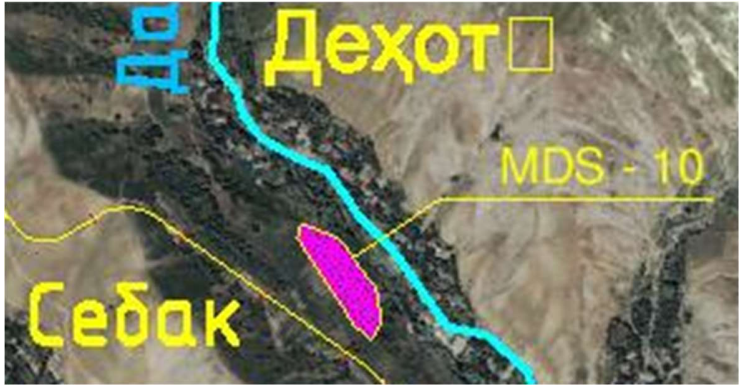
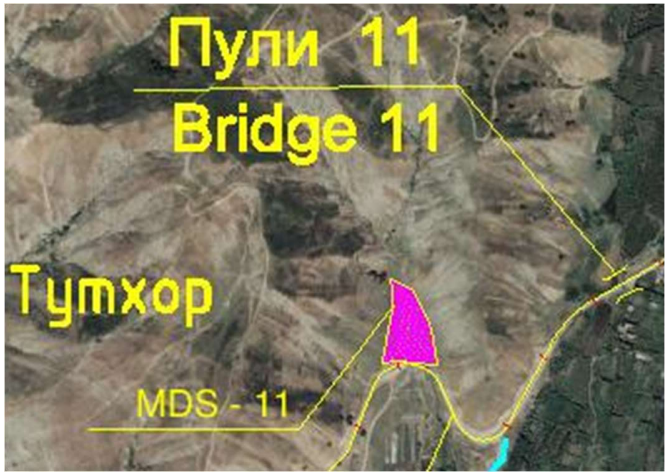
ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-6	29.5	Tagikamar Tunnel West Portal	Small site in river valley immediately outside portal	200 000	✗ No	In river valley	

ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-7	33	Bridge 7 Tagikamar Tunnel East Portal	In river valley immediately outside portal	350 000	✗ No downstream	In river valley	

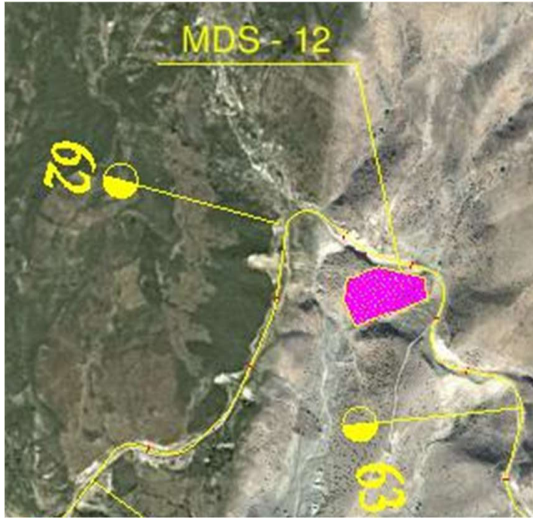
ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-8	36	Bridge 8	In river valley beneath bridge	250 000	✗ No downstream	In river valley	


ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-9	47	Remote	upland hillside	145 000	✖ No	Remote	

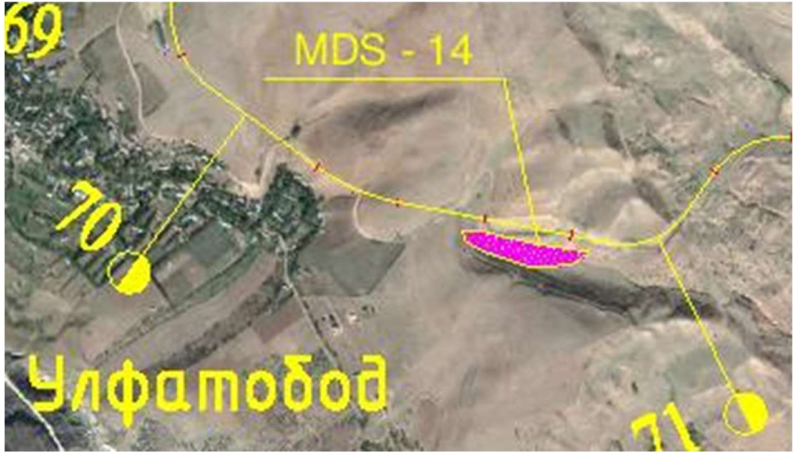



ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-10	51	Flatland east of alignment	In flood plain	320 000	Cedak village	In river valley	
MDS-11	56	Area upstream of alignment	In dry river valley	190 000	Tymxop d/s	Dry river valley	



ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-12	62.5	Immediately south of alignment	Flat scrubland	240 000	Isolated agricultural buildings to south >500m	Dry river valley	

ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-13	65	Depression south of alignment		170 000	× No	No	

ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-14	70.5	Depression south of alignment		180 000	✗ No	No	

ID	Km	Location	Description	Volume (m³)	Village houses within 500 m	Watercourse	
MDS-15	72.5	Large site south of alignment	In alluvial fan (within inundation)	1 000 000	✗ No	n/a within inundation	
End							

613. The inappropriate siting and construction of disposal areas may have impacts due to:

- the generation of silty runoff and dust
- Poor design resulting in landscape degradation and loss of visual amenity; and
- loss of valued habitats and biodiversity.

#### 7.3.23.2 Mitigation

614. To ensure that spoil disposal sites are identified and operated, and decommissioned correctly a Spoil Disposal Plan will be prepared by the Contractor as part of the CESMP. This will form part of the Waste and Materials Management Plan. The Spoil Disposal Plan must be developed in association with a biodiversity specialist and the Forestry State Department.

615. The Plan will be provided to the Engineer as part of his CESMP. No spoil storage will be allowed until the MoT through the Supervising Engineer have approved the plan and all licenses and approvals have been received.

616. With these mitigation measures the risk is assessed as “medium” and the effect is considered not significant, following the implementation of the ongoing mitigation and management.

RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	SIGNIFICANT?
Site specific impacts – spoil disposal sites	MODERATE	POSSIBLE	MEDIUM	NO

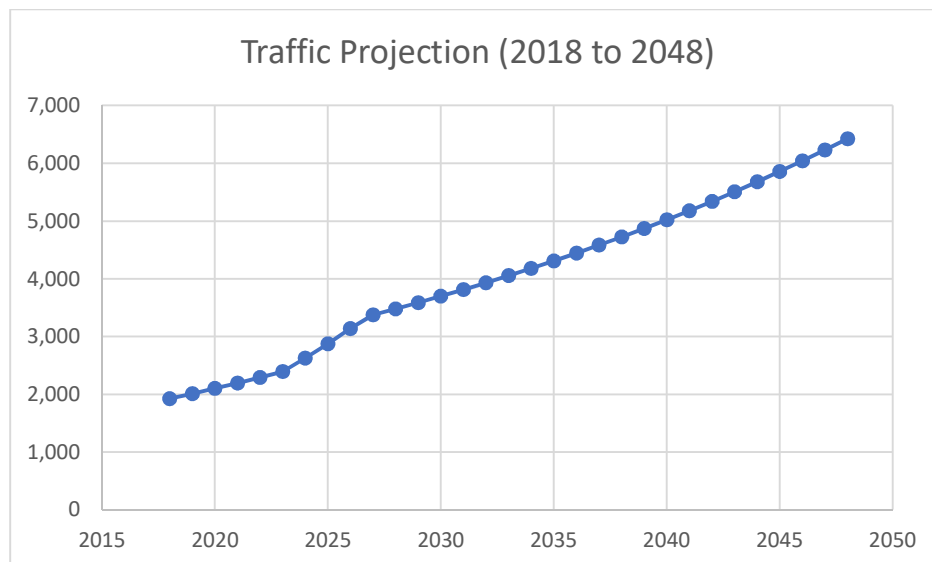
## 7.4 Operational Phase Impacts

### 7.4.1 Operational Phase Traffic Noise

#### 7.4.1.1 Impacts

617. Rehabilitation of the road will increase traffic movements on the project alignment i.e. all traffic on the existing M41 alignment will be transferred to the new alignment. Detailed traffic information is included in section 5.14.10. In summary the traffic counts in September 2018 indicated that all traffic on the existing alignment would use the new alignment. There was no systematic difference between weekday and weekend traffic and a simple average was taken as representative of base year traffic.
618. Small passenger vehicles accounted for 84% of the observed traffic at Hakimi. Assuming the Karamyk border crossing remains closed, future growth is expected to be closely related to growth in GDP per head. Forecast normal passenger and light-medium goods traffic has therefore been assumed to grow at 4.3% per year from 2019 to 2026, thereafter growing at 3% per year (Figure 43).

Figure 43: Traffic Growth on the Alignment (2018 to 2048)



619. To investigate the impact of traffic noise a specialized traffic noise prediction model has been created using *Soundplan*, a computer model that allows a 3 dimensional (3D) prediction of noise levels to be made<sup>97</sup>. The *Soundplan* model builds on the engineering design information produced in Computer Aided Design (CAD) format. *Soundplan* superimposes traffic noise predictions (from number of vehicles, mix of traffic (HGV, cars, etc), speed, gradient of road) onto CAD information (alignment centreline, road edges, elevation, cross section and topographic (contours)).
620. The output is a drawing showing (i) a noise level contour (usually the 55 dB(A) daytime and 45 dB(A) night-time contour representing the acceptable daytime and night-time

<sup>97</sup> The traffic Noise modelling exercise was conducted by Kocks Consult GmbH, Stegemannstrasse, Koblenz, Germany. Report dated April 2019

traffic noise level respectively); and (ii) the actual noise level at a particular location (usually at a building on the alignment representing a sensitive use).

621. The guidelines of the International Finance Corporation (IFC) (Table 42) have been used for assessing the impacts of traffic noise. This guideline provides criteria and guidance for noise control from a development beyond the property boundaries.
622. The criteria specify that noise levels measured at noise receptors must not be 3 dB(A) greater than the background noise levels or exceed 55 dB(A) during the day or 45 dB(A) during the night in residential areas and 70 dB(A) in commercial areas. Furthermore, the 3dB(A) criterion is also applicable for this project as there is some ambient background noise due to traffic movement on the existing gravel / earth road in the villages.

*Table 42: IFC noise level guidelines used in traffic noise assessment*

Receptor	One Hour LAeq (dB(A))	
	Day time 07:00 – 22:00	Night time 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Note: For acceptable indoor noise levels for residential, institutional, and educational settings refer to WHO, 1999

Source: IFC, EHS Guidelines, Noise Management

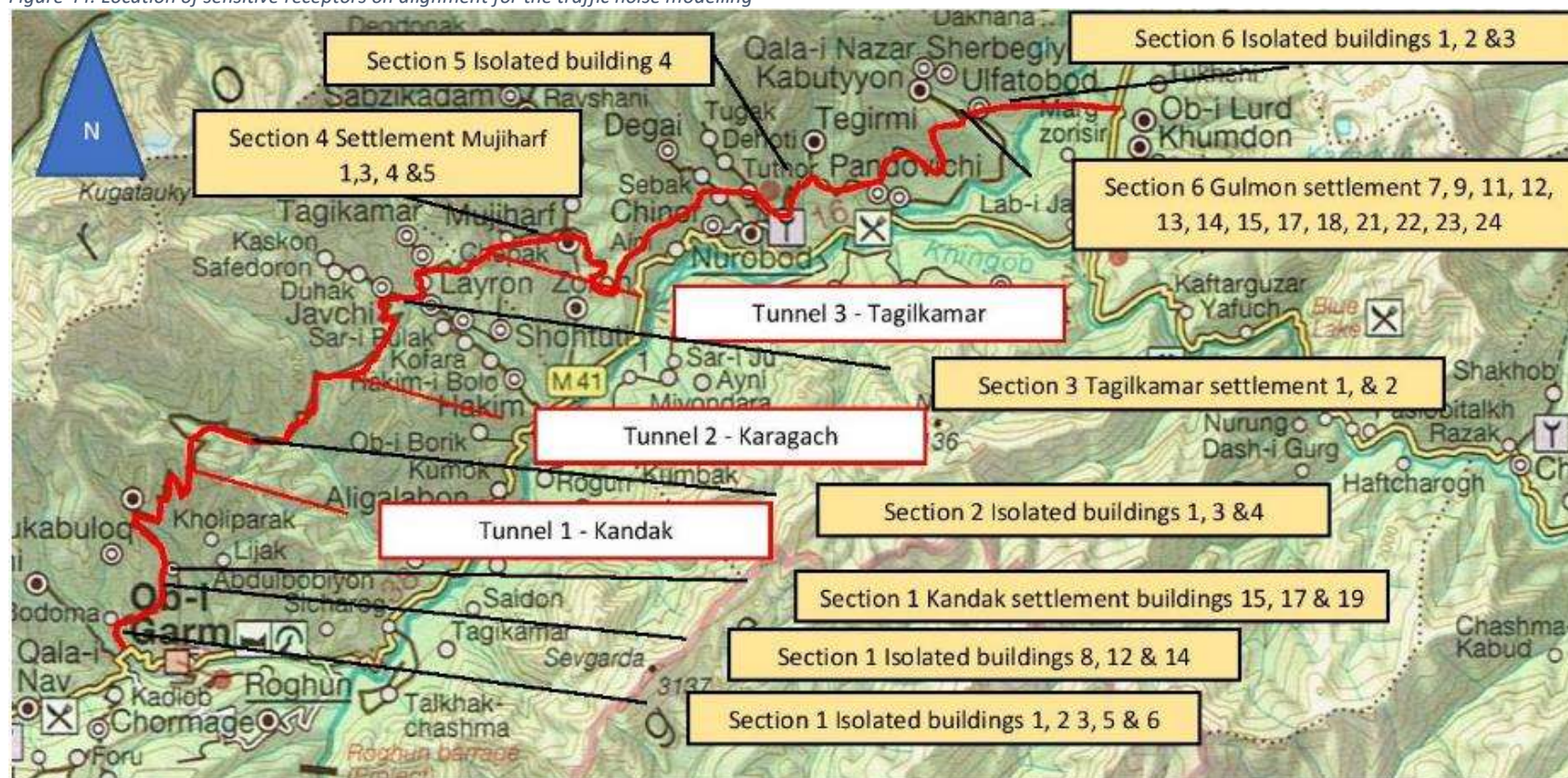
623. The receptors in the study area were identified through interpretation of aerial photography (Google earth) and topographical survey data. Each receptor has been assigned a unique identifier for modelling and reporting purposes. All receptors are assumed to be one story residential buildings. The sensitive receptors are shown in Figure 44.
624. An onsite survey was carried out in June 2019 to determine the use of structures, their status, presence of compound walls that may shield noise to refine the impact assessment<sup>98</sup>. It is noted that many residential developments are within a walled compound. The compound wall, if solid construction (mud brick, blockwork or steel) forms a noise barrier, shielding the sensitive development from noise impact. It was also observed during the survey that some of the existing structures cannot be considered as sensitive receptors as these are used for some other purposes such as a storage yard or a barn.

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<sup>98</sup> A field survey of all the identified noise modelling points was carried out in June 2019. The assessment included visual inspection (to determine the structure use i.e. sensitive (residential, school, place of worship, etc.) or not sensitive (a storage shed / barn). Owners were interviewed on gave informal views on the need for barriers and other observations.



Figure 44: Location of sensitive receptors on alignment for the traffic noise modelling



625. It was noted that there was a higher proportion of non-sensitive structures at the east end of the alignment (Ulfatobod and Dekhitag villages in Safedchashma Jamoat) where there were greater numbers of non-sensitive barn structures and storage sheds close to the alignment.
626. During the field surveys owners were identified and offered their views on the road. All were strongly supportive of the development of the alignment but had reservations about the installation of noise barriers citing concerns over loss of access and amenity. In addition, an owner of a property on the downhill side of the alignment welcomed the construction of a barrier for safety concerns during construction and operation (debris falling down the road batter during construction and vehicles running off the road during operation).
627. Traffic noise increases with traffic volume and the proportion of heavy vehicles. Traffic forecasts for the base year 2018, and future year 2025 (after 7 years from the base year) and year 2033 (after 15 years from the base year) were provided for the project road by the Traffic Engineer. The provided traffic data for the project road are shown in Table 43.

Table 43: Traffic forecasts in Annual Average Daily Traffic (AADT)

Year	AADT				Sum
	Small pax	LMGVs	HGVs	TTs	
2018	1,695	79	139	12	<b>1,924</b>
2025	2,453	155	224	39	<b>2,871</b>
2033	3,373	263	336	80	<b>4,052</b>

628. Since the noise impacts are calculated during the one-hour period where the worst-case noise levels occur, the peak hour traffic volumes for day and night time have been derived from the forecasted traffic volumes based on the hourly distribution of the traffic established during the traffic counts. The hourly traffic data used for the noise modelling is shown in Table 44.

Table 44: Traffic Data

<b>Year: 2018 (Baseline year)</b>	Day time	Night time
Light vehicles per hour	85	52
Trucks per hour	3	12
<b>Total per hour</b>	<b>88</b>	<b>64</b>
<b>Year: 2025 (opening)</b>	Day time	Night time
Light vehicles per hour	123	79
Trucks per hour	6	20
<b>Total per hour</b>	<b>129</b>	<b>99</b>
<b>Year: 2033 (Peak)</b>	Day time	Night time
Light vehicles per hour	170	114
Trucks per hour	10	33
<b>Total per hour</b>	<b>180</b>	<b>149</b>

629. It should be noted that the percentage of heavier trucks is at night time higher than in day time. Considering that the worst hourly noise impact typically occurs when heavy truck volumes are the greatest, the loudness of traffic noise is higher at night time than at day time.

630. The lowest traffic noise for a typical traffic mix occurs at about 30 km/h. Increasing average vehicle speed above this increases traffic noise. Estimated operating speeds are used to predict road traffic noise levels and based on the road characteristic of the designed road. The vehicle speeds used in the noise modelling are shown in Table 45.

Table 45: Vehicle speed used in noise modelling

Vehicle speed (km/h)		Remarks
Cars	Trucks	
50	50	Mountainous terrain and partly passage through build-up areas

631. A traffic noise calculation has been done for a vehicle speed of 40 km/h for cars and trucks while passing through villages and settlements as per the local speed limit requirements.

632. Different road surfaces generate different noise levels from tyres. The difference in noise emission (correction) between road surface types in accordance to RLS-90 is shown in Table 46.

Table 46: Noise emission correction values for different road surface types

Road Surface	Surface Correction dB(A) for Permitted Speeds			
	30 km/h	40 km/h	> 50 km/h	> 60 km/h*
Non-grooved mastic asphalt, asphalt concrete, or stone mastic asphalt	0	0	0	0
Concrete or grooved mastic asphalt	1.0	1.5	2.0	2.0
Block pavement with smooth surface	2.0	2.5	3.0	3.0
Other block pavements	3.0	4.5	6.0	6.0
Concrete with metal broom treatment	n/a	n/a	n/a	1.0
Concrete with smooth texture (burlap cloth)	n/a	n/a	n/a	-2.0
Asphalt concrete < 0/11 and stone mastic asphalt 0/8 & 0/11 aggregate size without chipping	n/a	n/a	n/a	-2.0
Porous asphalt with more than 15% voids and 0/11 aggregate size	n/a	n/a	n/a	-4.0
Porous asphalt with more than 15% voids and 0/8 aggregate size	n/a	n/a	n/a	-5.0

Note: \* Outside settled areas

Low noise road surfaces should have a referred noise reduction of at least 2 dB(A)

5. For noise modelling on this project roads with an asphalt surface have been adopted, as stated in the design documents and no correction factor has been used in the road noise calculation.

633. The road noise prediction consists of the project road alignment and forecasted further traffic data. Noise levels for the base year 2018 (baseline) and future years 2025 (after 7 years from the base line) and 2033 (after 15 years from the base line) were calculated and compared to the relevant criteria. The results of the noise prediction at the selected sensitive receptors are presented in Table 47.
634. It should be noted that: due to the high truck traffic at night, the noise values at night time are relatively higher than during the day time, and
635. Although the traffic noise levels at some receptors exceed the desirable level of 55 dB(A) in daytime and 45 dB(A) in night-time in accordance to IFC standard, it should be noted that the increase of the noise levels between the base year 2018 and the reference year 2025 will be less than 3 dB(A).
- Moreover, the predicted night-time noise levels at most of the sensitive receptors are exceeding the 3dB(A) criteria for year 2033. However, predicted noise levels for year 2025 are considered for devising any mitigation measures due to uncertainties involved with predicted traffic volumes for 2033.
  - Survey of the buildings carried out in June 2019 revealed that many of these buildings have boundary walls. Hence, the predicted noise levels will further reduce at the building as these boundary walls would act as noise barriers.

Table 47: Results of the Traffic Noise modelling exercise for the project

Point No.	Works Package	Jamoat	Mahalla	SR Type	Permissible Noise Level IFC Guidelines dB(A)		Measured Ambient Noise Level		Predicted Noise Level 2018 in dB(A)		Predicted Noise Level 2025 in dB(A)		Predicted Noise Level 2033 in dB(A)		Difference Noise Level 2018-2025 in dB(A)		Requirement of additional noise protection measures
					LAeq day time	LAeq night time	LAeq day time	LAeq Night time	LAeq day time	LAeq Night Time	LAeq day time	LAeq night time	LAeq day time	LAeq night time	day	night	
1	Civil Works Package 1 - Western	Section 1 – Obigarm (western end of alignment)	Bozorak	Dwelling	55	45			44.8	48.1	47.1	50.3	49.0	52.3	2.3	2.2	No
2				Dwelling	55	45			37.6	40.8	39.8	43.0	41.7	45.1	2.2	2.2	No
3				Dwelling	55	45			38.2	41.5	40.5	43.7	42.4	45.8	2.3	2.2	No
5				Dwelling	55	45			42.9	46.2	45.2	48.4	47.1	50.5	2.3	2.2	No
8			Kandak	Dwelling	55	45			45.0	48.3	47.3	50.4	49.2	52.5	2.3	2.1	No
12				Dwelling	55	45			46.3	49.6	48.6	51.7	50.4	53.8	2.3	2.1	No
14				Dwelling	55	45			33.5	36.8	35.8	38.9	37.7	41.0	2.3	2.1	No
15				Dwelling	55	45			37.7	40.9	39.9	43.1	41.8	45.2	2.2	2.2	No
17				Dwelling	55	45			42.6	45.9	44.9	48.1	46.8	50.2	2.3	2.2	No
19				Dwelling	55	45			44.0	47.3	46.3	49.5	48.2	51.6	2.3	2.2	No
21				Dwelling	55	45			52.7	55.9	55.0	58.1	56.8	60.2	2.3	2.2	No
22				School	55	45	42.3	38.5	40.1	43.4	42.4	45.6	44.1	47.5	2.3	2.2	No
		Tunnel 1 - Kandak															
1		S2 Sicharog	Shohiaslon	Dwelling	55	45			44.9	48.2	47.2	50.4	49.1	52.2	2.3	2.2	No
3				Dwelling	55	45			46.1	49.4	48.4	51.6	50.3	53.7	2.3	2.2	No
4				Dwelling	55	45			33.5	36.7	35.7	38.9	37.6	41.0	2.2	2.2	No
		Tunnel 2 – Karagach															
1	S3 Hakimi	Javchi Poyon	Dwelling	55	45			52.1	55.4	54.4	57.5	56.2	59.6	2.3	2.1	No	
2		Siyohgulak	Dwelling	55	45			54.1	57.4	56.4	59.6	58.3	61.7	2.3	2.2	No	
3		Sadokot	Dwelling	55	45	45.4	41.4	44.4	47.7	46.7	49.9	48.6	52.0	2.3	2.2		

Tunnel 3 - Tagikamar																
1	Civil Works Package 2	S4 Mujiharf	Chepak	Dwelling	55	45		50.0	53.3	52.3	55.5	54.2	57.6	2.3	2.2	No
3			Mujiharfi Kalon	Dwelling	55	45		44.7	47.9	46.9	50.1	48.8	52.2	2.2	2.2	No
4				Dwelling	55	45		48.4	51.6	50.6	53.8	52.5	55.9	2.2	2.2	No
5				Dwelling	55	45		36.4	39.7	38.7	41.9	40.6	44.0	2.3	2.2	No
6			Mujiharf	Dwelling	55	45	51.2 44.3	39.9	42.5	42.2	44.7	44.1	46.8	2.3	2.2	No
4		S5 Komsomolobod	Tutkhor	Dwelling	55	45		37.5	40.8	39.8	43.0	41.7	45.1	2.3	2.2	No
				Dwelling	55	45	46.3 44.1	44.5	47.7	46.8	49.9	48.7	52.0	2.3	2.2	No
1		S6/7 Safedchashma (East end of the alignment)	Dekhitag	Dwelling	55	45		46.3	49.6	48.6	51.8	50.5	53.9	2.3	2.2	No
2				Dwelling	55	45		51.4	54.7	53.7	56.9	55.6	58.9	2.3	2.2	No
10			Ulfatobod	Dwelling	55	45		42.8	46.1	45.1	48.3	47.0	50.4	2.3	2.2	No
11				Dwelling	55	45		50.9	54.1	53.1	56.3	55.0	58.4	2.2	2.2	No

Note 1: Red shading denotes exceedance of IFC guidelines as well as the 3dB(A) criteria

Note 2: For precise locations of the sensitive receptors see **Error! Reference source not found.**

Note 3: Civil Works Package 3 consists only of construction of the long bridge with approach roads from km 72+900 - km 74+303



#### 7.4.1.2 Mitigation

636. An Operational Noise Management Plan will be developed and implemented by the Maintenance Department of the MoT and will include provisions for emissions monitoring, noise related grievance investigation and resolution, and additional mitigations if identified as necessary.
637. With these mitigation measures, the risk is assessed as “medium” and the noise effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Noise from road traffic	MINOR	PROBABLE	MEDIUM	NO

#### 7.4.2 Operation Phase Traffic Air Quality

##### 7.4.2.1 Impacts

638. A screening exercise has been carried out to assess the potential impact of traffic emissions on the population adjacent to the alignment. The approach comprised a review of ten recent (post 2010) ADB, World Bank and EIB projects in Central Asia. The screening has identified projects in: Tajikistan (2 Initial Environmental Examination (IEE) and 1 EIA), Kyrgyzstan (1 IEE and 1 EIA), Armenia (1 EBI IEE and 1 ADB IEE), Azerbaijan (1 World Bank EIA and 1 ADB EIA) and one project in Georgia (1 ADB EIA).
639. Only two of the ten projects included quantitative modelling of air quality impact. These projects were: (1) an ADB EIA in Georgia (October 2018); and (2) an ADB IEE project in Kyrgyzstan (November 2016). We have therefore focused on these projects.
- Roads Department of Georgia - Preparation of an EIA for the Kvesheti-Kobi Road - Lot 1 Tunnel South Portal Kobi and Lot 2 – Kvesheti – Tunnel South Portal The project passes through sparsely populated uplands, similar conditions to the Project alignment, through the traffic volumes are considerably higher 4,895 to 11,593 vehicles / day compared to 1,824 to 4,062. However, even with this much higher traffic volumes the predicted air pollution contours suggest that air pollution standards would not be exceeded beyond the alignment corridor.
  - CAREC 1&3 Connector Road Project – Epkin / Bashkugandy, Kyrgyzstan. This project is a 70km twin carriageway project with a peak elevation of 2664m passing through areas of low population / grazing land. Traffic volumes are higher than the project alignment, though similar 3,742 / 6,231 vehicles / day compared with 1,824 to 4,062 vehicles / day, this project. The air quality modelling assessment concluded that there was no significant air pollution beyond 6m from the project centre line. This suggests that air pollution outside the transport corridor was of acceptable quality and would not impact on surrounding uses.
640. The screening exercise therefore concludes that the project alignment will have minimal, if any, impact above the limit levels beyond the corridor itself. Therefore, no mitigation measures are proposed at this stage.
641. Table 48 summarises the findings of the screening exercise.





Table 48: Air Quality Assessment – Documents used in screening process

	Country	Name	Agency	Traffic Volume	Type	Date	Operational Air Quality Assessment		Conclusion
							Qualitative	Quantitative	
A	TAJ	This project	ADB / EBRD	1,824/4,062	EIA	Jun 2019		Nil	
1	GEO	Road Corridor Investment Programme 3. Kvesheti / Kobi	ADB	4,895/11,593	EIA	Oct 2018	Nil	✓	No significant negative impacts on the environment- No pollution effects outside corridor
2	TAJ	CAREC 3&5. Kangert / Boljuvon / Khovaling	ADB	780 to 800/day	IEE	May 2018	Nil	Nil	Open aspect – no impact anticipated
3	TAJ	CAREC 2, 5 & 6. Dushanbe / Kurgontepa	ADB	8,296/25,257	IEE	Feb 2018	Nil	Nil	Open aspect – no impact anticipated
4	KGZ	CAREC 1&3 Connector Road Project – Epkin / Bashkugandy	ADB	3,742 / 6,231	IEE	Nov 2016	Na/	✓	Air pollution at 6m from c/l caused no significant air pollution (para 121)
5a	ARM	M6 Vanadzor / Georgian Border	ADB	6,881/day	IEE	April 2016	Nil	Nil	Acceptable level of impact
5b	ARM	M6 Vanadzor / Georgian Border	EIB	3,000/ 6000	EIA	April 2015	Nil	Nil	
6	KGZ	CAREC Transport Corridor 1 (Bishkek-Torugart Road) Project 3: EIA	ADB		EIA	March 2015	Nil	Nil	Open aspect – no impact anticipated
7a	ABE	2 <sup>nd</sup> Road network Masalli / Shorsulu	ADB	4,446 / 20,000	EIA	Aug 2012	Nil	Nil	Open aspect – no impact anticipated
7b	ABE	Sections 2a / 3a Kur River / Jalilabad	WB	4,544/ 15,700	EIA	Aug 2007	Nil	Nil	
9	TAJ	CAREC Corridor 3 (Dushanbe–Uzbekistan Border) Improvement Project	ADB		EIA	Sept 2010	Nil	Nil	

642. In conclusion, with the low number of vehicles and proximity to sensitive receivers (compared to urban expressways or street upgrades in highly developed cities) and the high levels of dispersion afforded by the setbacks and generally open aspect of the alignment, the operational air quality impacts are not expected to be significant.
643. Air emissions will also be generated by road maintenance activities, including dust, vehicle emissions and bitumen fumes, from the asphalt. Impacts for these activities are anticipated to be similar to construction phase emissions, but on a much reduced localised scale and lower frequency.
644. Vehicle emissions in tunnels may become concentrated if adequate ventilation is not provided and maintained.

#### 7.4.2.2 Mitigation

645. An Operational Air Quality Management Plan will be developed and implemented by the Maintenance Department of the MoT and will include provisions for maintenance of tunnel air extraction systems and procedures to mitigate dust and emissions from road maintenance activities.
646. With these mitigation measures, the risk is assessed as “low” and the air quality effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Emissions to air from exhaust emissions from vehicles using the road and maintenance activities	MINOR	POSSIBLE	LOW	NO

### 7.4.3 Climate Change - GHG Emissions Due to Operation

#### 7.4.3.1 Impacts

647. As discussed in Section 7.3.3, a greenhouse gas assessment was conducted for both the construction and operational phases of the road. Emissions sources for the operational phase were included or excluded from the assessment, based on their potential to result in significant emissions. The scope of this assessment has been informed by professional judgement and is summarised in Table 49.

Table 49: Scope of Operational Greenhouse Gas (GHG) Assessment

Emissions source	PAS2080 Ref <sup>99</sup>	Scope	Justification
Lighting electricity Consumption	B6	Out	Emissions from lighting are expected to have a small magnitude due to only small sections of the Project being lit
Tunnel Ventilation electricity Consumption	B6	Out	Emissions from ventilation are expected to have a small magnitude due to the ventilation system mainly being run for testing of fire suppression

<sup>99</sup> PAS2080 Refs are lifecycle reference codes used to consistently define construction Project lifecycle stages – BSI (2006) PAS2080: Carbon Management in Infrastructure  
<https://shop.bsigroup.com/ProductDetail?pid=000000000030323493>

Emissions source	PAS2080 Ref <sup>99</sup>	Scope	Justification
Maintenance / Repair	B2-3	Out	The Project will be maintained. However, this is not expected to result in large magnitude emissions, and the control over maintenance activates only fall partially within the design team and contractor's control.
Replacement / refurbishment	B4-5	In	During the Project reference lifespan Project elements will need to be replaced. This is expected to result in large magnitude emissions.
Water Consumption	B-7	Out	Water consumption has a low carbon emissions rate, it is not expected that large quantities of water will be used to operate the Project. As such this is not expected to be a large magnitude source of emissions.
Land Use Change – Biomass growth	B-8	Out	The project is not expected to add or remove any large carbon sinks and therefore land use change emissions are not expected to be a large magnitude source of emissions.
Emissions from traffic using the local road network	D	In	Emissions from the traffic using the Project are expected to have a large magnitude.
Deconstruction emissions	C1-4	Out	Expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity to determine their likely magnitude, even if they take place at all.

648. A range of scheme information, assumptions and emissions factors were used to calculate the magnitude of emissions from the operation of the scheme. These can be found in Table 50. There is a very high level of uncertainty associated with the results, due to the limited availability of data. As such it is recommended that this assessment, and its scope, is reviewed and updated once further information is available.

*Table 50: Design Information, Assumptions and Emissions Factors Used in the GHG Assessment*

Description	Data type	Value	Unit	Source
Project reference lifespan	Assumption	120	Years	Assumption
Tunnels and bridges replacements over Project reference lifespan	Assumption	0	no.	Assumption - other project examples
Road surface replacements over Project reference lifespan	Assumption	6	no.	Assumption - other project examples

Description	Data type	Value	Unit	Source
Road base replacements over Project reference lifespan	Assumption	2	no.	Assumption - other project examples
Vehicle journeys	Assumption	Dushanbe - Kyrgyz Border	N/A	Assumption - as the change in emissions is required this assumption is unimportant. However, it allows for the change in emissions due to routeing to be estimated
Current distance Dushanbe - Kyrgyz Border	Scheme information	338	km	GIS
Distance Dushanbe - Kyrgyz Border without Scheme	Scheme information	700	km	GIS
Distance Dushanbe - Kyrgyz Border with Scheme	Scheme information	366	km	GIS
Fewer journeys due to increased journey length without scheme	Scheme information	40	%	Annex H: Interim Economic Evaluation
Small passenger vehicles 2024	Scheme information	2267	No. per day	Annex H: Interim Economic Evaluation
Small passenger vehicles 2029	Scheme information	2996	No. per day	Annex H: Interim Economic Evaluation
Small passenger vehicles 2034	Scheme information	3474	No. per day	Annex H: Interim Economic Evaluation
Small passenger vehicles 2039	Scheme information	4027	No. per day	Annex H: Interim Economic Evaluation
Small passenger vehicles 2044	Scheme information	4668	No. per day	Annex H: Interim Economic Evaluation
Small passenger vehicles 2048	Scheme information	5254	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2024	Scheme information	125	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2029	Scheme information	234	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2034	Scheme information	271	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2039	Scheme information	314	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2044	Scheme information	364	No. per day	Annex H: Interim Economic Evaluation
Light-medium goods vehicles 2048	Scheme information	410	No. per day	Annex H: Interim Economic Evaluation
Heavy goods vehicles 2024	Scheme information	205	No. per day	Annex H: Interim Economic Evaluation

Description	Data type	Value	Unit	Source
Heavy goods vehicles 2029	Scheme information	284	No. per day	Annex H: Interim Economic Evaluation
Heavy goods vehicles 2034	Scheme information	351	No.	Annex H: Interim Economic Evaluation
Heavy goods vehicles 2039	Scheme information	433	No.	Annex H: Interim Economic Evaluation
Heavy goods vehicles 2044	Scheme information	535	No.	Annex H: Interim Economic Evaluation
Heavy goods vehicles 2048	Scheme information	633	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2024	Scheme information	26	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2029	Scheme information	71	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2034	Scheme information	83	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2039	Scheme information	96	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2044	Scheme information	111	No.	Annex H: Interim Economic Evaluation
Truck-trailers vehicles 2048	Scheme information	125	No.	Annex H: Interim Economic Evaluation
Small passenger vehicles	Emissions factor	0.382	kgCo2/v.km	GHG Protocol 2017
Light-medium goods vehicles	Emissions factor	0.531	kgCo2/v.km	GHG Protocol 2017
Heavy goods vehicles	Emissions factor	1.151	kgCo2/v.km	GHG Protocol 2017
Truck-trailers vehicles	Emissions factor	1.717	kgCo2/v.km	GHG Protocol 2017

649. Using the above information and assumptions, it was possible to quantify emissions from the replacement of scheme elements over the Project's reference life span, and emissions and changes in emissions from road vehicles, either using the scheme, or diverted around the reservoir if the scheme was not in place. The results of this assessment are presented below.

Emissions from traffic average per year (D) - tCO2	Emissions from traffic over Project life span (D) - tCO2	Emissions from replacement (B4) - tCO2	Net - tCO2
-59,000	-7,098,000	276,000	-6,822,000

650. The magnitude of emissions shows that the increase in vehicle use due to the road, is more than offset by the distance reduction due to the road, resulting in avoided traffic emissions due to the Project. The magnitude of these avoided emissions is greater than the emissions due to replacing Project elements over the Project lifespan, resulting in net negative emissions due to the scheme.

651. Based on the magnitude of emissions and professional judgment it is possible to conclude on the impact of the Project on the climate during operation. This is presented below.

#### 7.4.3.2 Mitigation

652. During operation, all maintenance and refurbishment of the Project will be undertaken using best-practice efficient approaches and efficient plant and equipment.

653. Based on the magnitude of emissions and professional judgment it is possible to conclude that the impact of the Project on the climate during operation will be low and the effect will not be significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Climate Change – Operational GHG Emissions	MINOR	PROBABLE	LOW	NO

#### 7.4.4 Operational Phase Hydrology and Water Quality

##### 7.4.4.1 Impacts

654. The design of the road includes drainage provision. i.e. removal of rainwater / surface water run-off through drainage systems. In the villages this will be through edge drains and culverts. In the rural sections drainage will be through crossfall on the road surface.

655. Inadequate or non-timely maintenance and cleaning of the drainage network can lead to clogging and malfunction of the system, contributing to deterioration of the pavement (e.g. through water penetration and frost heave) and worsening sanitary-hygienic conditions in the road area. Road maintenance activities can result in silty run-off and oil leakage from poorly maintained maintenance machinery, stockpiled materials and asphalt, and from spilled liquids during refuelling and fuel handling. Runoff from salt application may also cause contamination of surface water runoff, if not appropriately planned and managed. Pollution of watercourses that may be used by the community and potential impacts on stream ecology is possible if not appropriately managed. These risks will be managed through the implementation of the Operational Drainage Management Plan.

##### 7.4.4.2 Mitigation

656. An Operational Drainage Management Plan will be developed and implemented by the Maintenance Department of the MoT. The plan will set out measures to monitor and maintain drainage structures, including the culverts and pipes beneath the road that the village water pipes will pass through.

657. This plan will cross reference other sub-plans including; Emergency Response Plan, Operational Waste Management Plan, and others as required. Additionally, location specific mitigation measures will be covered by the required plans for these operations, including the Tunnel Operational Management Plan.

658. With these mitigation measures the risk is assessed as “low” and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Contamination of watercourses and localised flooding due to blocked drainage	MINOR	IMPROBABLE	LOW	NO

#### 7.4.5 Operational Phase Biodiversity

##### 7.4.5.1 Impacts

659. Current livestock movement patterns will likely be of local importance to scavenging animals, in particular birds such as black vulture and griffon vulture. The project will potentially result in changes to livestock movements, thus impacting species which rely on the associated carrion or faeces as part of their foraging regime.



660. Illegal hunting and collecting of fruit / seeds / firewood / medicinal herbs, etc., is already occurring across the project area. The project will improve local access along its extent, which poses potential risks in terms of increasing this activity. It is not considered likely that the magnitude of change in this regard will result in a significant effect. However, mitigation will be implemented to further ensure this.

661. Furthermore, the new road use will potentially impact local animal movement through an increase in vehicle collisions, in particular during the period within which animals are habituating to the operational road.

#### 7.4.5.2 Mitigation

662. The project's potential impact on biodiversity is considered to be limited, however, mitigation measures should be adopted to ensure this. These are detailed within the project ESMP, and an Operational Biodiversity Management Plan will be developed and implemented to mitigate potential impacts

663. With mitigation in place, the effect to biodiversity is considered to be not significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Adverse impacts on Biodiversity, flora and fauna, due to collisions, changes to livestock movement patterns and illegal poaching and seed/fruit/herb gathering.	MINOR	IMPROBABLE	LOW	NO

#### 7.4.6 Operational Waste Management

##### 7.4.6.1 Impacts

664. Operation of the road will require periodic removal of waste accumulated from littering alongside the alignment. Improper and non-timely collection, removal and disposal of waste can lead of odour and aesthetics impacts in the road and nearby area. Waste from the road alignment will be removed during scheduled maintenance by the MoT maintenance teams, as set out in the Operational Waste Management Plan.

##### 7.4.6.2 Mitigation

665. The Operational Waste Management Plan set outs measures to manage roadside waste, waste from maintenance activities and the tunnel offices.

666. With mitigation in place, the waste effect is considered to be not significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT
Removal of wastes during planned maintenance, and waste accumulation along road	MINOR	POSSIBLE	LOW	NO

#### 7.4.7 Operational Soil Management

##### 7.4.7.1 Impacts

667. The application of chemicals for road de-icing may impact the soil and water quality and lead to pollution, thus operation and maintenance manuals should establish the approaches for winter maintenance of the road with due consideration of environmental impacts. Though it

is noted that normal practice for winter maintenance in Tajikistan is to spread earth on the snow / ice to improve surface grip.

#### 7.4.7.2 Mitigation

668. Chemicals for road de-icing shall be chosen carefully with due consideration of environmental impacts. Maintenance programmes should include defined application rates and conditions for de-icing chemicals to minimise potential for run-off of excess into drainage and soils.
669. The MoT maintenance team will develop and implement an Operational Soil Management Plan that sets out the defined approach. With mitigation in place, no significant effect on soils is anticipated.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT
Impacts to soils from maintenance.	MINOR	POSSIBLE	LOW	NO

### 7.4.8 Climate Change – Adaptation and Resilience of the Project

#### 7.4.8.1 Impacts

670. Climate change and associated natural hazards is a key issue affecting road infrastructure during both construction and operation. The climate change and seismic risks to the project were assessed under separate dedicated assessments which aimed to identify material climate change related risks to the project and propose mitigating structural and non-structural improvements to increase the project's resilience. "Assessment of climate change risks to Vahdat – Kyrgyz Border Rehabilitation Project" contracted by EBRD covers the climate risks to package 2, and a Climate Risk and Vulnerability Assessment screening contracted by ADB was undertaken for package 1. The assessments identified the following relevant hazards to the project:

- Increasing ambient average temperature and temperature ranges;
- Increasing average precipitation and short-term heavy rains;
- Increase in melted water coming from higher altitudes resulting in an increase in slush flows on the road or around the road;
- Increasing average levels of wind and short-term stronger winds;
- Changes in seismicity.

#### 7.4.8.2 Mitigation

671. Measures to mitigate these risks have been incorporated into the design documents.
672. An Operational Climate Resilience Management Plan will be developed, which will include updates on changes in physical conditions and their projections, and which will specify requirements and processes (management framework) with respect to climate resilience.
673. With mitigation in place the post mitigation risk is assessed as "medium" and it is recommended to be monitored throughout operation.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Climate change resilience	MODERATE	POSSIBLE	MEDIUM	YES

## 7.4.9 Operational Worker Health & Safety

### 7.4.9.1 Impacts

674. Workers involved with operation of the road will mainly be maintenance personnel, but will also include tunnel operations staff.

675. Risks to safety can occur due to violation of proper health and safety practices and may lead to injuries and accidents.

676. Key hazards associated with maintenance activities include:

- Heavy vehicles and construction traffic
- Interaction between vehicles and pedestrians
- Excavations
- Exposure to noise, dust, vibrations and other agents
- Hazardous materials, including fuels and bitumen
- Exposure to heat, cold and extreme weather conditions
- Work in confined spaces
- Collapse of tunnels and other structures
- Electrical and other equipment
- Welfare at work locations

677. Key hazards associated with tunnel operations include:

- Interaction between vehicles and pedestrians
- Exposure to heat, cold and extreme weather conditions
- Lone working
- Welfare at work locations

### 7.4.9.2 Mitigation

678. The hazards from maintenance activities can be mitigated, as long as proper safety practices and procedures are robustly and competently applied. An Operational Worker Health and Safety Plan will be developed, including processes and responsibilities for mitigating the key risks described above.

679. An Operational Emergency Response Plan, including a specific plan for Tunnel Emergencies will be developed, including measures for prevention, mitigation and response to all relevant emergency scenarios (road traffic accidents, spills, fire, etc.). The plan will define the suitable response resources (medical, fire fighting, etc) necessary to mitigate the remote location of the alignment and consequent increased response times.

680. With these management plans in place, the risk is assessed as “low” and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Operational phase worker health & safety	MINOR	POSSIBLE	LOW	NO

## 7.4.10 Socio-Economic Impacts – Road Safety

### 7.4.10.1 Impacts

681. The operation of the road will bring vehicles into an environment where there was previously no vehicle movements. This will change the safety environment, resulting in an increase risk of traffic accidents, due to an increase in the number of vehicles, particularly if

they drive at high speeds. The project may change the community's exposure to risks and impacts arising from traffic accidents, and structural failures, due to this increased traffic.

682. During the operation period negative impact might occur as a result of driving at higher speed.

#### 7.4.10.2 Mitigation

683. Many of the key mitigations measures to reducing the potential safety impacts to the public during the operation of the road, were incorporated into road design during the design phase. The designed-in safety features are summarised in Section 7.2.

684. A robust maintenance regime for roads, barriers, bridges, drainage and safety features will be developed and implemented by the MOT maintenance team, as set out in their Operational Maintenance Plan. This plan will ensure the continued effectiveness of safety measures (signage, crossings etc). A specific programme of inspection and maintenance will also be developed for the tunnels.

685. A programme of road safety audits will be conducted to assess safety performance along the alignment and village access roads, and to identify any unsafe conditions. This will include a Road Safety Audit at Pre-Opening / Post Construction to confirm that the recommendations agreed during the design stage Road Safety Audit have been implemented. A further Road Safety Audit should be undertaken 12 months post opening, and then periodically every 3 years to assess road traffic collisions along the road and identify any trends / accident blackspots that required safety improvement actions.

686. An Operational Community, Health and Safety Management Plan will be developed by the PIURR and will include monitoring of the effectiveness of safety measures, ongoing consultation with the community (with reference to the Stakeholder Engagement Plan).

687. Community road safety awareness will be enhanced, and information on any safety issues raised by the community will be obtained, though the engagement of the CLO, who will liaise with the local community as required by the SEP. Various initiatives will be carried out during operation to raise awareness or road safety and other aspects within the local community, particularly the safety awareness of local women and children. Such initiatives have been identified within the Operational Community Health and Safety Management Plan. Furthermore, a GRM will be developed and implemented for the Project so community and maintenance / tunnel workers concerns can be raised, addressed and closed out by the Contractor.

688. The Emergency Response Plan, including a tunnel specific section, will set out measures for prevention, mitigation and response to all relevant emergency scenarios (road traffic accidents, spills, fire, etc.). It will be implemented and enforced to ensure timely and adequate reaction in case of emergencies affecting road users (both vehicles and pedestrians) and the wider community.

689. With these management plans in place, and the proposed support initiatives by the IFIs in relation to road safety, the risk is assessed as "low" and the effect is not considered significant.

RISK	RISK SEVERITY	RISK LIKELIHOOD	POST MITIGATION RISK LEVEL	SIGNIFICANT?
Operational phase community health & safety	MINOR	POSSIBLE	LOW	NO

#### 7.4.11 Other Socio-Economic Impacts -- Livelihood.

##### 7.4.11.1 Impacts

690. The impacts on population and employment are anticipated to be generally positive, providing improved access to jobs and services. The project will create limited job opportunities for the local population (both men and women), during the operation / maintenance phases. Additionally, there may be commercial opportunities associated with improved access to markets, either due to easier transportation of goods and people, or through trading activities along the alignment
691. The project will improve the reliability, safety and speed of passengers and goods transportation along the alignment. Additionally, it will reduce the potential for transport interruptions, and provide a route to replace the highway inundated by the Rogun Dam, and will provide a connection to Kyrgyzstan.

##### 7.4.11.2 Mitigation

692. The PIURR and maintenance team will be required to consider employing local men and women, where possible.
693. The parking areas in the villages are expected to provide opportunities to sell local produce to road users.
694. The road itself will provide faster access to markets, reducing the risk of fresh produce deteriorating during transport to markets. It will also provide access to employment opportunities and education establishments.
695. The road is anticipated to result in a significant positive effect on local employment and livelihood.

RISK	RISK SEVERITY	RISK LIKELIHOOD	RISK LEVEL	SIGNIFICANT?
Operational impacts on employment and livelihood	MAJOR	POSSIBLE	HIGH (POSITIVE)	YES

Table 51: Summary of Construction Impacts, Mitigation and Significance

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
Topography and Landscape	Construction	Degradation of Landscapes and Soil Erosion as a result of vegetation removal and earthworks	Users of landscapes and soil	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Landscape and Visual Management Plan;</li> <li>Soil, Erosion and Topsoil Management Plan; and</li> <li>Waste and Materials Management Plan.</li> <li>Local mitigation measures</li> </ul>	Not significant
Soils, Geology and Hydrogeology	Construction	Excessive use of local water resources for construction	Local communities	The Contractor will undertake a water resources capacity study, to avoid any impact on the availability of resource to communities and businesses along the alignment. Management plans to be produced and implemented by Contractors:	Not significant
		Soils and water contamination as a result of	Soils and/or surface or groundwater		

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
		accidental spillages		<ul style="list-style-type: none"> <li>Ground investigation and risk assessment;</li> <li>Water Resources Management Plan;</li> <li>Emergency Response Plan;</li> <li>Waste and Materials Management Plan; and</li> <li>Soil, Erosion and Topsoil Management Plan.</li> <li>Local mitigation measures</li> </ul>	
		Migration of contaminants to soils, groundwater and surface water (and aquatic ecology)	Surface and groundwater, soils and aquatic ecology		
Climate Change - GHG Emissions	Construction	Increased rate of climate change due to GHG emissions	n/a	<ul style="list-style-type: none"> <li>Use of construction materials and products with recycled or low carbon content;</li> <li>Use of locally sourced materials where practicable; and</li> <li>Use of efficient and electrically powered construction plant where practicable.</li> </ul>	Not significant
Climate Resilience	Construction	Climate hazards (extreme temperatures, mudslides, landslides, rockfalls, floods, rapid snow melt and high winds) resulting in damage and disruption	The project, road users and residents	The Climate Resilience Construction Management Plan, will ensure that the temporary construction works do not affect the resilience of the permanent elements of the project.	Not significant
Natural Hazards	Construction	Seismic Conditions (magnitude 9)	The project and construction workers	Design of structures in accordance with the Tajik Seismic Code GNIP RT 22-07-2015	Not Significant
		Landslides, Mudslides and Floods	The project, construction workers and surrounding communities	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Slope stabilisation plan;</li> <li>Water Resources Management Plan;</li> <li>Construction Plans and Method Statement Plans; and</li> <li>Tunnel Construction Plan and Blasting Management Plan</li> <li>Recommended measures in the Avtostrada Engineering Geology Survey of dangerous locations.</li> </ul>	
Noise and Vibration	Construction	Increase in noise from construction activities causing a nuisance	Residents and Biodiversity	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Noise and Vibration Management Plan;</li> <li>Traffic Management Plan; and</li> <li>Blasting Management Plan.</li> <li>Local mitigation measures</li> </ul>	Not significant

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
				Limitations to site operations times (daylight only) and general best practice measures such as the use of natural topographic barriers.	
		Increase in vibration from construction activities causing a nuisance and damage to nearby buildings and structures.	Residents, biodiversity, buildings and structures.	<ul style="list-style-type: none"> <li>• Precondition survey to be undertaken along the alignment by the contractor;</li> <li>• Preconstruction survey to be conducted by the Contractor and the Engineer;</li> </ul> Management Plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>• Noise and Vibration Management Plan;</li> <li>• Traffic Management Plan; and</li> <li>• Blasting Management Plan.</li> <li>• Local mitigation measures</li> </ul>	Not significant
Air Quality	Construction	Increase in dust and particulate matter emissions, affecting sensitive receptors.	Residents and Biodiversity	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>• Air Quality Management Plan;</li> <li>• Water Management Plan;</li> <li>• Traffic Management Plan; and</li> <li>• Blasting Management Plan.</li> <li>• General best practice measures such as dust-suppression through watering of construction areas.</li> </ul>	Not significant
Hydrology and Water Quality	Construction	Depletion of water resources and availability to local communities	Water resources and residents	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>• Water Resources Management Plan;</li> <li>• Emergency Response Plan; and</li> <li>• Waste and Materials Management Plan.</li> <li>• Local mitigation measures</li> </ul> A capacity study of water resources along the alignment will be undertaken by the Contractor.	Not Significant
		Contamination and pollution of watercourses as a result of construction activities	Surface water bodies		
Habitats and Biodiversity	Construction	Temporary and permanent loss of habitat utilised by flora and fauna.	Flora and Fauna	<ul style="list-style-type: none"> <li>• Walkover survey of full route;</li> <li>• Implementation of Biodiversity Management Plan;</li> <li>• Appointment of an Ecological Clerk of Works</li> <li>• Avoidance of works in the most sensitive temporal windows for sheltering species;</li> <li>• Awareness training of workforce;</li> <li>• Monitoring programme of wildlife road traffic accidents; and</li> </ul>	Not significant
		Disturbance to fauna, impacting their ability to undertake activities such as foraging, hibernating or nesting.			



Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
		Injury or death from road traffic accidents		<ul style="list-style-type: none"> <li>Sympathetic restoration of temporary construction areas.</li> </ul>	
Historic, Cultural and Archaeological Monuments	Construction	Impacts of works on building of cultural value (mosques) and undiscovered archaeology	Local buildings	Implementation of a chance find procedure in case of the discovery of buried archaeology.	Not significant
Waste and Materials	Construction	Generation of waste arisings as a result of construction works and site clearance	Waste disposal capacity, soil, flora, fauna and human health	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Waste and Materials Management Plan; and</li> <li>Water Resources Management Plan.</li> <li>Local mitigation measures</li> </ul> There are no hazardous waste landfills available in Tajikistan, any hazardous waste arisings are to handled by authorised contractors only. Alternative management measures are also to be developed.	Not Significant
		Material procurement and usage	Reduced supply of construction materials	The Materials Management Plan will seek to maximise the re-use of material, particularly the material excavated from the tunnels and cuttings.	Not Significant
Socio-Economic Impacts	Construction	Generation of Jobs and resulting adverse interactions with construction workers and the community	Construction workers and residents	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Labour and Working Conditions Management Plan;</li> <li>Local Employment and Procurement and Employment Plan;</li> <li>Social Risk Register;</li> <li>Code of Conduct;</li> <li>Grievance Redress Mechanisms; and Camp Management Plan.</li> <li>Implementation of the SEP.</li> </ul>	Not Significant
		Workplace and community health and safety being adversely impacted by multiple hazards associated with the project	Construction workers and residents	Management plans to be produced and implemented by Contractors: <ul style="list-style-type: none"> <li>Occupation and Community Health and Safety Plan; and</li> <li>Emergency Response Plan</li> <li>Local mitigation measures</li> </ul>	Not Significant
		Utilities and infrastructure being disrupted by construction activities	Local residents and communities	Safe access to resources to be provided during construction	Not Significant

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
		Resettlement, land acquisition and compensation requirements disrupting landowners	Landowners	Implementation of the Land Acquisition Resettlement Plan	Not Significant
Site Specific Impacts	Construction	Developments of site construction access roads disrupting local residents along the route, causing soil erosion and raising H&S concerns	Local residents and soil	Supplementary Impact Assessment of access roads to be produced.	Not Significant
		Adverse impacts (social and health) to communities from construction camp and workers	Local residents	Production and implementation of the Camp Management Plan, and Code of Conduct	Not Significant
		Deposition of materials into watercourses as a result of bridge construction and rehabilitation	Watercourses and aquatic ecology	<ul style="list-style-type: none"> <li>• Pre-casting of works;</li> <li>• Implementation of standard; and pollution prevention measures.</li> </ul>	Not Significant
		Rockfalls, explosions and collapse as a result of tunnel construction activities	Construction workers	Production and implementation of a Tunnel Construction Plan, and Blasting Management Plan.	Not Significant
		Silty runoff, landscape degradation and loss of habitats and biodiversity of a result of siting of disposal areas.	Users of landscape, soil and biodiversity	Production and implementation of a Soil Disposal Plan	Not Significant

Table 52: Summary of Operational Impacts, Mitigation and Significance

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
Noise and Vibration	Operation	Increase in noise levels exceeding IFC standards (particularly at night)	Residents and Biodiversity	Noise abatement measures in the form of short sections of concrete block noise barriers.	Not significant
Air Quality	Operation	Increase in vehicle emissions resulting in a reduction in air quality	Residents and Biodiversity	Development and implementation of an Air Quality Management Plan. including provisions for tunnel air extraction system maintenance	Not significant
Soil, Hydrology and Water Quality	Operation	Inadequate or non-timely drainage maintenance leading to malfunctioning of the system and a deterioration in hygienic/ sanitary conditions	Residents and Biodiversity	Development and implementation of a Drainage Management Plan.	Not significant
Habitats and Biodiversity	Operation	Change of foraging routes of fauna	Flora and Fauna	Implementation of a Biodiversity Management Plan. Operational monitoring of wildlife road traffic accidents.	Not significant
		Increased accessibility resulting in poaching of fauna or depletion of foraging supplies			
		Increased vehicles collisions			
Historic, Cultural and Archaeological Monuments	Operation	Low potential for traffic impacts on building of cultural value (mosques)	Local buildings	None required	Not significant
Waste and Materials	Operation	Improper or non-timely collection, removal and disposal of waste resulting in adverse odour and aesthetic impacts	Residents	Development and implementation of a Waste Management Plan to manage roadside waste, maintenance waste and tunnel office waste.	Not significant
Soil Management	Operation	Pollution and degradation of soil due to application of de-icing chemicals to road surfaces	Soil	<ul style="list-style-type: none"> <li>Selection of de-icing chemicals to take into account environmental considerations;</li> <li>Detailing of application rates and conditions for de-icing</li> </ul>	Not significant

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
				chemicals to minimise run-off and drainage into soils; and <ul style="list-style-type: none"> <li>Development and implementation of a Soil Management Plan.</li> </ul>	
Climate Change – GHG Emissions	Operation	Increased rate of climate change due to GHG emissions	n/a	The magnitude of emissions shows that the increase in vehicle use due to the road, is more than offset by the distance reduction due to the road, resulting in avoided traffic emissions due to the Project.	Not significant
Climate Resilience	Operation	Climate hazards (extreme temperatures, mudslides, landslides, rockfalls, floods, rapid snow melt and high winds) resulting in damage and disruption	The project, road users and residents	An Operational Climate Resilience Management Plan will be developed, which will include updates on changes in physical conditions and their projections, and which will specify requirements and processes (management framework) with respect to climate resilience.	Not significant
Natural Hazards	Operation	Seismic Conditions (magnitude 9)	The project and road users	The Emergency Response Plan will include measures to respond to natural hazard events.	Not Significant
Worker Health and Safety	Operation	Exposure to vehicles, hazardous materials, the weather and electrical equipment and risk of tunnel collapse resulting in injury or death of maintenance workers	Maintenance workers	Development and implementation of a Plans: <ul style="list-style-type: none"> <li>Health and Safety Plan; and</li> <li>Emergency Response Plan (including specific tunnel emergency plans).</li> </ul>	Not significant
Socio-economic Impacts	Operation	Economic and employment opportunities	Residents, users of the road and the local economy	Likely to be enhance by the provision of parking spaces in the villages.	Not significant
		Increased reliability, safety and speed of transport options		Will be enhance by regular maintenance of the roads.	
		Adverse impacts on safety due to introduction of motorised vehicles to a new environment		<ul style="list-style-type: none"> <li>Development of a programme of safety audits to be conducted to assess safety performance;</li> <li>Development of a Community Health and Safety Management Plan;</li> <li>CLO engagement to liaise with the local community;</li> <li>Development and implementation of a robust maintenance regiment; and</li> </ul>	

Topic	Stage of the Proposed Scheme	Description of potential impact	Receptor	Proposed Mitigation Measures	Significance of Effect
				<ul style="list-style-type: none"> <li>The development of an Emergency Response Plan.</li> </ul>	

## 8 Environmental and Social Management Plan

### 8.1 Objectives, Structure and Content

696. The objectives of the Environmental and Social Management Plan (ESMP), including the Monitoring Plan, are:

- To ensure project components are conducted in compliance with the national laws and regulations as well as the requirements of the Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), Organisation of the Petroleum Exporting Countries (OPEC) Fund for International Development (OFID) and the Asian Infrastructure Investment Bank (AIIB) (the Lenders);
- To measure the success of proposed mitigation measures in minimising and/or reducing potential environmental, health, safety and social impacts;
- To continuously control the changes to baseline environmental, health, safety and social conditions during pre-construction, construction and operation activities;
- To facilitate a continual review of activities based on performance data and consultation feedback; and
- To implement corrective actions or new adaptive management programs, as required.

### 8.2 Lenders Requirements

697. The project is being financed by the lenders as follows:

- **Package 1** will be financed by USD 110 million grant from ADB and USD 40 million loan from OPEC Fund for International Development. Package 1 consists of the following sections of the Road:
  - Section 1 - Javoni – Kandak
  - Section 2 - Gazakyon – Sebnok (Lugur);
  - Section 3 - Hakimi – Siyohgulak;
  - Bridge No 1 through Bridge No 6
  - Tunnel No 1 (Kandak Tunnel); and
  - Tunnel No 2 (Karagach Tunnel)ending short of the south portal of Tunnel No 3 (Tagikamar Tunnel).
- **Package 2** will be financed by USD 150 million loan from European Bank for Reconstruction and Development (EBRD). Package 2 consists of the following sections of the Road from 33 km:
  - Section 4 - Mudzhiharv-Alihodzha;
  - Section 5 - Alihodzha – Tuthor;
  - Section 6 - Tuthor – Kabudiyon (Samsolik);
  - Section 7 - Kaboudiyon – Humdon
  - Bridge No 7 through Bridge No 13;
  - Tunnel No 3 (Tagikamar Tunnel); and
  - The temporary bridge over the Surkhkhob River at Darband.
- **Package 3** will be financed by USD 40 million loan from Asian Infrastructure Investment Bank (AIIB) and covers the long permanent bridge (760 m) over the Rogun HPP Reservoir at Darband over the Surkhkhob River.

698. This ESMP has been developed for all packages, in accordance with all the Lenders' requirements. The Construction Environmental and Social Management Plan (CESMP) and sub-plans set out in this ESMP, will be developed by the Contractor in accordance with the relevant Lenders' requirements, at a contract level.

699. The Lenders' requirements are described below.

700. EBRD – Performance Requirements (PRs)

- **PR 1: Assessment and Management of Environmental and Social Impacts and Issues**
  - *Establishes the importance of integrated assessment to identify project-specific environmental and social impacts and the requirement to implement an Environmental and Social Management System (ESMS) to effectively manage these impacts.*
- **PR 2: Labour and Working Conditions**
  - *Outlines the need to respect and protect the fundamental principles and rights of workers.*
- **PR 3: Resource Efficiency and Pollution Prevention and Control**
  - *Sets out how resource efficiency and pollution prevention and control are essential elements of environmental and social sustainability and that projects must meet Good International Practice (GIP).*
- **PR 4: Health and Safety**
  - *Outlines the need to protect and promote the health and safety of workers by ensuring healthy and safe working conditions and requires the implementation a project-specific health and safety management system.*
- **PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement**
  - *Recognises the need to avoid, or when unavoidable, minimise involuntary resettlement by exploring alternative project designs. This PR also outlines the need to minimise adverse social and economic impacts from land acquisition or restrictions on affected persons' use of and access to assets and land.*
- **PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources**
  - *To project and conserve biodiversity using a precautionary approach, implementing the mitigation hierarchy and promoting GIP.*
- **PR 8: Cultural Heritage**
  - *Recognises the importance of cultural heritage for present and future generations. The aim is to protect cultural heritage and to guide clients in avoiding or mitigating adverse impacts on cultural heritage in the course of their business operations.*
- **PR 10: Information Disclosure and Stakeholder Engagement**
  - *Recognises the importance of open and transparent engagement between the client and their stakeholders, in particular local communities directly affected by the project.*
- PR 7 (Indigenous Peoples) and PR 9 (Financial Intermediaries) are not applicable to this project.

701. ADB – Safeguard Requirements

- Safeguard Requirements 1: Environment; and
- Safeguard Requirements 2: Involuntary Resettlement.
- Noting that Safeguard Requirements 3: Indigenous Peoples, is not applicable to this project.

702. AIIB – Environmental and Social Standards (ESS)

- ESS 1: Environmental and Social Assessment and Management; and
- ESS 2: Involuntary Resettlement.



- Noting that ESS3: Indigenous Peoples, is not applicable to this project

### 8.3 Roles and Responsibilities

703. The following roles and responsibilities have been established for implementation and management of this ESMP.

- **PIURR**

The PIURR, as Project implementing authority (IA) will be responsible for ensuring the compliance with and implementation of all national and international environmental, health, safety and social policies, guidelines and performance requirements of both the Republic of Tajikistan and IFIs (ADB, OFID, EBRD and AIIB) involved in the Project alignment.

The PIURR will be responsible for the overall implementation of the mitigation measures and requirements specified within the ESIA disclosure package for the Project. They will be required to oversee implementation of the CESMP developed by the contractor to ensure it fulfils all identified environmental, health, safety and social requirements under the loan agreement for the Project. The PIURR are responsible for ensuring roles and responsibilities are clearly identified and allocated for environmental, health, safety and social, gender, both within the PIURR itself, within the contractors' arrangements and for the handover to operations. The PIURR will also be responsible for the implementation of the Environmental and Social Action Plan (ESAP) agreed with the EBRD.

In relation to land acquisition and resettlement, the PIURR will be responsible for the full implementation of the Land Acquisition Resettlement Plan (LARP) following approval by IFIs and the Government of Tajikistan. In addition, the PIURR will be responsible for the implementation and conformance of the grievance redress mechanism (GRM) to ensure that all grievances and/or objections (if any raised by the local community and/or workers) are received, acknowledged and addressed as per the grievance procedure presented in the Stakeholder Engagement Plan (SEP) and LARPs for each of the three Package.

A Community Liaison Officer (CLO) shall also be appointed by the PIURR to manage consultations and implement the developed Stakeholder Engagement Plan (SEP) with local communities.

Monitoring of environmental quality and of the implementation of mitigation measures will be performed by the Construction Supervision Consultant (CSC) with sufficient TORs and staff-time for this task. Therefore, as a minimum, it is required for CSC to recruit 3 months of a Senior International Environmental Specialist and full time for a National Environmental specialist over 3 years during the project implementation. In addition, a Senior International Occupational Health and Safety Specialist will be employed for 4 months during the project duration and a National Occupational Health and Safety Specialist full time (18 months) during the implementation of the project under the CSC Contract. Within the PIURR a National Environmental Monitor will be employed half time (18 months) to provide support to the PIURR officers in monitoring environmental performance of the project.

- **Supervising Engineer**

The Supervising Engineer will be responsible for supervising the Contractor to ensure that recommendations and requirements, as set out in this ESMP and other documentation are applied. They will be responsible for continuous monitoring of the

processes and activities undertaken by the Contractor, and specifying measures to be implemented by the Contractor, to address any areas of non-compliance

- **Lenders Technical Advisor**

The Lenders will appoint a Technical Advisor who will be responsible for reviewing documentation on behalf of the lenders (ADB, OFID, EBRD and AIIB), and who will monitor the Contractor's implementation of the activities specified in the ESMP on a quarterly basis. They will be responsible for providing a monitoring report to the Lenders that evaluates compliance with both the ESMP and Lenders requirements, and providing recommendations to the Supervising Engineer and Contractor to address any areas of non-compliance.

- **Contractor**

The Contractor will be responsible for implementing the ESMP and the Environmental and Social Management System (ESMS) in line with Lender Requirements.

The Contractor is also responsible for implementing any environmental, health, safety and social measures identified in the National EIA, that the PIURR has developed for submission to the Committee for Environmental Protection (CEP).

The Contractor will be responsible for submission of relevant reports to the Supervising Engineer, for subsequent approval by the Supervising Engineer, PIURR and/or the Committee for Environmental Protection (CEP), as appropriate.

The Contractor must ensure the ESMP is implemented by competent individuals, using approved methods of monitoring, and calibrated equipment (field testers and hand-held equipment) where appropriate. Calibration must be done regularly. All calibration records and monitoring results, along with the copies of the site records, certificates, permits and documents shall be submitted and kept by the Project Implementation Unit Road Rehabilitation (PIURR).

The Contractor shall appoint a dedicated Environmental and Safety Officer (ESO) and Deputy Environmental and Safety Officer (DESO) responsible for undertaking health, safety and environmental management tasks as set out in the Contract and lead the monitoring team. These personnel will be supported by additional personnel with specific EHS responsibilities. The Environmental and Safety team will report directly to the contractor's Project Manager.

The responsibilities of the ESO will include:

- Ensuring the contractor implements the environmental protection and management specifications set out in the Contract and the CESMP;
- Undertaking day-to-day environmental and safety management tasks as required for the Project and weekly environmental audits;
- Maintaining a daily Site Diary recording all relevant matters concerning environmental and safety management on the Site including protections and controls, audits, inspections, and related incidents. Making the Site Diary available for inspection by the Engineer upon request;
- Participating in joint inspections to be undertaken by PIURR, ADB and other environmental organisations and the Engineer's environmental team; and
- Preparing and submitting the reports as required by the Contract and the CESMP.

The Contractor shall also appoint a dedicated person with responsibilities for managing the requirements of the Contract and ESMP related to social and gender matters.

On site support from a highly experienced consultant specialising in health and safety, providing additional support and advice, and building the capacity of the Contractor will be engaged. The consultants will assist the Contractors in developing, implementing and monitoring the Health and Safety Plan. Other safety, environmental and/or social specialists may be engaged to provide support as necessary.

- **PIU Consultant**

A special Project Implementation Unit (PIU) will be established within PIURR and will be dedicated to the management of the EBRD financed Section 2 as well as other components included in the EBRD's technical assistance program (PIU Section 2). The PIU Consultant will facilitate the timely and effective implementation of the Project by providing assistance to the Client with respect to the following:

- Assistance with the establishment of the PIU;
- Assistance with procurement, tendering and contract implementation;
- Assistance with compliance & reporting obligations under the financing documents;
- Environmental and social implementation support;
- Assistance with asset management, including support in development of an operations and maintenance manual for effective asset management and routine maintenance;
- Support with climate change adaptation including development of a Climate Resilience Management Plan (CRMP).

#### 8.4 Environmental and Social Management System (ESMS)

704. The Contractor will be responsible for implementing an ESMS that is in line with International Standards. The Contractor will be required to appoint appropriately qualified specialists with the following expertise, to ensure the ESMS is implemented to the required standards:

- Environmental;
- Health and safety;
- Social (including gender and stakeholder engagement); and
- Land acquisition and resettlement.

705. The ESMS, will include a Social Risk Register, which the Contractor will be responsible for updating at least monthly throughout the pre-construction and construction period, and more frequently when required. This will utilise information from the community and health review, (in ESMP).

706. The Contractor must conduct an initial environmental, safety and social induction course for construction workers regarding health and safety measures, emergency response in case of accidents, fire, earthquakes, landslides, flash flooding, environmental and community interactions, grievance procedures etc. They must also develop and implement an environmental, health and safety and security (EHSS) training program, and conduct EHSS meetings on a monthly basis with the PIURR.

#### 8.5 Environmental and Social Reporting Requirements

707. The Contractor will produce monthly and quarterly reports and these must include information on environmental, social and safety performance. Reporting will include but not be limited to:

- Status of the ESMP;
- Status of any other contractor prepared environmental and social documents

- Status of environmental, safety and labour permits (e.g. asphalt plant, borrow areas if appropriate)
- Recording any environmental, health and safety and social (EHSS) monitoring results (e.g. air, noise, water quality, vibration, audits / inspections)
- Results of contractor and joint contractor / CSC site audits
- Grievance redress mechanism
- Interaction with the public – public consultations and complaints
- Training of site staff in EHSS matters

The PIURR will prepare a six monthly EHSS Monitoring Report drawing on the Contractors monthly and quarterly EHSS monitoring information and reporting the Environmental and Social Performance of the project. This document will be disclosed on the ADB project website

## 8.6 Pre-Construction and Construction Phase ESMP

708. An overarching Environmental and Social and Management Plan has been developed for the construction phase of the Project. This identifies the need for Constrictor Environmental and Social Management Plans, and a number of sub-plans to manage specific issues or activities (Table 53).

Table 53: Environmental and Social Management Plan – Pre-construction and Construction stage

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
Overall Contractor Environmental & Social Management Plan (CESMP)					
1	Development of a Contractor Environmental and Social Management Plan (CESMP)	<p>The Contractor shall prepare a CESMP. The CESMP will</p> <ul style="list-style-type: none"><li>describe the precise location of the required mitigation / monitoring, the persons responsible for the mitigation / monitoring, and the schedule and reporting methodology.</li><li>define the boundaries of the Project and all works will have to be completed within them. Marker posts will outline these boundaries within the Project area.</li><li>include all of the sub-plans listed below unless these works are not scheduled to start until a later date (see specific sub-plans for details)</li></ul> <p>The CESMP will be submitted to the Engineer and PIURR for approval at least 30 days before taking possession of any work site. No access to the site will be allowed until the CESMP is approved by the Supervising Engineer, and the PIURR. New topic specific or site specific ESMPs may also need to be developed by the Contractor during the construction phase. These new plans will also need to be approved by the Supervising Engineer, and the PIURR.</p> <p>The Contractor will implement a ESMS in line with national and international EHSS Standards.</p>	<p>Preparation: Contractor’s Environmental and Social Experts (ESE)</p> <p>Approval: Supervising Engineer PIURR</p>	PIURR/Supervising Engineer.	<p>CESMP approved by PIURR/Supervising Engineer</p> <p>PR1, PR10</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>The CESMP will include a review of the capacity of local emergency services.</p> <p>The Contractor will also prepare a Social Risk Register, which will include any specific plans/programmes required as a result of the Community and Health Review.</p>			
2	Development of sub-plans	<p>Prior to start of site works, the Contractor shall prepare the following plans in line with the Lenders environmental and social requirements:</p> <ul style="list-style-type: none"><li>Waste and Materials Management Plan (WMMP), including:<ul style="list-style-type: none"><li>Spoil Disposal Plan</li><li>Asbestos Management Plan</li></ul></li><li>Soil, Erosion and Topsoil Management Plan</li><li>Water Resources Management Plan, including:<ul style="list-style-type: none"><li>Ground Water Management</li><li>Waste Water Management</li></ul></li><li>Air Quality Management Plan (AQMP), including:<ul style="list-style-type: none"><li>Air Quality Control Plan for tunnels</li></ul></li><li>Noise and Vibration Management Plan (NVMP), including:<ul style="list-style-type: none"><li>Pre-Commencement Condition Surveys</li></ul></li><li>Cultural Heritage Management Plan, including:<ul style="list-style-type: none"><li>Chance Find Procedure</li></ul></li><li>Biodiversity Management Plan (BMP), including:<ul style="list-style-type: none"><li>Land Restoration Plan</li></ul></li></ul>	<p>Preparation: Contractor</p> <p>Approval: Supervising Engineer and PIURR</p>	<p>Supervising Engineer/PIURR and CEP (where appropriate)</p>	<p>Plans approved as part of the CESMP by relevant parties</p> <p>PR 1, PR2, PR3, PR4, PR6, PR8</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>○ Climate – Management Plan</li><li>• Climate Resilience Management Plan</li><li>• Landscape and Visual Management Plan</li><li>• Contractor Stakeholder Engagement Plan (CSEP), including:<ul style="list-style-type: none"><li>○ Grievance Redress Mechanisms (GRM)</li></ul></li><li>• Code of Conduct (CoC)</li><li>• Land Acquisition and Resettlement Plan</li><li>• Social Community and Health Review and Health Plan</li><li>• Labour and Working Conditions Management Plan (LWCMP), including:<ul style="list-style-type: none"><li>○ Local Employment and Procurement Plan (LEPP)</li><li>○ Gender Action Plan (GAP)</li><li>○ Social Risk Register</li></ul></li><li>• Traffic Management Plan (TMP)</li><li>• Health and Safety Plan, including:<ul style="list-style-type: none"><li>○ Specific measures for the construction of bridges and tunnels</li></ul></li><li>• Emergency Response Plan, including:<ul style="list-style-type: none"><li>○ Natural Disaster Response Plan</li><li>○ Spill Management Plan</li></ul></li><li>• Camp Management Plan</li><li>• Concrete and Asphalt Production Management Plans</li></ul>			



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Construction plans and Method Statements, including:<ul style="list-style-type: none"><li>Bridge Construction Plan</li><li>Tunnel Construction Plan</li><li>Tunnel Handover Plan</li><li>Slope Stabilisation Plan</li></ul></li><li>Method Statements for Temporary Activities, including:<ul style="list-style-type: none"><li>Storage Areas</li><li>River crossings</li><li>Roads / Access Roads</li></ul></li><li>Blasting Management Plan, including:<ul style="list-style-type: none"><li>Tunnel specific measures</li></ul></li></ul>			
3	Obtaining licences, permits and agreement	<ul style="list-style-type: none"><li>All necessary licences and permits must relation to environmental, safety and labour must be obtained prior to starting the activity that they apply to.</li><li>A database tracking all permits and consents shall be developed and maintained.</li><li>If the Contractor decides to run an asphalt production facility, then this must be discussed and agreed with the CEP. A screening exercise may be required.</li><li>If the Contractor decides to establish its own quarry or borrow pit – an appropriate licence must be obtained from the CEP. Otherwise material must be purchased from licenced providers.</li></ul>	Implementation: Contractor  Approval: PIURR CEP	PIURR, CEP Information – included in reports to the Lenders	Copies of licences, permits and agreements.  PR1, PR3, PR4, PR5, PR6

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Maximum allowable concentration of substances discharged into the surface water body must be agreed with (approved by) the CEP.</li><li>Volume of water abstraction, and sources, must be agreed with the CEP.</li></ul>			
4	Sub-contractors	<p>The Contractor shall ensure that:</p> <ul style="list-style-type: none"><li>Provisions will be incorporated into all subcontracts to ensure the compliance with lender requirements, Tajik legislation and the CESMP and its associated sub-plans at all tiers of the sub-contracting.</li><li>All environmental, social and safety requirements for the Contractor will apply to the sub- contractors. This will be secured via contracts. It is the responsibility of the Contractor to audit sub-contractors and ensure compliance.</li><li>All Project sub-contractors will be supplied with copies of the CESMP, and sub plans.</li><li>All relevant requirements of the CESMP and sub-plans must be communicated to sub-contractors.</li><li>All subcontractors will be required to appoint a safety representative who will be available on the Site throughout the operational period of the respective subcontract, unless the Supervision Engineers approval for the Contractor’s safety representative to undertake take this role, is given in writing.</li></ul>	Supervision Engineer/ PIURR	All plans and contracts approved by the relevant parties.  Information – included in reports to the Lenders.	Copies of sub-contractor agreements.  PR1, PR3, PR4

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
Environmental Management Sub-Plans					
5	Waste and Materials Management Plan (WMMP) Including – <ul style="list-style-type: none"><li>Spoil Disposal Plan</li><li>Asbestos Management Plan</li></ul>	<p>The Waste and Materials Management Plan (WMMP) shall;</p> <ul style="list-style-type: none"><li>utilise the waste hierarchy<sup>100</sup> to prevent or reduce the generation of waste where possible,</li><li>describe waste streams and estimated amounts of each,</li><li>separate hazardous, non-hazardous and reusable waste streams.</li><li>describe recycling/reuse methods for each material,</li><li>identify the waste destinations and transport modes, including what materials are being segregated on site for reuse or recycling,</li><li>specify responsibilities for managing and disposal of waste,</li><li>describe special measures for material use and handling,</li></ul> <p>The WMMP will identify the location of any borrow-pits required by the project, including the volumes required and the locations that the materials will be used.</p> <p>The plan will describe communication and training to support and encourage participation from everyone on site.</p> <p>The plan will set out the following requirements:</p> <ul style="list-style-type: none"><li>Prior to commencement, the Contractor will need to confirm disposal procedures for non-hazardous waste, including:</li></ul>	Preparation: Contractor Approval: Supervision Engineer, PIURR	PIURR/ Supervising Engineer. Information – included in reports to the Lenders	Plan approved as part of the CESMP by relevant parties. PR1, PR2, PR3

100 Waste prevention→Reuse→Recycling→Other recovery→Disposal

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>obtaining the required permits, securing agreements with any waste companies, and establishing management processes.</p> <ul style="list-style-type: none"><li>• Prior to commencement of works, agreement(s) with company / companies authorised for utilisation or disposal of hazardous waste must be signed. If none are available, measures for the selection of suitable sites, and processes for the safe disposal of hazardous waste must be set out and implemented.</li><li>• Agreements with waste management companies must be kept active.</li><li>• The contractor is responsible for auditing all waste companies, they have agreement with, and reviewing their documentation and working practices, including environmental and safety performance twice per year.</li><li>• </li><li>• The Construction Camp Management Plan must include waste disposal measures, including:<ul style="list-style-type: none"><li>○ the regular collection and disposal of household waste.</li><li>○ Provide bins and facilities within the project site for temporary storage of all waste streams. These facilities should be designed to prevent the escape of litter, liquids, odours or other contaminants / nuisance emissions.</li><li>○ Train staff in best practice for waste minimisation and management.</li></ul></li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		<p>The Spoil Disposal Plan will be developed based on site specific topo-geodetic, geotechnical, hydrological data, environmental and social data. The plan shall include:</p> <ul style="list-style-type: none"><li>• information on location and layout of the spoil disposal areas (dimensions, slope angle) with 3D view and cross sections;</li><li>• surface water runoff management and bank protection measures;</li><li>• land rehabilitation and re-cultivation measures;</li><li>• designation of suitable transport routes and schedule for spoil truck movements to minimise traffic disruption/ congestion, and</li><li>• environmental mitigation measures to minimise impacts during transport, storage and disposal of spoil, including using covering truck.</li></ul> <p>The spoil disposal plan must be developed in association with a biodiversity specialist and the Forestry State Department. The plan must specify spoil dewatering procedures (and facilities), as necessary, and describe mitigation measures to ensure adequate treatment of wastewater prior to disposal.</p> <p>An asbestos management plan will be developed that describes processes for the identification of asbestos and for management and safe disposal of any asbestos containing materials found during construction works.</p>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		Asbestos is prohibited from being used at any stage during the project. Any existing material that maybe present will be managed to minimise the potential environmental, health and social risks.			
6	Soil, Erosion and Topsoil Management Plan	<p>The Soil, Erosion and Topsoil Management Plan shall describe</p> <ul style="list-style-type: none"><li>• topsoil stripping procedures and rules,</li><li>• topsoil stripping depth and volumes,</li><li>• topsoil stripping supervision,</li><li>• transportation and stockpiling requirements,</li><li>• stockpile location,</li><li>• topsoil stockpile design,</li><li>• stockpile management,</li><li>• erosion hazard and erosion control,</li><li>• runoff drainage/diversion,</li><li>• soil protection measures at the storage area, maintenance of the stockpile; and</li><li>• topsoil application procedure.</li></ul> <p>The following measures shall be applied by the Contractor:</p> <ul style="list-style-type: none"><li>• Unwanted materials from topsoil such as roots of trees, rubble and waste removed prior to stockpiling.</li><li>• Stockpiles of removed topsoil must be properly designed/shaped and managed, – stability of the stockpile will be achieved through preservation of ‘safe’ slope inclination and diversion of surface water runoff from the area. Soil stabilisation Best Management Practices such as mulch, soil</li></ul>	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer.	<p>Plan approved as part of the CESMP by relevant parties.</p>  <

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		<p>binders, plastic sheeting or erosion control blankets must be used to protect bare soil.</p> <ul style="list-style-type: none"><li>• To ensure stability, the soil piles shall not be higher than 2 meters, with a slope gradient of less than 25%. The piles must be placed and managed so as to avoid erosion and washing off. Drainage trenches must be established to divert surface runoff from the site.</li><li>• Soil compaction will be reduced by strictly keeping to temporary roads, construction camp/construction area boundaries.</li><li>• Embankments and slopes with disturbed vegetation must be replanted immediately after the construction/disturbance stops, and before it rains – or if not covered with gabion baskets, fibre rolls, gravel bags or plastic sheets. Native species must be used for any replanting, fibre mats should be used to encourage vegetation growth and temporary fencing used to protect plants from being grazed.</li><li>• Contractor will confine operation of heavy equipment within the area of works to avoid soil compaction and damage to privately owned land. If private lands are disturbed, the contractor should promptly inform the owner and agree on the ways to remedy the situation.</li></ul> <p>Measures to prevent soil contamination due to accidental spills are set out in the Water Resources Management Plan.</p>			



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Pre-construction and Construction					
7	Water Resources Management Plan Including; <ul style="list-style-type: none"><li>• Ground Water Management</li><li>• Waste Water Management</li></ul>	<p>The Water Resources Management Plan must provide details on predicted waste water (sewage) volumes, disposal scheme, information on capacity and type of waste water treatment facility, location of the discharge point/points with indication of coordinates. A discharge permit will be sought from the CEP and Maximum Allowable Discharge Limits (MADLs) will be set which the project must then comply with.</p> <p>The plan will include calculations of the predicted water demand for construction including water required for:</p> <ul style="list-style-type: none"><li>• Construction (e.g. concrete mixing);</li><li>• Dust suppression;</li><li>• Cleaning equipment;</li><li>• Potable water for construction workers; and</li><li>• Use in construction camps.</li></ul> <p>The plan should include measures to minimise water usage in the first instance, and also opportunities for reuse of water where possible.</p> <p>The Contractor will undertake a capacity study of available water resources along the alignment, including the location and quality of water resources used by the villages, to identify suitable resources, with sufficient availability to avoid any impact on the availability of resource to communities and businesses along the alignment. If existing groundwater or surface water resources are not appropriate (quantity or quality), alternative sources of water will be identified by the Contractor, to ensure the available</p>	Preparation: Contractor Approval: Engineer and PIURR,	PIURR/ Supervising Engineer. Information – included in reports to the Lenders.	<p>Plan approved as part of the CESMP by relevant parties.</p> <p>PR1, PR2, PR3</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>resources used by the local communities are maintained at all times, including rapid provision of alternative temporary supplies in the event of disruption to usual supply.</p> <p>A review and audit of all water pipes along the route will be undertaken prior to commencement of works, to identify all existing water sources used by the communities near the alignment.</p> <p>Pipes/ culverts will be included within the design of the road, at the location of existing water resources. This will ensure that local villagers will not need to cross the new road to access water. The local communities will be consulted to inform the audit results and ensure that all the proposed new pipes/ culverts are in the correct locations.</p> <p>The Contractor will liaise with the community to understand seasonal water demand constraints, and periods of high water volumes / increased erosion.</p> <p>Water abstraction should be designed in accordance with the requirements of the Biodiversity Management Plan to minimise impacts to habitats reliant upon surface and ground water.</p> <p>Works should be performed with due consideration of environmental protection:</p> <ul style="list-style-type: none"><li>• All temporary fuel tank and storage areas must be located at least 100 m away from any surface water body and outside any flood plain.</li></ul>			

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Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Any temporary fuel tanks (if contractor requires small stock of fuel on the site) shall be placed in a secured, covered area with berms or dikes to contain any spills. Capacity of containment must be 110% of capacity of the tank. Any spill shall be immediately contained and cleaned up with absorbent material as per the Spill Management Plan.</li><li>Discharge of any untreated water into the surface water body must be strictly prohibited. Treated water discharge must comply with International Finance Corporation (IFC) and EU standards for effluent discharge, as well as national standards and any licence / permit requirements.</li><li>Discharge of cement contaminated water must be avoided as cement pollution results in high alkalinity and raises the pH, which can be toxic to aquatic life.</li><li>Washing out concrete trucks at construction sites will be prohibited unless specific concrete washout areas are provided for this purpose at the construction site (e.g. a bridge site). The washouts will be impermeable and emptied when 75% full. The removal of water will be in line with the requirements of the Water Resources Management Plan.</li><li>Runoff control measures can be installed at the time of road/highway construction to reduce runoff pollution.</li><li>To prevent runoff contamination, paving should be performed only in dry weather.</li><li>In disturbed soil areas silt fence, fibre rolls (biodegradable logs), gravel bags, or other approved sediment control must</li></ul>			

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Pre-construction and Construction					
		<p>be ensured. At a minimum, bare soil (whether it is an abutment slope or a stockpile) must be protected before it rains. Soil stabilisation Best Management Practices such as mulch, soil binders, plastic sheeting or erosion control blankets must be used to protect bare soil.</p> <ul style="list-style-type: none"><li>• Store materials in suitable containers, with clear legible labels. The same applies to containers for short term storage of used oil.</li><li>• Ensure availability of spill clean-up materials (e.g., spill kits, etc.) in the areas where accidental spills may occur.</li><li>• Prohibit discharge of any untreated potentially contaminated effluents.</li><li>• Provide septic tanks for the camp sites servicing less than 150 employees. Contract authorised company to remove the liquid waste regularly. For larger sites, primary treatment in anaerobic tank or pond preceded by a bar screen to remove large solid objects will be required.</li><li>• All camp sewage treatment plants will be managed in accordance with manufacturer’s instructions by competent personnel, and discharges regularly monitored. If discharges cannot be treated to an acceptable standard, liquid wastes must be removed by an authorised company and disposed in an environmentally responsible manner in accordance with the Waste &amp; Materials Management Plan. Septic tanks necessary at construction camp(s) shall be made of impermeable material and will be emptied regularly in</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<p>accordance with applicable rules. Treatment sludges and the contents of any septic tanks must also be removed by an authorised company and disposed in an environmentally responsible manner..</p> <ul style="list-style-type: none"><li>• Surface water bodies/ rivers will only be crossed via bridges.</li></ul> <p>Ensure that liquid wastes are removed by an authorised company and disposed in an environmentally responsible manner in accordance with the Waste &amp; Materials Management Plan. Keep an ongoing contract with authorised company responsible for removal of the liquid waste. If the camp is equipped with a sewage treatment plant this must be operated and maintained according to manufacturer’s instructions</p>			
8	Air Quality Management Plan (AQMP) Including Air Quality Control Plan for tunnels	<p>The Air Quality Management Plan shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimise impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities.</p> <p>Prior to commencement of works, likely emissions from crushers, concrete production facilities and other emissions generating activities must be calculated and agreed with the CEP. A separate plan/schedule for air quality control in the tunnel must be provided.</p> <p>Mitigation measures will include:</p>	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer. Information – included in reports to the Lenders	<p>Plan approved as part of the CESMP by relevant parties.</p> <p>PR1, PR3, PR4, PR6</p>

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Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Ensure all machinery and vehicles are maintained to minimise exhaust emissions. Vehicles and equipment that emit smoke will not be used and if they can't be fixed shall be removed from the project.</li><li>• Undertake immediate repairs of any malfunctioning construction vehicles and equipment.</li><li>• Use construction equipment and vehicles that meet national emission standards.</li><li>• Wherever possible, use electrically-powered equipment rather than gas or diesel-powered equipment.</li><li>• Use fuel efficient machinery.</li><li>• Ensure that all diesel and petrol running machinery use is equipped with catalytic convertors.</li><li>• Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors.</li><li>• Locate support facilities and spoil disposal sites to reduce trip numbers and travel distance – as far as feasible.</li><li>• Provide truck-washing facilities at tunnel portals and at safe distance from bridge construction sites to prevent track-out of mud and dust.</li><li>• Implement a regular vehicle maintenance and repair program, utilising the manufacturer recommended maintenance programs.</li><li>• All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins.</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Carry out watering for dust control at least 3 times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25°C, or in windy weather. Avoid overwatering as this may make the surrounding muddy.</li><li>Ensure compliance with the Water Resources Management Plan, including maintenance of resources used by the local communities are maintained at all times, including rapid provision of alternative temporary supplies in the event of disruption to usual supply.</li><li>Earthwork operations to be suspended when the wind speed exceeds 20 km/h (based on on-site monitoring) in areas within 500 m of any community.</li><li>Provide vegetation planting along roadsides to stabilise soils and reduce air quality impacts.</li></ul>			
9	Noise and Vibration Management Plan (NVMP) Including Pre-Commencement Condition Surveys	Under the Noise and Vibration Management Plan (NVMP), as per the ESIA, undertake condition surveys no later than 28 days before the commencement of construction works. The NVMP will set out the process for this. The Contractor and the Engineer will carry out joint condition surveys of all buildings within 25 metres of the road alignment that, in the opinion of the Engineer, might be affected by vibration resulting from the Contractor’s construction operations. The surveys shall be conducted in the presence of and with the permission of the property owners.	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer.  Information – included in reports to the Lenders.	Plan approved as part of the CESMP by relevant parties.  PR1, PR3, PR4



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>The findings of the building condition surveys shall be recorded in the reports and will contain the following information, as a minimum:</p> <ul style="list-style-type: none"><li>• Building address and location;</li><li>• A description of the building condition and any cosmetic and/or structural damage;</li><li>• Sketches and photographs showing the location and extent of any damage;</li><li>• High resolution video recordings of the surveyed buildings; and</li><li>• Verification of the report by the building owner.</li></ul> <p>The NVMP will set out the need to undertake further refined noise modelling to determine the specification and precise locations of the proposed noise barriers.</p> <p>The NVMP shall provide details of mitigation measures, specific location and schedule where such measures shall be implemented to minimise impacts to sensitive receptors due to the presence of the camp, construction works, sourcing and transport of construction materials, and other project-related activities.</p> <p>Mitigation to include:</p> <ul style="list-style-type: none"><li>• • Use well maintained construction equipment and vehicles.</li><li>• • Use construction equipment and vehicles fitted with appropriate noise suppression. Fit all pneumatic tools with an effective silencer on their air exhaust port.</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Use temporary noise barriers while working in sensitive locations if allowable noise limits are expected to be exceeded.</li><li>• Impose speed limits on the project vehicles to minimise noise emission while moving along/across the sensitive areas.</li><li>• Keep to no horn policy unless vitally necessary.</li><li>• As much as possible, use quiet equipment and working method: e.g. Diesel hammer piling – substituted with drill piling or hydraulic piling.</li><li>• Whenever possible: enclose noisy equipment, restrict non- stop operation of noisy equipment, avoid simultaneous operation of noise generating equipment.</li><li>• Consider seasons sensitive for birds and other wildlife while planning noise-generating works, with cross reference to the biodiversity management plan.</li><li>• Train staff in best practice for noise reduction and mitigation.</li><li>• Inform community on schedule and duration of construction activities, particularly where these are likely to generate high noise levels.</li><li>• Implement 24-hour community complaints hotline.</li><li>• Limit truck speed - not to exceed 40 km/h, when driving through communities, and not to exceed 80 km/h when driving on highways.</li><li>• Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people are least</li></ul>			

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Pre-construction and Construction					
		<p>likely to be affected; construction work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved by the Engineer having due regard for possible noise disturbance to the local residents or other activities.</p> <ul style="list-style-type: none"><li>• Construction activities will be strictly prohibited between 10 PM and 6 AM near residential areas. When operating close to sensitive areas (within 250 m) such as residential, nursery, or medical facilities, the Contractor’s hours of working shall be limited to 8 AM to 6 PM.</li><li>• Noise protection kits such as ear plugs, earmuffs, will be provided for workers who are working in areas where noise levels are higher than 80 dB(A), and made available to all workers on request, regardless of noise level. Mandatory use of hearing protection will be required at noise levels over 285 dB(A)</li></ul> <p>The plan shall detail the procedures for noise and vibration surveys, monitoring and control. Such details shall include;</p> <ul style="list-style-type: none"><li>• procedures to complete condition surveys.</li><li>• Measurement locations and methods;</li><li>• Method statements for works likely to induce noise and vibrations, including programs of trial construction sections to determine the likely magnitude of noise and vibrations at defined distances from the vibration source, in sufficient detail for the contractor to develop a final method for constructing the works without excessive vibration;</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Description of the instrumentation and equipment to be used;</li><li>• Copies of the instruction manuals and the laboratory calibration and test equipment certification;</li><li>• The resumes of the vibration monitoring technical support.</li></ul> <p>The Contractor must respond to any noise and vibration grievances and implement remediation measures as soon as practical in line with the SEP and GRM.</p>			
10	Cultural Heritage Management Plan Including – Chance Find Procedure	<p>The Cultural Heritage Plan will include details of identified cultural heritage within the project construction area (including location maps) and describe measures to prevent impacts on these locations / items.</p> <p>Monitoring of vibration effects adjacent to sensitive receptors such as mosques will be undertaken in accordance with the Noise &amp; Vibration Management Plan.</p> <p>The boundaries of the worksite will be strictly observed.</p> <p>The Plan will include induction training for workers on chance finds the plan will include a chance finds Procedure, detailing the actions to be taken if buried archaeology or other heritage items are discovered during construction activities. This will include immediate stoppage of works and notification of the Ministry of Culture and/or other relevant authority. Works would only be allowed to proceed in accordance with any instructions from the authorities.</p>	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer Information – included in reports to the Lenders.	Plan approved as part of the CESMP by relevant.  PR1, PR8

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
11	Biodiversity Management Plan (BMP)	<p>The Contractor will develop a Biodiversity Management Plan covering actions to safeguard, conservation of biodiversity on the influence territories or specific sites that tend to be affected due to the planned activity. Compliance with the plan will be responsibility of Contractor and an Ecological Clerks or Works CoW.</p> <p>The plan will set out the requirement to</p> <ul style="list-style-type: none"><li>hire a suitable number of suitably qualified Ecological Clerks or Works (ECoW) to both map and clear the route, and approve that the route is approved as clear of biodiversity constraints, in advance of construction works.</li><li>They should include identification of areas of greatest ecological value, features/species needing translocation, bird nesting areas where schedules need to be altered, etc. Their responsibility will include both surveys to inform the development of additional mitigation (if required) such as bat surveys and other species-specific surveys, and surveys to help ensure that specific mitigation is applied within the project Right of Way (RoW) in advance of vegetation clearance.</li></ul> <p>Actions to include in the BMP include:</p> <ul style="list-style-type: none"><li>Mark and keep to the boundaries of the project area and the temporary sites.</li></ul>	<p>BMP Preparation: Contractor</p> <p>Contractor to hire Ecological Clerk of Works.</p> <p>BMP Approval: Engineer, PIURR, ADB, AIIB, EBRD</p>	<p>BMP: PIURR/ Supervising Engineer.</p> <p>Information – included in reports to the Lenders.</p>	<p>BMP Plan approved as part of the CESMP by relevant parties.</p> <p>Annual reporting on BMP actions / monitoring outcomes.</p> <p>ECOW approval reports that alignments have been checked and cleared prior to access</p> <p>Training Records</p> <p>PR1, PR2, PR3, PR4, PR6</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Replace trees where lost as part of the Project (5 to 1 replacement ratio).</li><li>• No removal of vegetation outside the mentioned boundaries.</li><li>• Prohibit shortcuts by workers, pedestrians and vehicles to avoid impact on the vegetation.</li><li>• Reinstate disturbed sites immediately after completion of works.</li><li>• Restore vegetated areas with diverse plants/seed mix of local/regional provenance.</li><li>• Prohibit use of herbicides/chemical during vegetation clearance.</li><li>• Brief the staff in vegetation protection issues during site induction.</li><li>• Brief staff in relation to biosecurity measures (in particular invasive species).</li></ul> <p>In order to prevent the introduction/spread of invasive species, robust biosecurity measures should be implemented, including (but not limited to):</p> <ul style="list-style-type: none"><li>• Strict sourcing of plant machinery and materials (i.e. from trusted suppliers).</li><li>• Wheel-washing</li><li>• Toolbox talk of site workers</li><li>• Use of native flora for revegetation/site restoration</li></ul> <p>The BMP will also include specific actions to be implemented through the lifetime of the project to further enhancement of</p>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		<p>biodiversity in the area. These actions will have associated monitoring commitments to ensure long-term effectiveness/relevance.</p> <ul style="list-style-type: none"><li>• Use low wattage lamps directing light downwards.</li><li>• Preserve vegetation in the areas outside the boundaries of the project sites.</li><li>• Adhere to no horn policy to avoid disturbance of wildlife.</li><li>• Impose speed limits on the project vehicles to minimise risk of road kills.</li><li>• Fence trenches or pits to avoid entrapping and injuries of the fauna species. Bright coloured ribbons may be used for big animals (e.g. cattle), while metal plastic and other shields/fences may be used for small animals.</li><li>• Upon completion of the shift put planks or medium size twigs in the trenches to allow small animals to escape.</li><li>• Check pits and trenches prior to filling up.</li><li>• Unless advised otherwise by a ECoW, tree-felling should be timed to avoid bat roosting and bird nesting seasons. Where a tree is identified as having the potential to support such features, felling/removal should only take place between mid-July and mid-September. In case bat roosts are found, arrangement of bat boxes can be considered as mitigation measure. Implement tree felling/house demolition works from late September till mid-November to avoid impact on bats and breeding birds (nesting/hatching).</li></ul>			



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Where relevant, implement monitoring of water quality (visual detection of turbidity increase, analysis - upstream and downstream the worksite).</li><li>Implement mitigation measures set for preservation of water quality and bank erosion (soil stability).</li><li>Where there are permanent and temporary ponds, efforts will be made to maintain them during the breeding season. The measures to prevent construction works extending beyond the construction boundary are anticipated to prevent disturbance to ponds outside the construction area.</li><li>All staff to comply with Code of Conduct.</li></ul> <p>The BMP will be linked to the Landscape Management Plan, with regards to land restoration and selection of suitable species.</p>			
12	Climate – Resilience Management Plan	<p>The Climate Resilience Management Plan will ensure appropriate design measures, materials specification and mechanisms for management of climate resilience risks, particularly those associated with adverse impacts of temporary works on permanent works during construction.</p> <p>Ensure:</p> <ul style="list-style-type: none"><li>compliance with the to ensure that the temporary works (e.g. access roads) do not decrease climate resilience of permanent works as contained in the tender specification</li><li>that surfacing materials are adequately specified accounting for anticipated climate change.</li></ul>	Engineer/ PIURR	PIURR/ Technical Advisor for ADB/ EBRD / AIIB	<p>Confirmation of resilience.</p> <p>PR1, PR3, PR4</p>

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>that the drainage system has sufficient capacity for intense rainfall events.</li><li>that the Road is protected against slope instabilities</li><li>that substructures and foundations have sufficient resistance to changes in ground parameters</li><li>that expansion joints have sufficient margin for anticipated climate change.</li><li>that bearings have sufficient margin for anticipated climate change</li><li>that surfacing materials are adequately specified</li><li>that elements can be replaced at a later date but more resilience components</li><li>that the bridges allow for high wind loading</li></ul>			
13	Landscape and Visual Management Plan	<p>The Landscape and Visual Management Plan will outline the need to.</p> <ul style="list-style-type: none"><li>Use low wattage lamps directing light downwards at work sites and camps.</li><li>Ensure all lighting related to construction activities shall be shielded or directed to restrict any direct illumination onto property located outside of the Project Site boundaries.</li></ul> <p>All construction site lighting shall be turned off when construction activities have ceased for the day.</p> <p>In the design, the designers will:</p> <ul style="list-style-type: none"><li>Avoid using non-native plant species.</li></ul>	<p>Preparation: Contractor</p> <p>Approval: Supervising Engineer, PIURR</p>	<p>PIURR/ Supervising Engineer.</p> <p>Information – included in reports to the Lenders.</p>	<p>Plan approved as part of the CESMP by relevant parties.</p> <p>PR1, PR2, PR6</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Replace trees where lost as part of the Project (5 to 1 replacement ratio).</li><li>• Ensure new lighting does not result in light spill/ light pollution.</li><li>• Choose colours of above ground sections of new buildings and at tunnel exits so they merge with environment.</li><li>• Give priority to use of geotextile against shotcrete.</li><li>• Use irregular shape stones for rubble.</li><li>• Avoid use of white concrete.</li><li>• Use full horizontal cut off glass lens luminaires, installed at 0o uplift.</li><li>• Where possible use lower lamp heights, provided it does not compromise safety aspects, such as the need to see road signs.</li></ul> <p>To prevent future pollution issues, it is recommended that the use of sodium light bulbs is prohibited and that Light Emitting Diode (LED) lights are installed with a “neutral” colour temperature of 4000K.</p>			
Community Liaison, Labour and Safety Management Sub Plans					
14	Disclosure of project information and community consultation	<ul style="list-style-type: none"><li>• Implement the Stakeholder Engagement Plan (SEP) and organise regular consultation activities with local communities.</li></ul>	Project Implementation Unit (PIURR), Project Management and Supervision Consultant, if appointed	Committee for Environmental Protection (CEP), Technical Advisor for	PR10

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Pre-construction and Construction					
	Stakeholder Engagement Plan	<ul style="list-style-type: none"><li>• A Community Liaison Officer (CLO) shall be appointed to manage consultations and implement the developed Stakeholder Engagement Plan (SEP) with local communities.</li><li>• Organise consultation events for men, women and children and disclose information about the construction impacts, health and safety, scheduling and timeframes.</li><li>• Conduct a meaningful consultation with the affected vulnerable groups to identify a best solution to improve their livelihood; or provide an alternative living area for them.</li><li>• Focus groups are preferred methods for engagement with this group. Separate males and females focus group discussions should be conducted. In particular, women must be consulted on construction and road safety, and given fair and equal representation of women in decision-making situations and greater awareness of road safety from a perspective.</li><li>• Data to be collected on construction and road safety from a gender perspective in the region and results communicated.</li><li>• Develop outreach and campaign promoting gender-responsive road safety. This includes focusing on risks for women and children through an enhanced approach to safety inclusive of security dimensions and understanding masculinities and men’s behaviours in relation to road safety so as to better target potential campaigns.</li><li>• Provide regular updates on the Project website and at Project milestones. If required, engage the media in disseminating</li></ul>	The project design team if available	ADB, OFID, EBRD and AIIB	

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Pre-construction and Construction					
		<p>Project information and manage public relations in case of NGO interest.</p> <ul style="list-style-type: none"><li>Update SEP on annual basis throughout the Project as per PR10.</li></ul>			
15	Contractor Stakeholder Engagement Plan (CSEP)	<p>Prior to start of site works, the Contractor shall:</p> <ul style="list-style-type: none"><li>Develop and maintain a contractor SEP (CSEP) aligned with the overarching Project SEP and train workers in the grievance mechanism requirements;</li><li>establish and communicate a grievance redress mechanism (GRM), as described in the ESIA disclosure package, to communities in the project impact zone, building on the GRM in the SEP;</li><li>set-up and publicise a 24-hour hotline for complaints;</li><li>ensure that names and contact numbers of CLOs within the PIURR, Jamoats, villages and within the PIURR contractors organisation are placed on the notice boards outside the construction site; complete on-going consultation with men, women and children during construction; and</li><li>Keep a log of all complaints received.</li></ul> <p>The plan will outline the need to repair community facilities if damaged as a result of the works as soon as practicable.</p> <p>Contractor SEP to be updated on annual basis throughout the Project as per PR10.</p>	Preparation: Contractor Approval- PIURR, Supervising Engineer.	PIURR, Technical Advisor for ADB, EBRD, AIIB Information – included in reports to the Lenders.	GRM Established.  24-Hour hotline established and operational.  Notice boards located at construction sites.  Consultation completed with the identified stakeholders as per the SEP and CSEP.

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
16	Grievance Redress Mechanisms (GRM)	<p>Prior to start of works, the Contractor shall:</p> <ul style="list-style-type: none"><li>Establish and communicate a Grievance Redress Mechanisms (GRM), as described in the ESIA and their own CSEP, to communities in the project impact zone and to their worker and sub-contractors.</li><li>Set-up and publicise a 24-hour hotline for complaints</li><li>Ensure that names, genders and contact numbers of representatives of the PIURR and contractors are placed on the notice boards outside the construction site.</li></ul>	PIURR responsible for Contractor	Technical Advisor for ADB, EBRD, AIIB PIURR Information – included in reports to the Lenders.	<p>GRM Established.</p> <p>24-Hour hotline established and operational.</p> <p>Notice boards located at construction sites.</p> <p>Consultation completed with the identified stakeholders per the SEP.</p> PR10
17	Code of Conduct (CoC)	<p>The Contractor shall prepare a code of conduct that enshrines the commitment of the project to meet Lenders employment and labour standards. Environmental and social protection and anti-bribery and corruption controls.</p> <p>Ensure measures outlined in specific management plans (Biodiversity Management Plan, Waste and Materials Management, Water Resources Management Plan etc) are referenced within the CoC.</p> <p>All workers will be briefed on the Code of Conduct at the moment of recruitment, explaining ways of monitoring and consequences in case of violation.</p> <p>Measures to include:</p>	Implementation: Contractor Approval: PIURR CEP	PIURR, CEP Information – included in reports to the Lenders	<p>Completion of CoC</p>  PR1, PR2, PR3, PR4, PR6, PR8

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Appropriate attire for men and women – for health and safety and cultural reasons</li><li>• Community relations and sensitivities</li><li>• Hygiene/ Health</li><li>• Rules related to alcohol and drug use;</li><li>• Equal opportunities and gender-sensitive conduct</li><li>• Banned activities – no hunting/ poaching, no picking of berries / fruit / seeds or medicinal herbs</li><li>• Non discrimination</li></ul> <p>Special attention will be given to the prevention of gender-based violence and the promotion of a gender-sensitive working environment on construction sites, in line with the Local Employment and Procurement Plan (LEPP) and attached Gender Action Plan (GAP). A specific training session will be delivered on the Code of Conduct provisions on sexual harassment, abuse and exploitation at the moment of induction.</p>			
18	Land Acquisition and Resettlement Plan	<p>Prior to construction, develop a Land Acquisition and Resettlement Plan (LARP) that includes the alignment, the access roads to the new alignment and the planned construction access roads before any related land take and restrictions to accessing livelihoods take place.</p> <p>Organise consultation meetings with resettlement affected people to let them know about the processes, timing, impacts and procedures of land acquisition in advance.</p>	PIURR, PIURR Consultant	PIURR, Technical Advisor for ADB, OFID, EBRD, AIIB and PIURR  Survey reports  LARP  Consultation Meetings	Satisfactory completion of the LARP.  LRP to be approved by Lenders  PR5



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		Complete all land acquisition and livelihood restoration activities according to the LARP.  Arrange for the independent completion audit of land acquisition and economic displacement activities in line with LARP, national legislation and Lenders’ requirements.			
19	Social, Community and Health Review	As part of the project preparation, Social Community and Health Review needs to be completed for the project. This will include a review of matters including existing medical facilities, disease and health risks to the local community. This will include both existing risks and risks related to the Project - in-migration of construction workers can subsequently lead to increased health risk to the local community (i.e. the potential for transfer of communicable or infectious diseases, such as hepatitis, polio, influenza, HIV/AIDS, malaria, etc), crime levels, instances of alcoholism and drug use amongst others. This includes increased impacts to women and vulnerable groups, including the possibility of gender based violence.  The findings of the review will inform the development of plans to safeguard the health and wellbeing of the local community during construction.  A Health Plan will be developed based on findings of Social Community and Health Review and incorporated into the Health and Safety Plan	PIURR Contractor to develop Health Plan based on findings of Social Community and Health Review.  Approval – Supervising Engineer	Review of health risks and updated in response to changes on site including road safety, influx management.  PIURR	Social Community and Health Review.  Social Risk Register in the ESMS.  Social and Health plan established.

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
20	Labour and Working Conditions Management Plan (LWCMP) Including – <ul style="list-style-type: none"><li>Local Employment and Procurement Plan (LEPP)</li><li>Social Risk Register</li><li>Gender Action Plan</li></ul>	The Labour and Working Conditions Management Plan (LWCMP) will include: <ul style="list-style-type: none"><li>policy/legal framework information (including labour and OHS requirements of national legislation and EBRD Performance Requirements),</li><li>contractor’s human resource policy statement;</li><li>workforce induction and training;</li><li>information on labour rights, and establishment of a worker’s organisation in the project area to allow for the potential for collective bargaining;</li><li>prevention of child and forced labour;</li><li>equal opportunities and non-discrimination, and how this will be applied for all workforce;</li><li>management of impacts associated with migrant workers,</li><li>Measures to counter the potential risk of Gender Based Violence (GBV) (with reference to the Code of Conduct);</li><li>Rules related to alcohol and drug use;</li><li>worker accommodation requirements,</li><li>non-employee worker gaps</li><li>workforce grievance mechanism,</li></ul>	Supervising Engineer/ PIURR, Information – included in reports to the Lenders. Contractor Code of Conduct Labour audit. Complaints log.	Safety induction completed. 24-hour hotline operational. Regular training provided. No findings in the labour audit. GRM Established.	Tajik Labour Laws International Labour Organisation (ILO) requirements PR1, PR2, PR4

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>sourcing and management of security personnel (with reference to the Voluntary Principles on Security and Human Rights<sup>101</sup>), and</li><li>other matters as required</li></ul> <p>Conduct induction training for all workers prior to the start of civil works, in a language(s) and format easily understood by the workforce (see Section 17 Code of Conduct). The workforce Induction and documentation should specifically include: worker rights and responsibilities, including the worker grievance procedure, cultural context induction, and interaction/engagement with community members. The induction needs to apply for all workers (anyone working on the project site).</p> <p>The contractor needs to ensure that the core labour requirements are cascaded down across the entire contracting chains, including sub-contractors and suppliers of core materials.</p> <p>The LWCMP will tie in with the Grievance Redress Mechanism (GRM).</p> <p>The LEPP will describe the measures to be taken to promote local procurement and employment. Key actions will include processes and commitments to:</p> <ul style="list-style-type: none"><li>Maximise number of local people employed in pre-construction and construction works (both men and women).</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Maximise goods and services sourced from local commercial enterprises.</li><li>The need for work conditions to be competitive but comparable to equivalent employers, including equal pay for equal work by migrant workers (e.g. construction force labourers that may be engaged);</li></ul> <p>The engineer / PIURR will undertake a labour audit during the first month of the construction phase to confirm compliance with the Labour Standards identified above.</p> <p>The contractor will supply and/or employ workers with appropriate skills / competencies and qualifications.</p> <p>The Gender Action Plan (GAP) will complement the LEPP and describe affirmative measures to be taken to promote women in construction and gender-sensitive construction practices. Key actions will include processes and commitments to:</p> <ul style="list-style-type: none"><li>The prevention of any form of gender-based violence, including sexual harassment (in line with the Code of Conduct), including through the provision of explanatory sessions on the anti-harassment policy to all new and existing workers,</li><li>The development of concrete, affirmative measures, in collaboration with PIURR and the Lenders, to increase the number of women in specific positions through active local recruitment campaigns and outreach to VET institutions and Faculties of Engineering,</li></ul>			

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			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• The provision of adequate working conditions and Personal Protective Equipment (PPE) to workers of both sexes - customised by anthropometric specifications of women and men workers.</li><li>• The need for work conditions to provide a safe, secure and equal environment for men and women, including separate toilets for male and female workers with access to water and soap close to the actual places where women work, installation of lighting inside toilets and in the area through which women access these facilities, provision of adequate premises where women can get ready before starting work (i.e. accessible and clean places equipped with changing room and a toilet, in a facility that is well-illuminated, adequate lighting on site at night;</li><li>• The promotion of gender-responsive external communications, including through presentation of men and women road workers in visual PR and communications materials (from recruitment to delivery of the Project), consistent usage of images to represent the entire client base services (e.g. women and men of local communities benefiting from road construction and maintenance); use of non-sexist, gender-sensitive language, the respectful non-sexualised depiction of women, and provision of female role models based on women’s competence and professional skills in all public presentations, print and media, for local employment recruitment and other campaigns;</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• The maintenance of relationships with relevant community groups (especially women’s groups);</li><li>• The establishment of a system for monitoring the Gender Action Plan.</li></ul>			
21	Traffic Management Plan (TMP)	<p>The plan shall be designed to ensure that traffic congestion and traffic safety impacts due to construction activities and movement of construction vehicles, haulage trucks, and equipment is minimised. The plan shall be prepared in consultation with traffic officials. The plan will cover both on-site and off-site traffic movements.</p> <p>The plan shall identify traffic diversion and management issues, traffic schedules, traffic arrangements showing all detours/lane diversions, modifications to signalling at intersections, necessary barricades, warning/advisory signs, road signs, lighting, and other provisions to ensure that adequate and safe access is provided to motorists and other road users in the affected areas.</p> <p>Pre-construction access road surveys will also form part of the TMP.</p> <p>The Contractor shall provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions at least 24 hours before the disruptions. Construction site access roads which are also used by local traffic shall include safe passing places every 200 m where the roads are narrow.</p>	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer.  Information – included in reports to the Lenders.	Plan approved as part of the CESMP by relevant parties.  PR1, PR2, PR3, PR4

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>Access roads for batching plants, etc, should be maintained to their existing (or better) condition during the construction phase.</p> <p>Construction site access roads and village access roads should be inspected regularly to identify any damage to verges, bridges, culverts, etc and any deterioration will be repaired as soon as practicable.</p> <p>Regularly monitor traffic conditions along construction site access roads and village access roads to ensure that project vehicles are not causing congestion or traffic hazards.</p> <p>Install temporary accesses to properties affected by disruption to their permanent accesses and ensure access is possible at all times.</p> <p>Reinstate good quality permanent accesses following completion of construction.</p> <p>Impose speed limits on construction vehicles when travelling along residential areas.</p> <p>As part of the Traffic Management Plan, the Contractor shall consult with local residents to establish processes and locations for safe livestock crossing of the proposed access roads.</p>			
22	Health and Safety Plan  To include <ul style="list-style-type: none"><li>specific measures for the construction of</li></ul>	<p>This will be developed in a format and with content consistent with international standards (e.g., World Bank Group Environmental, Health, and Safety Guidelines, 2007).</p> <p>The Plan shall address health and safety hazards associated with construction activities (e.g., excavations, tunnelling etc.), use of heavy equipment, transport of materials and other hazards</p>	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer.  Information – included in reports to the Lenders	Plan approved as part of the CESMP by relevant parties.  PR2, PR4



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
	bridges and tunnels <ul style="list-style-type: none"><li>Health Plan</li></ul>	<p>associated with various construction activities, including both risk to site personnel and to the community. The Plan shall address hazards from a gender perspective, for the Plan to be in line with the Gender Action Plan</p> <p>The document to be read together with the Camp Management Plan, and other activity-specific sub-plans.</p> <p>All workers (including sub-contractors) will receive a formal induction ahead of starting works, in a language(s) and format easily understood by the workforce. This will include information on health and safety measures, emergency response in case of accidents, fire, earthquakes, landslides, flash foods, disease etc, and minimisation of environmental and community impacts. The Contractor will also develop and implement a safety and security training program including toolbox talks, safety briefings, and issue specific training. The Contractor will conduct safety meetings on monthly / regular basis.</p> <p>The Contractor shall develop women-only training sessions and safety meetings and discuss any additional health and safety concerns from a gender perspective. Safety awareness training will also target vulnerable groups such as children and animal herders, and cover such issues as road safety, construction hazards, safe movement of animals, etc.</p> <p>A Health Plan will be developed based on findings of Social Community and Health Review and incorporated into the Health and Safety Plan</p>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
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Pre-construction and Construction					
		<p>General Safety Measures</p> <ul style="list-style-type: none"><li>• Appointment of an environment, health and safety, (EHS) manager to supervise implementation of mitigation measures, to ensure that environment, health and safety precautions are strictly implemented, evaluate efficiency of mitigation measures and identified new measures if required.</li><li>• Develop and implement a process for reporting and investigating incidents, injuries, near misses and unsafe conditions</li></ul> <p>Community road safety measures to include:</p> <ul style="list-style-type: none"><li>• Provide driver training programmes to ensure that Contractor’s staff are aware of community sensitivities, such as specific livestock movement periods.</li><li>• Ensure lighting in public places is adequate and is maintained, particularly to reduce gender-based violence and construction and road safety risks at night,</li><li>• Provide safe road crossings for children including adequate signals to alert presence of children and families.</li><li>• Provide a series of road safety awareness sessions for schools in the Project Area. The sessions will be provided on a six-monthly basis throughout the construction phase.</li><li>• As part of the awareness sessions, children will be given reflective badges to fix to their coats and school bags.</li><li>• Ensure all construction driving is to occur during daytime hours, where possible.</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Prepare guidelines for maximum driving hours per day and week, to prevent driver fatigue.</li><li>• All drivers to adhere to site and national speed limits, reinforced by speed limit signage and sanctions for non-compliance.</li><li>• Provide road signs in accordance with the approved traffic management plan.</li><li>• Consult with local households, community groups, police, and emergency services along the transport routes as per the SEP.</li><li>• Consult with local households and community groups to establish and design locations and methods for allowing safe passage of animals / stock across the route.</li><li>• Develop and implement a program of workplace inspections and audits, to monitor the effectiveness of EHS control measures.</li></ul> <p>Health and Welfare</p> <ul style="list-style-type: none"><li>• Provide adequate housing conditions and services for all workers at the construction camp/camps as per requirements of national legislation, and EBRD/ADB/AIIB standards, including EBRD/IFC Guidance Note: Workers’ Accommodation: Processes and Standards<sup>102</sup>.</li></ul>			

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<sup>102</sup> [https://www.ebrd.com/downloads/about/sustainability/Workers\\_accomodation.pdf](https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf)

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Provide separate hygienic sanitation facilities/toilets and showers areas with sufficient water supply for male and female workers.</li><li>• Provide reliable and sufficient supply of safe potable water at all times. Ensure that all supplies meet the drinking water standards of Tajikistan.</li><li>• Establish clean canteen/rest areas with hand washing facilities.</li><li>• Provide portable toilet facilities with hand washing facilities for workers at work sites. Toilet facilities must not pollute surface waters and must have holding tanks with waste transferred back to camp</li><li>• The construction camp will be staffed and equipped with a health clinic for all workers.</li></ul> <p>Security</p> <ul style="list-style-type: none"><li>• Provide appropriate security measures to prevent unauthorised access to hazardous work sites, including fencing on all areas of excavation greater than 1 m deep.</li><li>• Enforce access restrictions by means of regular monitoring of site boundaries (either by patrols or by camera)</li></ul> <p>PPE</p> <ul style="list-style-type: none"><li>• Provide appropriate personnel protection equipment (PPE) and harnesses (safety boots, helmets, gloves, protective clothes, breathing mask, goggles, and ear protection) adequate to task/activity. The PPE is to be provided for all site personnel – contractors, subcontractors, Project Management</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>and Construction Supervision Consultant staff, and site visitors (including drivers who leave their vehicle cabs while on site). Sufficient stocks of PPE must be held at all camps.</p> <p>Excavations</p> <ul style="list-style-type: none"><li>Minimise the duration of excavations, and backfill as soon as practicable,</li><li>Install warning signs where required, in accordance with other management plans (e.g. Traffic Management Plan).</li><li>Implement measures to avoid damage to buried utilities (e.g. consultation with service providers and land users, use of service location equipment, support for exposed services, etc.)</li></ul> <p>Plant and Equipment</p> <ul style="list-style-type: none"><li>Regularly inspect, test and maintain all safety equipment. Immediately replace equipment that is not in working order, damaged and/or not fit to use.</li><li>Ensure reversing signals are installed on all construction vehicles, although consider the noise impacts and controls in the Noise and Vibration Management Plan.</li></ul> <p>Work at Height / Fall Prevention</p> <ul style="list-style-type: none"><li>Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery, falling through an opening in a work surface, or other dangerous location. Fall prevention/protection measures may include</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area;</li><li>• installation and inspection of scaffolds by competent persons</li><li>• regular inspection of ladders and access equipment</li><li>• proper use of ladders and scaffolds by trained employees,</li><li>• use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc. Regular inspection of fall prevention devices.</li><li>• Mark the areas where risk of injuries from falling objects exist with rope or flagging to minimise risks and injuries.</li></ul> <p>Work in Confined Spaces</p> <ul style="list-style-type: none"><li>• Develop a procedure for entry into confined spaces, including training of personnel, PPE requirements, rescue provisions, etc.</li><li>• Prohibit entry into confined spaces, except by trained persons using the controls developed.</li></ul> <p>Electrical Equipment and Electrical Works</p> <ul style="list-style-type: none"><li>• Ensure that all electrical equipment is suitable for use in a harsh construction environment.</li><li>• Regularly inspect electrical equipment and replace / repair if damage is identified.</li><li>• Ensure that electrical works are only conducted by qualified and experienced personnel</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Ensure that power supply is disconnected and isolated before work is allowed on electrical systems.</li></ul> <p>Lifting Operations</p> <ul style="list-style-type: none"><li>• Ensure that all lifting operations are planned and supervised by suitably qualified and experience persons, to minimise risk to persons on site, and to co-ordinate with other site activities. This must include measures to avoid contact of lifting equipment and loads with above ground utilities and structures.</li><li>• Prevent persons from walking beneath loads.</li><li>• Ensure all loads are properly secured</li><li>• A programme of inspection and testing to be developed and implemented for all lifting equipment, including all straps, chains, shackles, etc.</li></ul> <p>Hazardous Chemicals</p> <ul style="list-style-type: none"><li>• Ensure that all hazardous chemicals are stored appropriately in suitable containers and labelled with the name and hazards of the contents.</li><li>• To prevent bitumen burns ensure workers handling hot bitumen to wear full-body protection.</li><li>• All transportation, handling and storage of bitumen will be done by experienced personnel.</li><li>• Ensure all hazardous materials are stored (including within suitable sized bunds for liquids), handled and disposed of appropriately.</li></ul>			



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Keep a plan of site indicating where all hazardous materials are stored.</li></ul> Heat / Cold Exposure <ul style="list-style-type: none"><li>Provide suitable clothing for work during cold and/or wet, weather.</li><li>Provide shaded rest areas and drinking water, and organise work to allow for sufficient rest breaks during hot weather.</li></ul> Site Illumination <ul style="list-style-type: none"><li>Provide sufficient lighting at night within and in the vicinity of construction sites, but consider need for mitigation of impact on wildlife and community.</li></ul>			
23	Emergency Response Plan Including – <ul style="list-style-type: none"><li>Natural Disaster Response</li><li>Spill Management Plan</li></ul>	Develop and implement emergency preparedness and response plans (ERP) for each Project package. These should include measures for prevention, mitigation and response to emergency scenarios, at a minimum covering: <ul style="list-style-type: none"><li>Road and traffic accidents;</li><li>Other accidents and injuries;</li><li>spills of hazardous substances;</li><li>fire;</li><li>natural disasters (earthquake, landslip, flood, extreme weather events, etc.);</li><li>accidents during tunnelling (e.g., tunnel collapse, tunnel fires, gas release, etc.).</li><li>The ERP should describe</li></ul>	Preparation: Contractor Approval: Engineer and PIURR,	PIURR/ Supervising Engineer. Information – included in reports to the Lenders.	Plan approved as part of the CESMP by relevant parties. PR2, PR3, PR4

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Roles and responsibilities for prevention and response</li><li>• Procedures for responding to different scenarios (fire, flood, traffic accident, etc.)</li><li>• Resources required (personnel and equipment) and how these will be provided and maintained. This must consider delays to emergency response services, due to the current condition of the road</li><li>• Competence and training requirements</li></ul> <p>The Spill Management Plan will include procedures, responsibilities, resources, documentation and reporting requirements, training provisions for relevant staff, etc. to avoid spills of hazardous substances and to effectively respond to such incidents.</p> <ul style="list-style-type: none"><li>• All refuelling activities must occur on hard surfacing.</li><li>• Provide first aid facilities that are readily accessible by emergency response personnel and workers.</li><li>• Provide firefighting equipment at the work areas, as appropriate, and at construction camps.</li></ul> <p>The ERP must be regularly reviewed and updated – as a minimum annually and after any emergencies or accidents.</p>			
Activity Specific Sub-Plans					
24	Camp Management Plan	Prior to start of site works, an Environmental and Social Screening of potential camp locations prior to construction, to identify any sensitive environmental receptors and to ensure the camps are of	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer.	Plan approved as part of the CESMP by relevant parties.

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>sufficient distance from villages and local communities. Consultation with local communities before the construction camp is developed is required, covering</p> <ul style="list-style-type: none"><li>• Location of camps over one kilometre from any residential area and at least 50 m from any surface watercourse and not within 2 km of a protected area – any deviation from these separation distance must be supported by sufficient justification and additional mitigation measures, and the location and mitigations must be approved;</li><li>• Coordination of all construction camp activities with neighbouring land uses;</li><li>• confirmation as to whether workers can be accompanied by families or whether rosters will enable locally engaged workers to go home daily or not.</li></ul> <p>Prior to start of site works, the Contractor shall develop a Camp Management Plan. This will include:</p> <ul style="list-style-type: none"><li>• Ensuring that workers’ accommodation/ construction camps is designed and managed in compliance with EBRD/IFC guidance on workers’ accommodation<sup>103</sup>;</li><li>• layout of the site, including location of temporary specifications for storage areas for waste, equipment maintenance areas, lubricant and fuel storage sites with</li></ul>		Information – included in reports to the Lenders	PR1, PR2, PR3, PR4, PR5, PR6, PR10

103 [https://www.ebrd.com/downloads/about/sustainability/Workers\\_accomodation.pdf](https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf)

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>indication of the distance from watercourses and other sensitive receptors</p> <ul style="list-style-type: none"><li>• description of sewage management activities, including treatment, monitoring and effluent disposal processes;</li><li>• description of waste management activities, including waste minimisation, and storage and disposal processes for each waste stream;</li><li>• community relations, restriction of access to camp and facilities, induction briefing on camp rules and local issues/sensitivities, camp rules (such as restrictions on; alcohol, drugs use, discipline, noisy activities, community liaison, no poaching, environmental protection measures applicable to the camp site, decommissioning and re-cultivation, etc.), and workers welfare</li></ul> <p>The construction camps will be staffed and equipped with a health clinic for all workers.</p> <p>The Contractor will be responsible for maintenance and clean-up of campsites and respecting the rights of local land users.</p> <p>The Camp Management Plan will indicate the system proposed and the locations of related facilities in the site, including latrines, showers, canteen, recreation facilities, laboratories, maintenance areas, etc. The plan will cover camp sites as well as any sites considered as associated facilities, and will require IFI consideration, due diligence and approval.</p>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>The plan will cover camp sites as well as any sites considered as associated facilities, and will require ADB, OFID, EBRD and AIIB consideration, due diligence and approval.</p> <p>The plan will cross reference other sub-plans including; Water Resources Management Plan, Spill Management Plan, Air Quality Management Plan, Noise and Vibration Management Plan, Waste and Materials Management Plan, and others as required.</p>			
25	Concrete and Asphalt Production Management Plans	<p>Prior to start of site works, the Contractor shall develop a Concrete and Asphalt Production Management Plan. This will include:</p> <ul style="list-style-type: none"><li>• Describing the layout and management of asphalt and concrete batching plant including:</li><li>• Location, hours of use, water discharge, noise and vibration management and dust control.</li><li>• Batching plants will be located downwind of residential areas and not within 1 km of any residential area.</li><li>• The entire batching area traversed by vehicles – including driveways leading into and out of the area – will be paved with a hard, impervious material.</li><li>• Sand and aggregates will be delivered in a dampened state, using covered trucks. If the materials dry out during transit they will be covered to avoid creation of dust.</li><li>• Sand and aggregates will be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend 1</li></ul>	<p>Preparation: Contractor</p> <p>Approval: Engineer, PIURR</p>	<p>PIURR/ Supervising Engineer</p> <p>Information – included in reports to the Lenders.</p>	<p>Plan approved as part of the CESMP by relevant parties.</p> <p>PR1, PR2, PR3, PR4</p>

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<p>m above the height of the maximum quantity of raw material kept on site, and extend 2 m beyond the front of the stockpile.</p> <ul style="list-style-type: none"><li>• The hopper or bunker will be fitted with water sprays which keep the stored material damp at all times.</li><li>• Monitor the water content of the stockpile to ensure it is maintained in a damp condition.</li><li>• Overhead storage bins will be totally enclosed. The swivel chute area and transfer point from the conveyor will also be enclosed.</li><li>• Rubber curtain seals may be needed to protect the opening of the overhead bin from winds.</li><li>• Conveyor belts which are exposed to the wind and used for raw material transfer will be effectively enclosed, to ensure dust is not blown off the conveyor during transit. Conveyor transfer points and hopper discharge areas will be fully enclosed.</li><li>• Conveyor belts will be fitted with belt cleaners on the return side of the belt.</li><li>• Weigh hoppers at front end loader plants will be roofed and have weigh hoppers shrouded on three sides, to protect the contents from the wind.</li><li>• The raw materials transferred by the front-end loader should be damp, as they are taken from a dampened stockpile.</li><li>• Store cement in sealed, dust-tight storage silos. All hatches, inspection points and duct work will be dust-tight.</li></ul>			

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Silos will be equipped with a high-level sensor alarm and an automatic delivery shut-down switch to prevent overfilling.</li><li>Cement dust from the silo during filling operations must be minimised. A fabric filter dust collector will be used.</li><li>The cement weigh hopper will be enclosed, to ensure that dust cannot escape.</li><li>An inspection of all dust control components will be performed regularly – for example, at least weekly.</li></ul> <p>The plan will cross reference other sub-plans including; Water Resources Management Plan, Spill Management Plan, Air Quality Management Plan, Noise and Vibration Management Plan, Waste and Materials Management Plan, and others as required.</p>			
26	Construction plans and Method Statements Including – <ul style="list-style-type: none"><li>Bridge Construction Plan</li><li>Tunnel Construction Plan</li><li>Tunnel Handover Plan</li><li>Slope Stabilisation Plan</li></ul>	<p>Plans will outline the specific construction for each element of the Project.</p> <p>The Bridge Construction Plan will outline measures to minimise environmental impacts on surface waterbodies during works in water, such as those from sediment disturbance, flow impedence, pollution from cement and other materials, etc. It will also address the particular hazards from work in and over water, including potential risks from drowning and working at height.</p> <p>The Tunnel Construction Plan will outline measures including</p> <ul style="list-style-type: none"><li>Use of non-toxic slurry and additives and minimise impact of these materials to reduce risk of impact on ground water quality.</li></ul>	Preparation: Contractor Approval: Supervising Engineer, PIURR	PIURR/ Supervising Engineer Information – included in reports to the Lenders	Plans approved 14 days prior to commencement of works in these areas.  PR1, PR2, PR3, PR4



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>• Ensure that pressure applied to tunnelling and ground treatment is controlled to prevent excessive pressure that will drive the slurry out of the desired range increasing the risk of water pollution.</li><li>• Ensure any de-watering does not impact groundwater users (users of wells etc).</li><li>• Include cross reference to the Blasting Management Plan</li></ul> <p>The Tunnel Handover Plan will as a minimum include an operations handover process and the documentation required for handover; training requirements including commissioning and staffing requirements; occupational health and safety requirements and risk management and reporting.</p> <p>The Slope Stabilisation Plan will determine the specific areas of slope stabilisation works ahead of construction.</p> <p>All Construction Plans will cross reference relevant; environmental, social and health and safety sub-plans.</p>			
27	Method Statements for Temporary Activities Including – <ul style="list-style-type: none"><li>• Storage Areas</li><li>• River crossings</li><li>• Roads/ Access Roads</li></ul>	The Contractor will be responsible for preparing a method statement for any temporary activities and infrastructure (e.g. temporary roads, temporary river crossings, temporary storage areas), including establishment, operation and reinstatement of the facilities.	Preparation: Contractor Approval: Engineer, PIURR	PIURR/ Supervising Engineer  Information – included in reports to the Lenders	Statement approved 14 days prior to commencement of works in these areas.  PR1, PR2, PR3, PR4



Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		<ul style="list-style-type: none"><li>Must be produced in accordance with the requirements of the Biodiversity Management Plan (e.g. regarding avoidance of impacts to nesting birds and roosting bats, etc.).</li></ul> <p>The Blasting Management Plan will set out the safe and secure storage of blasting equipment (including explosives) when not in use.</p>			
29	Construction Road Access Management Plan	<p>A Construction Access Road Management Plan will be developed, which will include measures for the establishment, operation and timely reinstatement of the roads. Disruption to villagers along the construction access roads must be minimised at all times.</p> <p>The construction access roads shall be carefully chosen and delineated to minimise impacts on landscape and soil erosion, and damage to bridges, river banks, verges, drain conduits and other structures along the route, and will be closely monitored to eliminate their unduly expansion during construction works.</p> <p>The top surface of access roads and work areas should be graded and compacted before works commences and maintained through the works to remove ruts and potholes. The access roads should be watered to reduce impact of dust caused by vehicles running on dry dusty surfaces. Speed limits should be identified by the contractor and strictly maintained to reduce noise and dust emissions and for road safety purposes.</p> <p>The requirements for environmental, social and safety controls on the access roads will be identified during the assessments of each route, but will implement the same types of management plan as</p>	Preparation: Contractor Approval: Supervising Engineer, PIURR	PIURR/ Supervising Engineer. Information – included in reports to the Lenders.	Plan approved as part of the CESMP by relevant parties. PR1, PR2, PR3, PR4

Ref	Environmental or Social Aspect/ Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator / EBRD Performance Requirement
			Implementation	Monitoring	
Pre-construction and Construction					
		set out in the ESMP (for issues such as safety management, dust control, water control, etc.) for the main alignment.			

## 8.7 Operational Phase ESMP

709. An Environmental and Social and Management Plan has been developed for the operational phase of the Project. This identifies the need for a number of sub-plans to manage specific issues or activities (Table 54).

Table 54: Environmental and Social Management Plan – Operational Phase

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
Overall Operational Environmental & Social Management Plan (OESMP)					
1	Development of an Operational Environmental and Social Management Plan (OESMP)	<p>The PIURR shall prepare an over-arching operational phase Environmental and Social Management Plan (OESMP). The OESMP will</p> <ul style="list-style-type: none"><li>Set out processes and responsibilities for implementation of the requirements of permits, licences, lenders and regulations associated with operation and maintenance of the Project after construction</li><li>include all of the sub-plans listed below<ul style="list-style-type: none"><li>Operational Stakeholder Engagement Plan (SEP)</li><li>Operational Community Health and Safety Management Plan</li><li>Operational Worker Health and Safety Management Plan</li><li>Road Safety Audits</li><li>Tunnel Operational Management Plan</li><li>Maintenance Depot Inspections</li><li>Emergency Response Plans, including Tunnel Emergency Response Plan</li><li>Operational Drainage Management Plan</li><li>Operational Biodiversity Management Plan</li><li>Operational Waste Management Plan</li><li>Air Quality Management Plan, including air pollution from transport emissions and air quality and greenhouse gas emissions as a result of maintenance activities.</li><li>Operational Noise Management Plan</li><li>Operational Soil Management Plan</li><li>Climate Resilience Management Plan</li></ul></li></ul>	PIURR	PIURR Information – included in reports to the Lenders.	OESMP and plans developed and implemented  PR 1, PR2, PR3, PR4, PR6, PR8

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		The PIURR will implement a ESMS in line with national and international EHSS Standards.  This OESMP should be costed so that an annual budget can be established			
Community, Labour and Safety Management Plans					
29	Operational Stakeholder Engagement Plan (SEP)	<ul style="list-style-type: none"><li>• Update the Project SEP for the operational phase.</li><li>• Implement the SEP and organise regular consultation activities with local communities.</li><li>• A Community Liaison Officer (CLO) shall be appointed to manage consultations and implement the developed SEP with local communities.</li><li>• Organise consultation events for men, women and children (including vulnerable groups) as and when required.</li><li>• Focus groups are preferred methods for engagement with vulnerable groups. Separate males and females focus group discussions should be conducted.</li><li>• Women must be consulted on road safety, and given fair and equal representation of women in decision-making situations and greater awareness of road safety from a gender perspective.</li><li>• Data to be collected on road safety from a gender perspective in the region and results communicated.</li><li>• Develop outreach and campaign promoting gender-responsive road safety. This includes understanding masculinities and men’s behaviours in relation to road safety so as to better target potential campaigns.</li><li>• The road should promote public transport and space that is pedestrian-friendly, female friendly, disabled friendly and child friendly.</li><li>• Safe road crossings for children including adequate signals to alert presence of children and families.</li></ul>	PIURR	PIURR Information – included in reports to the Lenders	Consultation completed with the identified stakeholders per the SEP and results of consultations presented to PIURR and Lenders.

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>Adequate lighting in public spaces around the road should be provided to reduce gender-based violence and road safety risks at night.</li><li>Update SEP on annual basis</li></ul>			
30	Operational Community Health and Safety Management Plan	<ul style="list-style-type: none"><li>Co-ordinate with police by the PIURR to ensure regular patrolling as per other international roads.</li><li>Install warning signs, as per the recommendations of the Road Safety Audit.</li><li>Consult with local households, community groups, police, and emergency services as per the SEP. Investigate all community concerns related to road safety during road operation.</li><li>Inform community about any hazards and/or restrictions.</li><li>Provide road signs in accordance with national regulations and the recommendations of the Road Safety Audit</li><li>Ensure lighting in public places is adequate and is maintained, particularly to reduce gender-based violence and road safety risks at night,</li><li>Provide safe road crossings for children including adequate signals to alert presence of children and families.</li><li>Maintain an accident log and review regularly to identify potential to reduce future accidents.</li></ul>	PIURR	PIURR Information – included in reports to the Lenders.	Road included in police patrols.  Inclusion of rest areas.
31	Operational Worker Health and Safety Management Plan	<p>This will be developed in a format and with content consistent with international standards (e.g., World Bank Group Environmental, Health, and Safety Guidelines, 2007).</p> <p>The Plan shall address health and safety hazards to workers associated with maintenance of roads, bridges, tunnels, etc.</p> <p>All workers (including sub-contractors) will receive a formal induction ahead of starting works, in a language(s) and format easily understood by the workforce. This</p>	PIURR	PIURR Information – included in reports to the Lenders.	



	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<p>will include information on health and safety measures, emergency response in case of accidents, fire, earthquakes, landslides, flash foods, disease etc, and minimisation of environmental and community impacts.</p> <p>The plan will include controls for:</p> <p>Traffic Management</p> <ul style="list-style-type: none"><li>• Develop and implement traffic control systems for each maintenance job, including<ul style="list-style-type: none"><li>○ Signage to warn of lane closures, obstructions and workers in the road</li><li>○ Provision of adequate lighting where needed.</li><li>○ Provision of high visibility clothing for workers.</li><li>○ Lane and traffic control, e.g. by traffic lights or STOP/GO boards</li><li>○ Notification of potentially affected persons / communities prior to the works using the SEP</li></ul></li></ul> <p>Health and Welfare</p> <ul style="list-style-type: none"><li>• Provide reliable and sufficient supply of safe potable water at all times.</li><li>• Provide portable toilet facilities with hand washing facilities for.</li></ul> <p>PPE</p> <ul style="list-style-type: none"><li>• Provide appropriate personnel protection equipment (PPE) (safety boots, helmets, gloves, protective clothes, etc.) appropriate to the task/activity.</li></ul> <p>Excavations</p> <ul style="list-style-type: none"><li>• Minimise the duration of excavations, and backfill as soon as practicable,</li><li>• Install warning signs where required.</li></ul> <p>Plant and Equipment</p> <ul style="list-style-type: none"><li>• Ensure the correct selection of all work equipment using on the project and that</li></ul>			

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<p>adequate information, instruction, training and supervision is given to all workers,</p> <ul style="list-style-type: none"><li>Regularly inspect, test and maintain all safety equipment. Immediately replace equipment that is not in working order, damaged and/or not fit to use. Mark all equipment to confirm it has been visually inspected and easily identifiable.</li><li>Ensure reversing signals are installed on all heavy maintenance vehicles.</li></ul> <p>Work at Height / Fall Prevention</p> <ul style="list-style-type: none"><li>consider the application of a fall prevent hierarchy of control – avoid, prevent, minimise</li><li>Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, or other dangerous location. Fall prevention/protection measures may include<ul style="list-style-type: none"><li>installation and inspection of scaffolds by competent persons</li><li>regular inspection of access equipment</li><li>proper use of ladders and scaffolds by trained employees,</li><li>use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc. Regular inspection of fall prevention devices.</li></ul></li></ul> <p>Work in Confined Spaces</p> <ul style="list-style-type: none"><li>Develop a procedure for entry into confined spaces, including training of personnel, PPE requirements, rescue provisions, etc.</li><li>Prohibit entry into confined spaces, except by trained persons using the controls developed.</li></ul> <p>Electrical Equipment and Electrical Works</p>			

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>• Ensure that all electrical equipment is suitable for use in a harsh construction environment.</li><li>• Regularly inspect electrical equipment and replace / repair if damage is identified.</li><li>• Ensure that electrical works are only conducted by qualified and experienced personnel</li></ul> <p>Lifting Operations</p> <ul style="list-style-type: none"><li>• Ensure that all lifting operations are planned and supervised by suitably qualified and experience persons, to minimise risk to persons on site, and to co-ordinate with other site activities.</li><li>• Prevent persons from walking beneath loads.</li><li>• Ensure all loads are properly secured</li><li>• A programme of inspection and testing to be developed and implemented for all lifting equipment, including all straps, chains, shackles, etc.</li></ul> <p>Hazardous Chemicals</p> <ul style="list-style-type: none"><li>• Ensure that all hazardous chemicals are stored appropriately in suitable containers and labelled with the name and hazards of the contents.</li></ul> <p>Heat / Cold Exposure</p> <ul style="list-style-type: none"><li>• Provide suitable clothing for work during cold and/or wet, weather.</li><li>• Provide shaded rest areas and drinking water, and organise work to allow for sufficient rest breaks during hot weather.</li></ul> <p>Site Illumination</p> <ul style="list-style-type: none"><li>• Provide sufficient lighting at night within and in the vicinity of construction sites, but consider need for mitigation of impact on wildlife and community.</li></ul>			

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
32	Road Safety Audits	<p>Develop and implement a program of road safety audits to assess safety performance along the alignment and village access roads, and to identify any unsafe conditions.</p> <p>This should include a Road Safety Audit at Pre-Opening / Post Construction to confirm recommendations accepted during the design stage Road Safety Audit have been implemented. A further Road Safety Audit should be undertaken 12 months post opening and then periodically every 3 years to assess road traffic collisions along the road and identify any trends / blackspots that required remedial actions.</p> <p>Road safety audits shall factor gender perspectives and identify potential gender adverse impacts and risks.</p>	PIURR Specialist consultant	PIURR, CEP Information – included in reports to the Lenders.	No accidents.
33	Operational Maintenance Plan	<p>Develop and implement a robust maintenance regime for roads, barriers, bridges, drainage and safety features. Inspections must be conducted and managed by suitably qualified and experienced engineers and in line with appropriate Tajik and international standards.</p> <p>A specific programme of inspection and maintenance will also be developed for the tunnels.</p> <p>The maintenance and inspection programme will also include community water supply pipes and other utilities.</p> <p>Sufficient resource must be provided for this programme.</p> <p>The maintenance plans will include inspections related to significant weather events at required by the Operational Climate Resilience Management Plan.</p> <p>All maintenance operations will be conducted in accordance with the Operational Worker Health and Safety Management Plan</p>	Maintenance department of MoT	PIURR, CEP Information – included in reports to the Lenders.	No accidents.

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
34	Tunnel Operational Management Plan	<ul style="list-style-type: none"><li>• Maintain ventilation in working condition.</li><li>• Provide firefighting equipment and other facilities in working order.</li><li>• Ensure tunnel staff are adequately trained in case of emergencies, including rescue, recovery and prevention of access to additional vehicles.</li><li>• Ensure the tunnel is cleaned regularly.</li><li>• Ensure that exit doors to the gallery and the passages are not blocked.</li><li>•</li></ul>	Maintenance department of MoT	PIURR, CEP Information – included in reports to the Lenders.	No accidents.
35	Maintenance Depot Inspections	<ul style="list-style-type: none"><li>• Prior to operation, the construction camps that will be converted into Maintenance Depots. These will be inspected prior to conversion to ensure that they are fit for purpose, and any deficiencies corrected.</li><li>• Key areas will include; sanitation, electricity, heating, waste facilities, security, etc.</li></ul>	PIURR, PIURR Consultant	PIURR Information – included in reports to the Lenders	Consultation completed with the identified stakeholders per the SEP and results of consultations presented to PIURR and Lenders.
36	Emergency Response Plans Including Tunnel Emergency Response Plan	Develop and implement emergency preparedness and response plans (ERP) for the operational phase, including a specific plan for tunnel emergencies. These should include measures for prevention, mitigation and response to emergency scenarios, at a minimum covering: <ul style="list-style-type: none"><li>• Road and traffic accidents;</li><li>• Other accidents and injuries;</li></ul>	PIURR, PIURR Consultant	PIURR Information – included in reports to the Lenders	Consultation completed with the identified stakeholders per the SEP

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>• Spills of hazardous substances;</li><li>• Fire;</li><li>• Natural disasters (earthquake, landslip, flood, extreme weather events, etc.);</li><li>• Accidents during tunnelling (e.g., tunnel collapse, tunnel fires, gas release, etc.).</li></ul> The ERP should describe <ul style="list-style-type: none"><li>• Roles and responsibilities for prevention and response</li><li>• Procedures for responding to different scenarios (fire, flood, traffic accident, etc.)</li><li>• Resources required (personnel and equipment) and how these will be provided and maintained. This must consider delays to emergency response services, due to the remote location;</li><li>• Competence and training requirements. Including response drills and exercises.</li></ul> The ERP must be regularly reviewed and updated – as a minimum annually and after any emergencies or accidents.			and results of consultations presented to PIURR and Lenders.
Environmental Management Plans					
37	Operational Drainage Management Plan	<ul style="list-style-type: none"><li>• Ensure clean up and waste removal from carriageway and roadsides.</li><li>• Store hazardous and potentially contaminating materials (chemicals, fuels, oils, etc.) in areas with watertight flooring, roofing, security fencing and access control and drainage/wastewater collection systems.</li><li>• Maintain integrity and permeability of storm water drainage system to avoid blockage, overflow and direct discharge of untreated runoff into the rivers.</li><li>• Monitor water quality (including: pH; Suspended Solids; BOD5; COD; Coliforms; Nitrate (NO3); Phosphate (PO4); Oil and Grease) in recipient watercourses</li></ul>	Maintenance department of MoT  Bridge operation staff	PIURR, CEP Information – included in reports to the Lenders.	No reduction in water quality.

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<p>quarterly (50 m upstream and 250 m downstream the point of discharge). The distance may change depending on accessibility of the river for sampling.</p> <ul style="list-style-type: none"><li>• Set, implement and adjust clean-up/maintenance schedule to ensure effective operation of the treatment facilities.</li><li>• Check quality of the sediments (list of parameters to control include: heavy metals, petroleum products) prior to making decision on the method of disposal. If contamination detected – use licenced contractor to deal with the waste.</li><li>• Maintain contracts with hazardous waste removal companies to ensure timely and safe removal of skimmed oil, other hazardous waste generated at maintenance facilities.</li><li>• Ensure tunnel operation staff are aware of material and waste management requirements.</li><li>• Ensure maintenance and timely clean-up/removal of sediments accumulated in runoff treatment facilities and drainage systems.</li><li>• Perform maintenance paving in dry weather to prevent runoff contamination.</li><li>• During maintenance works, apply the same measures as per construction stage.</li></ul>	Tunnel Operation Staff		
38	Operational Biodiversity Management Plan	<p>The Operational Biodiversity Management Plan will:</p> <ul style="list-style-type: none"><li>• Register and analyse road kills. Develop additional mitigation measures if found to be necessary. e.g. install reflectors /local fencing, warning signs, speed reduction etc.). Liaise with state forest authorities to inform supplementary feeding for carnivores should road kill incidents occur.</li><li>• Ensure carriageway and adjacent strip are waste free.</li><li>• Prohibit poaching/plant and seed collection (ensure that tunnel operator staff are also aware of the ban).</li></ul>	PIURR, PIURR Consultant	PIURR Information – included in reports to the Lenders	Consultation completed with the identified stakeholders per the SEP and results of consultations

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>• Programme of education/awareness-raising of workforce to prevent hunting/poaching/collecting of rare seeds, etc</li><li>• Monitor the status of re-cultivated areas. (Note: monitoring of vegetation within the guarantee period (as defined by the contract) will form part of the Construction Phase Landscape Management Plan, to ensure successful establishment of replanting.</li><li>• During maintenance of the road and associated infrastructure implement mitigation measures set for construction stage.</li><li>• Ensure the implementation of the Operational Waste Management Plan.</li><li>• Remove all materials, equipment, tools from the area after completion of works.</li><li>• Reinstate the sites disturbed during maintenance works, using species of local/regional provenance.</li></ul>			presented to PIURR and Lenders.
39	Operational Waste Management Plan	<p>The Operational Waste Management Plan will:</p> <ul style="list-style-type: none"><li>• Include wastes generated at operational facilities (tunnel cabins, maintenance depots, etc.), by road users, and during maintenance operations</li><li>• describe waste streams and estimated amounts of each,</li><li>• describe recycling / reuse methods for each material,</li><li>• identify the waste destinations and transport modes, including what materials are being segregated on site for reuse or recycling,</li><li>• specify responsibilities for managing and disposal of waste</li></ul> <p>Waste generated along the road</p> <ul style="list-style-type: none"><li>• Install sanitary facilities and waste bins in the rest areas along the road.</li><li>• Use bins fitted with lids to avoid scattering of litter and attraction of scavengers.</li><li>• Prohibit dumping of material or waste and undertake regular inspections.</li></ul>	Maintenance department of MoT	PIURR, CEP Information – included in reports to the Lenders.	Reduced waste-based pollution.



	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>Keep a log of illegally dumped waste and ensure that the locations are regularly inspected.</li><li>Ensure regular collections of wastes from roadside bins and also any illegally dumped wastes. For disposal of non-hazardous domestic waste, agreement with a solid Waste Management Company must be signed.</li></ul> <p>Waste from operational facilities</p> <ul style="list-style-type: none"><li>Apply the Waste Hierarchy</li><li>Install appropriate waste containers at all operational facilities.</li><li>Segregate hazardous, non-hazardous and reusable waste streams.</li><li>Manage and dispose hazardous waste according to the type and the class of hazard.</li><li>For disposal of non-hazardous domestic waste, agreement with a solid Waste Management Company must be signed.</li><li>Agreement(s) with company / companies authorised for utilisation or disposal of hazardous waste must be signed. If none are available, measures for the selection of suitable sites, and processes for the safe disposal of hazardous waste must be set out and implemented.</li><li>Provide bins and facilities at operational facilities for temporary storage of all waste streams. These facilities should be designed to prevent the escape of litter, liquids, odours or other contaminants / nuisance emissions.</li><li>Remove waste generating during maintenance activities according to the type and hazard category.</li></ul>			
40	<ul style="list-style-type: none"><li>Operational Air Quality Management Plan, including</li></ul>	<p>The Operational Air Quality Management Plan should include provisions to:</p> <ul style="list-style-type: none"><li>Keep roadside vegetation intact.</li></ul>	Maintenance department of MoT	PIURR, CEP	Road vegetation maintained.

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>Check air quality in sensitive receptor locations seasonally. Pay particular attention to measurements in tunnel exits.</li><li>Ensure of tunnel ventilation system is properly maintained.</li><li>Filter air before exhaust to environment (tunnel sections).</li><li>Apply the same mitigation measures during maintenance activities to reduce dust and emissions as the construction phase.</li></ul>	Tunnel operation staff	Information – included in reports to the Lenders.	Tunnel ventilation system operational.
41	Operational Noise Management Plan	<p>The Operational Noise Management Plan should include provisions to:</p> <ul style="list-style-type: none"><li>Monitor noise levels at annual intervals and, depending on the results, implement noise abatement measures when the noise level exceed the acceptable limits / criteria during the operation phase.</li><li>Maintain the grievance redress mechanism to allow identification of other potential locations where noise protection may become necessary during the operation of the infrastructure. Where issues are raised, check the noise level in the location indicated by the complainant to verify the claim and develop relevant mitigation measures.</li><li>Depending on the results of noise monitoring and/or based on justified complaints, additional mitigation measures shall be considered as necessary, including<ul style="list-style-type: none"><li>Reduction of vehicle speeds to reduce the noise levels</li><li>Ban on truck driving at night time</li><li>Noise-reducing porous asphalt road surfacing;</li><li>Provision of noise barriers may also be considered for the long term</li><li>Physical relocation in accordance with the LARP</li></ul></li></ul>	Maintenance department of MoT	PIURR, CEP Information – included in reports to the Lenders.	Low number of post completion complaints.
42	Operational Soil Management Plan	<ul style="list-style-type: none"><li>Implement the Operational Soil Management Plan.</li><li>Monitor slopes, in particular after strong rains and snowmelt for possible traces of erosion.</li></ul>	Maintenance department of MoT	PIURR, CEP	No degradation

	Environmental Aspect / Concern	Proposed Mitigation Measures	Responsibility		Target / Indicator
			Implementation	Monitoring	
Operation					
		<ul style="list-style-type: none"><li>Implement best practice for sediment / erosion control when undertaking repair/ maintenance works.</li><li>Analysis of soil following any intensive salt spreading during periods of high snow fall/ ice.</li><li>Keep vegetation strip between the edge of embankment and cultivated land plots.</li><li>Monitor soil quality for presence of heavy metals – Pb, Cd, Zn.</li></ul>		Information – included in reports to the Lenders.	of soil quality.
43	Operational Climate Resilience Management Plan	<p>Develop and implement an Operational Climate Resilience Management Plan, which will include updates on changes in physical conditions and their projections, and which will specify requirements and processes (management framework) with respect to climate resilience.</p> <p>This shall include regular inspection across the project and especially after significant weather events such as flash floods (potentially damaging infrastructure in river valleys), intense rainfall events (potential mudslides), periods of long dry weather (due to dust). These inspections will be integrated with the Operational Maintenance Plan.</p>	Maintenance department of MoT	PIURR Information – included in reports to the Lenders. Maintenance Log.	Limiting damage due to climate change.

## 8.8 Monitoring Plans

Table 55: Monitoring Plans – Pre-Construction Phase

Environmental and Social Effects Monitoring Plan				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
<b>Pre-construction/Site Preparation Phase</b>				
Biodiversity (Note: Pre-construction surveys as per requirements included within the BMP)	Whole alignment (including access roads)	N/A	For the duration of the pre-construction phase	Contractor
Review and audit of all water pipes along the alignment	Whole alignment (including access roads)	Observation	Prior to construction	Contractor
Land acquisition and economic displacement audit	N/a	Observation	Prior to construction	Independent 3rd party

Table 56: Monitoring Plans – Construction Phase

Environmental and Social Effects Monitoring Plan				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
<b>Construction Phase</b>				
Ambient air quality (Particulates PM10, PM2.5, CO, NOx, SO2)	Whole alignment (including access roads)	Instrumental measurement	Monthly and response to complaints	Contractor
Day time and night time noise levels dB(A)	Whole alignment (including access roads)	Instrumental measurement	Monthly and in response to complaints	Contractor

Environmental and Social Effects Monitoring Plan				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
<b>Construction Phase</b>				
Day time and night time vibration levels dB(A)	Whole alignment (including access roads)	Instrumental measurement	Continuous and during blasting	Contractor
Surface water quality (turbidity, pH, conductivity, total Oil and Grease, COD)	Downstream of activities close to rivers or streams.	Analytical methods/ standards – ISO, USEPA or similar Observation	Bi-weekly during project activities implemented close to rivers or streams.	Contractor
Effluent monitoring (camp sewage treatment) (pH; Suspended Solids; BOD5; COD; Coliforms; Nitrate (NO3); Phosphate (PO4); Oil and Grease)	50 m upstream and 250 m downstream the point of discharge from camp effluent plants	Analytical methods/ standards – ISO, USEPA or similar Observation	At least weekly, and in accordance with manufacturer's instructions	Contractor
Subsidence	Tunnelling operations	Observation	Daily during tunnelling.	Contractor
Ground water level and quality	To be determined	Instrumental measurement	Seasonally	Contractor
Vegetation	All work locations	Observation	Seasonally	Contractor
Biodiversity – as detailed within the BMP.	As detailed within the BMP	As detailed within the BMP	For the duration of the construction phase	Contractor
Subcontractor audits	N/a	Observation	Dependent on type and duration of activity	Contractor
Labour audit	All work locations	Observation	During the first month of the construction phase	PIURR

Environmental and Social Effects Monitoring Plan				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
<b>Construction Phase</b>				
Gender Action Plan (GAP)	As detailed within the GAP	Observation and gender-sensitive indicators as detailed within the GAP	For the duration of the construction phase	PIURR Gender Specialist / Contractor / Specialist Consultant
Workplace inspections and audits to monitor the effectiveness of EHS control measures	All work locations	Observation	Monthly	PIURR / Engineer
Waste company audits	Site / waste disposal locations	Observation	Dependent on hazard nature of waste and frequency of use	Contractor
Blasting contractor audit, to ensure all approvals and authorisations are in place and good practices are applied	N/a	Observation	Prior to engagement of supplier	Contractor
Regular inspection of scaffolds by competent persons	All work locations with scaffolds	Observation	After installation, weekly or following modification of inclement weather	Contractor
Regular inspection of fall prevention devices.	All work locations	Observation	Before each use	Contractor
Regular inspection and testing of all lifting equipment, including all straps, chains, shackles, etc	All work locations	Observation	Dependent on type of equipment	Contractor
Inspection of dust control measures at concrete / asphalt plants	All work locations	Observation	Weekly	Contractor

Environmental and Social Effects Monitoring Plan				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
<b>Construction Phase</b>				
Wind speed monitoring (for dust control purposes)	All work locations	Instrumental measurement	Daily and following significant increases in wind.	Contractor
Traffic and road conditions on construction site access roads and village access roads	Access roads	Observation	Dependent on traffic volumes	Contractor
Collation of accident and injury data, including road accident statistics	All work locations	Observation	Throughout construction	Contractor
Security patrols to prevent public access to hazardous areas	All work locations	Observation / cameras	Throughout construction	Contractor
Inspection of weather related damage to construction site, permanent and temporary assets	All work location (specifically exposed areas)	Observation	Throughout construction and specifically following significant weather events such as flash floods, mudflows and heavy snowfall, or long periods of dry weather	Contractor

Table 57: Monitoring Plans – Operational Phase

Operation				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
Ambient air quality (Particulates PM10, PM2.5, CO)	Locations indicated by complaints	Instrumental measurement	Quarterly In response to complaints	PIURR/ MoT
Day time and night time noise and vibration levels dB(A)	Locations indicated by complaints	Instrumental measurement	Quarterly and in other sites in response to complaints	PIURR/ MoT
Surface water quality monitoring pH; Suspended Solids; BOD5; COD; Coliforms; Nitrate (NO3); Phosphate (PO4); Oil and Grease	In watercourses receiving runoff from the road (50 m upstream and 250 m downstream the point of discharge)	Analytical methods/ standards - ISO, USEPA or similar Observation	Twice a year	PIURR/ MoT
Biodiversity –as detailed within the BMP	As detailed within the BMP	As detailed within the BMP	As detailed within the BMP	PIURR/ MoT
Slope stability monitoring for erosion	Whole alignment (including village access roads)	Observation	Twice a year and after heavy rain	PIURR/ MoT
Soil quality monitoring for heavy metals	Whole alignment	Analytical methods/ standards - ISO, USEPA or similar	Annually	PIURR/ MoT
Soil quality monitoring	Whole alignment	Analytical methods/ standards - ISO, USEPA or similar	following any intensive salt spreading	PIURR/ MoT



<b>Operation</b>				
<b>Aspects/Parameters to be Monitored</b>	<b>Location</b>	<b>Means of Monitoring</b>	<b>Frequency</b>	<b>Implementation Responsibility</b>
Maintenance depots inspections	Camps being converted to maintenance depots	Observation	Prior to conversion	PIURR/ MoT
Tunnel inspection and maintenance programme	Whole alignment	Observation Other methods as required	In line with appropriate Tajik and international standards	PIURR/ MoT
Maintenance regime for roads, barriers, bridges, drainage, water supply pipes and safety features	Whole alignment (including village access roads)	Observation Other methods as required	In line with appropriate Tajik and international standards	PIURR/ MoT
Road safety audits	Whole alignment (including village access roads)	Observation	Six monthly	PIURR / MoT / Specialist consultant
Collation of road accident data and statistics	Whole alignment (including village access roads)	Observation	Throughout construction	PIURR / MoT
Regular inspection of scaffolds by competent persons	All work locations with scaffolds	Observation	After installation, weekly or following modification of inclement weather	PIURR/ MoT
Regular inspection of fall prevention devices.	All work locations	Observation	Before each use	PIURR/ MoT
Regular inspection and testing of all lifting equipment	All work locations	Observation	Dependent on type of equipment	PIURR/ MoT

Operation				
Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Implementation Responsibility
Inspection of weather related damage to assets	Whole alignment (specifically infrastructure in river valleys)	Observation	Following significant weather events such as flash floods, mudflows and heavy snowfall, and following long periods of dry weather (due to dust)	PIURR / MoT

## 8.9 Estimated Costs for Environmental and Social Protection Measures

710. Estimated costs for implementation of the environmental and social measures are provided in Table 58. It should be noted that at the time of ESIA disclosure, these costs are still under consideration. In particular the costs associated with MoT capacity building (C1 to 4) and the Construction Design Consultant C5 to 7) will depend on the Terms of Reference (ToR) that are currently being drafted.

Table 58: Costs associated with environmental protection elements of the project

	Element	Description	Cost	Unit	No	Section 1: Western ADB <sup>Note 1</sup>	Section 2: Eastern EBRD <sup>Note 1</sup> *	Section 3: Long Bridge AIIB <sup>Note 1</sup>
D1	Already included in due diligence							
C1	Construction Supervision Consultant <sup>Note 2</sup>	Senior Environmental Specialist (international)	USD 16,000	Person Months	3	USD 48,000	-	USD 56,000
C2		Senior Occupational Health and Safety Specialist (International)	USD 18,000		4	USD 72,000	-	USD 81,000
		Environmental Specialist (National)	USD 2,500		40	USD 100,000	-	USD 110,000
C3		Occupational Health and Safety Specialist (National)	USD 2,500		40	USD 100,000	-	USD 110,000
		Senior Social and Gender Specialist (international) Social and Gender Specialist (National)	TBD			-	-	
	Contractor	Environmental and Safety Officer	TBD			-	-	-
		Deputy Environmental and Safety Officer	TBD			-	-	-
		Social and Gender Officer	TBD			-	-	-
C4	Project Management Consultant <sup>Note 3</sup>	Environmental Monitor (National)	USD 2,500	Person Months	20	USD 50,000	-	USD 52,500
C5	Traffic Noise Barriers <sup>Note 4</sup>	All costs associated with construction of a 2m high barrier (blockwork costed but could be steel)	USD 900	meters	200	USD 180,000	-	n/a
C6	Environmental Monitoring <sup>Note 5</sup>	Noise (5 sites) <sup>Note 6</sup>	USD 1,500	Set - each 6 months –	8	USD 12,000	-	n/a

	Element	Description	Cost	Unit	No	Section 1: Western ADB <sup>Note 1</sup>	Section 2: Eastern EBRD <sup>Note 1</sup> *	Section 3: Long Bridge AIIB <sup>Note 1</sup>
C7		Air Quality <sup>Note 7</sup> (5 sites)	USD 3,000	(pre construction and 6m & 12m)	8	USD 24,000	-	n/a
C8		Water Quality <sup>Note 8</sup> (11 sites)	USD 615		8	USD 4,920	-	USD 4,920
O1	Environmental Monitoring <sup>Note 4</sup>	Noise <sup>Note 6</sup> (5 sites)	USD 1,500	Set - Annual for 2 years post construction	2	USD 3,000	-	n/a
O2		Air Quality <sup>Note 7</sup> (5 sites)	USD 3,000		2	USD 6,000	-	n/a
O3		Water Quality (11 sites)	USD 615		2	USD 1,230	-	USD 1,230
	Sub TOTAL					601,150	-	415,650

- Note 1) Project duration of section 1, and 2 is 40 months (Almost 3.5 years) and for section 3 is 42 months (3.5 years)
- Note 2) Based on an International environmental specialist working in Construction Supervision Consultant (CSC) team for three person months over the project, an International Occupational Health and Safety Specialist for four person months over the project and National consultant as full time appointment over 40 months
- Note 3) National Environmental; Consultant employed within the PIURR as a Project Management Consultant half time over the project duration to audit performance, provide training and prepare 6 monthly monitoring reports on behalf of MoT for ADB
- Note 4) This is a tentative cost. Actual cost will be determined during the detailed design stage.
- Note 5) Environmental monitoring costs based on EIS due diligence project monitoring carried out in Q3 2018
- Note 6) Noise monitoring parameters: dB(A) 24 hrs
- Note 7 Air Quality Monitoring parameters: CO, CO<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, Mechanical dust
- Note 8) Costs of environmental protection included in contractor rates (i.e. no BoQ line item) not included (e.g. dust suppression, noise mitigation, waste management and operation of camps, etc.)
- \*The exact costs associated with the provision of these services will be determined during the procurement phase. EBRD is not required to disclose allocation budgets within the ESIA.

## 9 Annex 1: Document List / References

<b>Title</b>	<b>By</b>	<b>For</b>	<b>Date</b>
Central Asia Regional Economic Cooperation Corridors 2, 5 & 6 (Dushanbe – Kurgonteppa) Road Project Draft IEE	KOCKS Consult GmbH	MoT	Feb-18
Environmental & Social Impact Assessment for Rogun Hydro Power Plant	Pöyry Energy AG	QSHPC Barki Tojoik	Jun-14
Techno-Economic Assessment Study for Rogun Hydroelectric Construction Project	TEAS Consultant	QSHPC Barki Tojoik	Jun-14
Key Issues for Consideration on the Proposed Rogun Hydropower Project	World Bank	Discussion	Jun-14
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section from Chainage 424+80 to Chainage 759+14: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-Egs	Avtostrada	MoT	Apr-18
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Stage II Road Section from Chainage 0 to Chainage 424+80: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-Egs, Dushanbe, 2018	Avtostrada	MoT	Apr-18
Environmental Impact Assessment for the Kvesheti – Kobi Road Section – Lot 1 and 2, Georgia	AIE, GPI, IRD consortium	Ministry of Regional	Oct-18
ADB TA-9530 TAJ – Interim Land Acquisition and Resettlement Plan	Project Team – Social SG	MoT	Dec-18
ADB TA-9530 TAJ – Interim Economic Evaluation	Project Team – Economist	MoT	Dec-18
ADB TA-9530 TAJ – Interim Geotechnics: Interim Report (December 2018)	Project Team – Geotechnical	MoT	Dec-18
ADB TA-9530 TAJ – Interim Due Diligence of Tunnel Aspects and Tunnel Specifications	Project Team – Tunnel Specialist	MoT	Dec-18
ADB TA-9530 TAJ – Interim Structural Engineer Design Review: Detailed Bridge Engineering	Project Team – Structural Engineer	MoT	Dec-18
Road Safety: Detailed Design Stage Road Audit Report for the proposed Obi Garm – Nurobod Highway, Northern Tajikistan, final	Road Safety International	ADB	Nov 2018
Traffic / Economics: Interim Economic Evaluation		DFR	Nov 2018
Land Acquisition and Resettlement Plan [LARP] (Package 1)	ADB	MoT	Dec-18
Land Acquisition and Resettlement Plan [LARP] (Package 2)	ADB / EBRD	MoT	Jul 2019
Social and Gender Impact Assessment	ADB	ADB	Dec 2018
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridges Nos 9, 11, 12, 13: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-EG	Avtostrada	MoT	Dec 2018
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridge Across Dashtiguron River: Technical Report on the Results of Engineering-Geological Surveys for the Development of Working Design: Ref 16-16-EGR, Dushanbe	Avtostrada	MoT	2018
Hydrological Report – 16-16-EGI (in 2 parts)	Avtostrada	MoT	Undated

<b>Title</b>	<b>By</b>	<b>For</b>	<b>Date</b>
Technical Assessment Report (Working Draft 1) Assessment of Climate Change Risks to Vahdat – Kyrgyz Border Rehabilitation Project	Mott MacDonald	ADB	May 2019
Preparing the Central Asia Regional Economic Cooperation Corridors 2, 3, and 5 (Obigarm-Nurobod) Road Project Consultants' Services; Inception Report	Geotechnical Consultancy Services		Aug 2018
Geological engineering study for the Tajikamar Tunnel Ref 16-16-AS.T03-CS-EN	Avtostrada	MoT	2017
Rogun Bypass Project – Biodiversity Update Report	WSP	EBRD	Jun 2019
Drawing no 16-16-AD-DR.01, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)	Avtostrada	MoT	2019
Drawing no 16-16-AD-DR.02, Vahdat-Rasht-Jirgital-Kyrgyzstan border road (from km 72 to km 158)	Avtostrada	MoT	2019
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridge Across Dashtiguron River: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-EGR	Avtostrada	MoT	2018
Vahdat – Rasht – Jirgatal – Kyrgyzstan Border Road (From km 72 to km 158), Bridges Nos 9, 11, 12, 13: Technical Report On The Results Of Engineering-Geological Surveys For The Development Of Working Design: Ref 16-16-EG-T	Avtostrada	MoT	2018

## 10 Annex 2: Preliminary Data Analysis Under the Tajikistan OVOS

Marks:

- A: Expected major impact.
- B: Expected small (medium) impact.
- C: Level of impact is unknown; a confirmatory analysis is required.
- D: Minor impact; no analysis required.
- +: Positive impact; -: Negative impact

Category	№	Impact	Assessment		Reasons for evaluation
			Project/ Construction	Maintenance	
Pollution	1	Air pollution	B-	B±	<p><b>Construction:</b> The operation of construction equipment and machinery increases the volume of exhaust gases and dust, therefore, air quality is expected to deteriorate. Construction work can cause congestion of vehicles, which can result in increased exhaust gas levels. Earthworks can cause dust.</p> <p><b>Operation:</b> Increase of traffic intensity will simply lead to the increase of total gas emission. On the other hand, the improvement of road conditions and vehicle performance may accordingly reduce gas emissions.</p>
	2	Water pollution	B-	D	<p><b>Construction:</b> There is a possibility of flushing the land from the construction site, which will affect the rivers and canals near the construction zone.</p> <p><b>Operation:</b> Changes in the volume and quality of rainwater discharge are not expected and therefore no negative impacts are expected.</p>
	3	Solid wastes	B-	D	<p><b>Construction:</b> Construction debris, concrete and excess soil are expected. It is also expected the accumulation of domestic waste from workers-builders.</p> <p><b>Operation:</b> The project will not create (will not generate) solid waste.</p>
	4	Soil pollution	D	D	<p><b>Construction:</b></p> <p><b>Operation:</b> It is not foreseen to carry out any activities (works) that would cause soil contamination.</p>
	5	Noise and vibration	B-	B±	<p><b>Construction:</b> The operation of construction equipment and machinery increases the level of noise and vibration in the project area.</p> <p><b>Operation:</b> Increasing the traffic intensity will simply increase the level of noise and vibration. On the other hand, improving road conditions and vehicle performance can accordingly reduce noise and vibration.</p>

Category	№	Impact	Assessment		Reasons for evaluation
			Project/ Construction	Maintenance	
	6	Soil subsidence	D	D	<b>Construction:</b> <b>Operation:</b> It is not foreseen to carry out any activities (works) connected with the change of topography and extraction of groundwater, and therefore no soil subsidence is expected.
	7	Unpleasant smell	D	D	<b>Construction:</b> <b>Operation:</b> It is not expected to carry out any activities (works), as a result of which there would be an unpleasant smell.
	8	Sedimentary rocks	B-	D	<b>Construction:</b> There is a possibility of flushing the land from the construction site, which will affect the sedimentary rocks of the rivers and canals near the construction zone. <b>Operation:</b> It is not foreseen to carry out any activities (works) that will affect sedimentary rocks.
Natural habitat	9	Protected area	D	D	<b>Construction:</b> <b>Operation:</b> There is no any specifically protected zone in the vicinity of the project area.
	10	Ecosystem	B-	B-	<b>Construction:</b> The project area mainly refers to the rural area and mainly the sown area, therefore, no serious impact on the existing ecosystem is expected. The existing ecosystem in the project area will be established during engineering geological surveys. <b>Operation:</b> Since the project provides for the improvement of the existing road, a new ecosystem segmentation is not expected. The impact is minor.
	11	Hydrology	B-	B-	<b>Hydrology:</b> It is necessary to take into account (take into account) the effect on the gutters and drainage systems that cross the road. <b>Operation:</b> It is necessary to think of a suitable drainage system from the road part to gutters and drainage systems.
	12	Topography and geology	D	D	<b>Construction:</b> <b>Operation:</b> Construction work will not change the topography and geology in a significant way.
Social environment	13	Relocation	B-	D	<b>Before construction:</b> The residential area in the project area is not so large, and accordingly there are not too many resettlable targets. Such relocated objects as office buildings, commercial buildings and gas stations will be examined. <b>Operation:</b> No further land acquisition and / or resettlement is expected.
	14	Poverty	C	D	<b>Construction:</b> job opportunities Will be created (vacancies will be created) as part of the ongoing construction work, and the poor will also have the opportunity to get jobs. The current situation of poverty will be examined. <b>Operation:</b> No significant impact on the poor is expected.



Category	№	Impact	Assessment		Reasons for evaluation
			Project/ Construction	Maintenance	
	15	Ethnic minorities and aborigines	D	D	<b>Construction:</b> <b>Operation:</b> The project area has been landscaped, so there is no need for special consideration (approach) to ethnic minorities and aboriginal people.
	16	Employment, livelihood and local economy	B±	B+	<b>Construction:</b> The course of activities (business), offices, shops, street vendors will be disrupted by construction work. On the other hand, a temporary employment opportunity will be created.. <b>Operation:</b> As a result of the project implementation, the transportation time will be shortened and the driving conditions will improve. This contributes to the development of local economy.
	17	Use of land and local resources	B-	B±	<b>Construction:</b> The roadside is used for the transfer of livestock, and it will be disturbed during construction. Land intended for agriculture will be transformed into a road, and local resources will be partially reduced. <b>Operation:</b> Improved traffic conditions will contribute to more efficient use of local resources. The road is for public and local use. The extension of the road may result in a violation of these functions.
	18	Use of water	C	D	<b>Construction:</b> The current use of water at water bodies in the project area should be investigated and the construction impact will be determined after that. <b>Operation:</b> There is no significant impact from the project.
	19	Existing social structure and services	B-	B-	<b>Construction:</b> Construction work will create problems of congestion of vehicles and violation of access to facilities near the road. <b>Operation:</b> the crossing of the road by pedestrians and livestock will be disrupted.
	20	Social capital, Local policy makers and other social organizations	D	D	<b>Construction:</b> <b>Operation:</b> No serious impact on local social organizations is expected because the project implementation area has already been improved.
	21	Improper distribution of benefits and compensation of damages	C	C	<b>Construction:</b> <b>Operation:</b> Resettlement and land acquisition can only affect the affected persons.
	22	Conflict of interests in place	C	C	<b>Construction:</b> <b>Operation:</b> The likelihood of conflicts over resettlement and land acquisition should be studied.
	23	Cultural heritage	D	D	<b>Construction:</b> <b>Operation:</b> No cultural heritage exists.
	24	Landscape	B-	D	<b>Construction:</b> Construction work may temporarily disrupt the landscape.. <b>Operation:</b> The road is expected to expand, so there will be no impact on the landscape.

Category	№	Impact	Assessment		Reasons for evaluation
			Project/ Construction	Maintenance	
	25	Gender	D	D	<b>Construction:</b> <b>Operation:</b> No significant impact on gender issues is expected.
	26	Children's rights	D	D	<b>Construction:</b> <b>Operation:</b> Impact on children's rights not expected.
	27	HIV/AIDS and other infectious diseases	C	D	<b>Construction:</b> The effect of the influx of construction workers should be studied. <b>Operation:</b> No impact on infectious diseases is expected.
	28	Working conditions (including labour safety)	B-	D	<b>Construction:</b> It is necessary to create the necessary working conditions for construction workers. <b>Operation:</b> There is no component that would have an impact on working conditions.
Other	29	Accidents	B-	B-	<b>Construction:</b> Discussions should be held to ensure safety and prevent the occurrence of road accidents caused by construction equipment. <b>Operation:</b> The frequency of traffic accidents may increase due to increased vehicle speed and road expansion. Pedestrian safety must be ensured..
	30	Inter-state impacts and climate change	D	D	Interstate impact and climate change are not expected.

## 11 Annex 3: Geological Processes and Mitigations

List of sections affected by exogenous geological processes and phenomena

# s/n	Location		Side	Type of geological process	Recommended activities
	Survey Stake (SS)				
	from	to			
1	0-24			The destruction of the slopes of the artificial embankment	To construct embankment from soils that are changeable to climatic conditions (pebbles)
2	0+39	1+10	left	Slumping of wetlands from the slope of the mountain (back-slope)	Antimud slide protection facilities. Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
3	0+84	1+45	right	Formation of nonmoving water on the right side due to lack of water flow on the gully as a result of overlapping by artificial embankment.	Organization of water discharge by the installation of culverts
4	1+45	2+21	right	Mudflows on temporary beds with the occurrence of gulying.	The removal of atmospheric precipitation from the roadbed through construction of the ditch net
5	1+80	2+70	left	Formation of nonmoving water on the left side due to lack of water flow on the gully as a result of overlapping by artificial embankment.	Organization of water discharge by the installation of culverts
6	2+50	3+06	left	Destruction of the bottom slope due to improper installation of the culvert.	Competent organization of discharge of atmospheric water through culvert
7	2+60	3+00	right	Formation of gully in the back-slope	Backfill of the gully. Forest plantation
8	3+08	13+50		Gulying along the road bench	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
9	3+61		right	Formation of gully in the back-slope	Backfill of the gully. Forest plantation
10	4+20	5+20	right	Gulying	Backfill of the gully. Forest plantation
11	5+20	5+67	left	There is no runoff to atmospheric water. The bottom slope is destroyed	Organization of atmospheric water runoff through installation of culverts
12	10+37			Gulying and descent of mudflows along the gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
13	13+22	13+52	left	Backslope. Gulying and descent of mudflows along the gully	Backfill of the gully, regulation of the flow of atmospheric waters, fixation of the slope by forest plantation.
14	13+50	14+50	left	Soaking of soils by leakage of atmospheric and spring waters Spring No.1 Chainage 14+00	Regulated run-off. Protective structures-retaining walls widened benched slope.
15	10+54	15+45	right	Slumping of wetlands from the slope of the mountain (back-slope)	Antimud slide protection facilities. Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material

16	13+60	15+70	left	Slumping of loam wetlands on the bench slope with the fragmentation of large clayey pieces on the road. The reason for the collapse of the slope is the snow	Protective structures-retaining walls widened benched slope
17	15+80	17+60		Gullying with destruction of the existing road bench.	Regulated run-off through construction of culvert.
19	17+30	18+35		Wash away of the embankment by the mudflow water	Regulate run-off through culvert
20	17+92		left	Mudflow channel	Regulate run-off through culvert
21	18+80	20+00	left	Collapse of the soil with the formation of talus at the foot. The reason for the collapse is the soaking of the soil with spring water over cracks in rock formations Springs Nos.2 and 3. The accumulation of spring waters at the foot of the slope	Regulate run-off through culvert
22	20+35	20+80		Destruction of the embankment, formation of nonmoving water	Regulate run-off through culvert
23	21+90	23+80	left	Formation of sand talus	Construction of retaining wall
24	23+00	23+50	left	Soaking of soils by leakage of atmospheric and spring waters Spring No.4	Regulated run-off. Protective structures-retaining walls widened benched slope.
25	22+80	23+80	right	Wash-away of downstream slope with the formation of a series of gullies	Regulate run-off of the atmospheric water. Backfilling of gullies, forest plantation
26	25+05			The mudflow with the transfer of blocky mudstone material and the accumulation of it on the left side of the road and the formation of mud hole on the right	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
27	25+95		left	The mudflow with the transfer of blocky mudstone material and the accumulation of it on the left side of the road and the formation of mud hole on the right	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
28	25+95	29+80	left	Rockfalls (falling of rock fragments on the carriageway of the road.	Strengthening of the slope by mortaring. Timely repair of unstable overhanging blocks. Retaining wall

29	27+54			Mudflow channel with the removal of large-sized stone.	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
30	27+54	29+80		From the Chainage 29+80 and to Chainage 27+54 on the road bench removal of a large-sized stone with diameter of up to 2,0m	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks to avoid culvert clogging.
31	29+38	31+80	right and left	Gullying	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks to avoid culvert clogging.
32	29+70	30+53	left and right	Slumping of wetlands from the slope of the mountain (back-slope)	Slumping of wetlands from the slope of the mountain (back-slope)
33	34+15		left	Mudflows with the accumulation of liquid mudstone material on the road bench	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks to avoid culvert clogging.
34	34+70		left	Mud hole	Regulate run-off of the atmospheric water.
35	37+40	40+15	right	Gullying and the descent of mudflows along the gully, snow avalanches Avalanche overflows the outskirts of the settlement on the right	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
36	42+43			Avalanching	Retaining wall
37	43+30	45+60		Landslide, snow avalanches, mudflows in the flood season with the removal of a large-sized stone more than 700mm	Protective structures.
38	44+40	48+00		Mudflow channel on the left with gullying. The accumulation of mudstone material on the road bench	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
39	47+00	47+40		Mudflow channel on the left with gullying. The accumulation of mudstone material on the road bench	Regulate run-off of the atmospheric water by installing a culvert



40	46+40		right	Formation of sand talus	Backfill of the gully. Regulate run-off
41	48+60	50+10	left	The collapse of rocks	Protective structures-retaining walls widened benched slope.
42	65+30	76+60		A series of avalanches with the destruction of the road bench	Protective structures-retaining walls widened benched slope.
43	75+0	75+90	right	Slumping of wetlands during melting snow	Regulate the atmospheric run-off. Construction of the ditch net
44	75+0	75+90	right	Slumping of wetlands during melting snow	Regulate the atmospheric run-off. Construction of the ditch net
45	77+90		Bridge No.1 Kandak River	Mudflow river	Bank protection measures
46	78+33		left	Snow avalanche with the destruction of the road bench	Protective structures-retaining walls widened benched slope.
47	78+65		left	Snow avalanche with the destruction of the road bench	Protective structures-retaining walls widened benched slope.
48	79+20	81+85	right	Talus of small gravel	Protective structures-retaining walls widened benched slope.
49	84+00		left	Mudflow channel with the destruction of road	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
50	85+30	85+60	left	Soaking the soils in the slope of the excavation by spring water Spring No. 6	Regulate the atmospheric run-off
51	85+72			Mudflow channel with the destruction of road and the accumulation of the drifted material on the road bench	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
52	86+10	86+40	right	Gullying	Rainwater removal. Strengthening the sides of the gully by forest plantation. Backfilling of the gully
53	88+90	89+15	right	Gullying	Rainwater removal. Strengthening the sides of the gully by forest plantation. Backfilling of the gully

54	90+10	90+20	right	Gullying	Rainwater removal. Strengthening the sides of the gully by forest plantation. Backfilling of the gully
55	90+85	91+70		Slumping of wetlands during melting snow on the road bench, snow avalanche.	Regulate the atmospheric run-off. Construction of the ditch net
56	92+30	92+55		Slumping of wetlands during melting snow on the road bench, snow avalanche.	Regulate the atmospheric run-off. Construction of the ditch net
57	93+40	100+00		Slumping of wetlands during melting snow on the road bench, series of snow avalanches.	Regulate the atmospheric run-off. Construction of the ditch net
58	99+20			Mudflow channel	Regulate run-off of the atmospheric water by installing a culvert with a constant cleaning of large blocks at the beginning of the culvert.
59	100+25	103+00	left	Rockfalls (falling of rock fragments on the carriageway of the road. Talus	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
60	100+20	102+00	right	Spalling of weathered granites with the destruction of the road bench	Fixing breakages by cementation, construction of retaining wall on the downstream slope
61	103+00	112+45	left	A series of snow avalanches with the accumulation of wetlands of loams. In rocky soils, the outflow of small-sized debris with the formation of talus at the foot	Removal of atmospheric water. Construction of retaining wall
62	113+10		left	Mudflow with the removal of masses of crushed stone and sand on the road	Rainwater removal. Construction of culvert
63	115+45		right	Mudflow with the removal of masses of crushed stone and sand on the road	Rainwater removal. Construction of culvert
64	116+50		left	Permanent watercourse on the carriageway of the road	Rainwater removal. Construction of culvert system
65	114+00	116+50		Rockfalls (falling of rock fragments on the carriageway of the road. Talus	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material

66	113+00	114+60	right	Permanent and temporary watercourses with the destruction of the road bench. Debris during floods	Withdrawal of channel water. Construction of culvert system
67	130+00			Snow avalanche	Protective structures-retaining walls widened benched slope
68	131+60			Snow avalanche. Mudflow	Protective structures-retaining walls widened benched slope
69	135+50			Permanent watercourses. The mudflow danger river during the flood Bridge No.3 At 150m from the designated place there is spring No.8	Antimud slide protection measures
70	135+95	136+60		Artificially organized water blockage with formation of nonmoving waters	Withdrawal of channel water. Construction of culvert
71	135+80	140+00	left	Parallel to the road is an artificially organized irrigation ditch with water intake from springs are passed	
72	136+50	137+30	left	Small formation of talus	Clearing the road as needed
73	136+90		left	Mudflow channel	Removal of atmospheric precipitation
74	138+40		left	Mudflow channel	Removal of atmospheric precipitation with the installation of culvert
75	139		left	Mudflow channel	Removal of atmospheric precipitation with the installation of culvert
76	139+57	140+71	left	Small formation of sand talus	Clearing the road as needed
77	140+26	141+78		Gully by unregulated rainwater to the right	Backfill of the gully. Regulate flow of rainwater. Strengthening the soils by forest plantation.
78	141+78		left	Mudflow channel	Removal of atmospheric precipitation with the installation of culvert
79	142+29	143+30	left	Snow avalanche. Destruction of the upstream slope by rainwater	Organized rainwater runoff
80	145+38		left	Snow avalanche. Destruction of the upstream slope by rainwater	Organized rainwater runoff with installation of culvert



81	146+24		left	Snow avalanche and mudflows in the flood season. Destruction of the road bench	Organized rainwater runoff by installation of culvert
82	146+50	146+60	left	Formation of nonmoving water	Organized rainwater runoff
83	146+24	149+40	left	A series of avalanches with the overlap of the carriageway of the road	Organized rainwater runoff. Construction of protection structures
84	148+79	149+40	left	Small formation of sand talus	Clearing the road as needed
85	149+75	151+30		Gullying on the carriageway of the road and in the downstream slope to the right	Organized rainwater runoff by the culvert. Backfill of the gully.
86	151+00		left	Mudflow	Organized rainwater runoff by the culvert.
87	150+58	150+85	left	Soil soaking in the cut slope	Regulate runoff of the atmospheric precipitation
88	152+10	151+85	left	Gullying	Organized rainwater runoff by the culvert. Backfill of the gully.
89	152+57		left	Mudflow	Organized rainwater runoff by the culvert.
90	152+70	152+30	left	Soil soaking in the back slope	Slope draining
91	153+45	154+70	bench of the road	Gullying	Organized rainwater runoff by the culvert and ditch nets. Backfill of the gully.
92	154+24		left	Mudflow	Organized rainwater runoff by the culvert. Backfill of the gully.
93	155+19	155+90	left	Small formation of talus	Clearing the road as needed
94	155+90	157+70	right	Destruction of road bench	Protective measures
95	156+40		left	Mudflow with the formation of lake water to the left of the carriageway	Organized rainwater runoff by the culvert.
96	158+00		left	Mudflow	Organized rainwater runoff by the culvert.

97	158+46		left	Mudflow	Organized rainwater runoff by the culvert.
98	157+40	160+20	bench of the road	Gullying	Organized rainwater runoff by the culvert and ditch nets. Backfill of the gully.
99	160+50			Mudflow, snow avalanche	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
100	160+93	161+20	left	Soil soaking in the back slope	Slope draining
101	161+29		left	Snow avalanche	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
102	161+95	162+50	right	Gullying	Organized rainwater runoff by the ditch nets.
103	161+70	162+70	left	Small formations of crushed stone talus	Clearing the road as needed
104	162+70	163+00	left	Soil soaking in the back slope	Slope draining
105	162+50	164+20		Gullying on the carriageway of the road	Organized rainwater runoff by the ditch nets.
106	164+28			Mudflow with the removal of masses of crushed stone and sand on the road	Rainwater removal. Construction of culvert
107	164+80	170+20	left	Rockfalls (falling of rock fragments on the carriageway of the road. Talus	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
108	166+30	166+90	left	Soil soaking in the back slope	Slope draining
109	166+90	170+20	left	Small formations of crushed stone talus with the height of 5-15 m	Clearing the road as needed
110	167+60	170+40	left	A series of avalanches with the overlap of the carriageway of the road	Organized rainwater runoff. Construction of protection structures
111	167+82			Mudflow	Organized rainwater runoff by the culvert.

112	168+87		left	Mudflow	Organized rainwater runoff by the culvert.
113	170+00	170+40	left	Gulying	Organized rainwater runoff by the ditch nets.
114	170+84		left	Mudflow with the removal of masses of crushed stone and sand on the road	Rainwater removal. Construction of culvert
115	171+60		left	Snow avalanche	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
116	171+80	174+40	left	Rockfalls (falling of rock fragments on the carriageway of the road.	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
117	174+85	175+00	right	Mudflow and gulying	Rainwater removal by ditch nets. Strengthening the slope from downstream slope with retaining wall
118	175+20	176+40	left	Small formations of crushed stone talus with the height of 5-15 m	Clearing the road as needed
119	176+40	207+60	left	Rockfalls (falling of rock fragments on the carriageway of the road. Formation of talus in the places of rock destruction. Height of talus from 5 to 20 m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
120	176+76		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
121	179+40	181+00	left	Slumping of wetlands during melting snow on the road bench, series of snow avalanches.	Regulate the atmospheric run-off. Construction of the ditch net
122	180+80	208+00	left	A series of avalanches with the overlap of the carriageway of the road	Organized rainwater runoff. Construction of protection structures
123	181+40		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
124	181+64		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
125	183+50		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.

126	184+90		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
127	185+23		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
128	188+00		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
129	189+00		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
130	189+12		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
131	189+42		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
132	191+38		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
133	193+40		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
134	194+20		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
135	181+40	181+60	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
136	182+60	183+35	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
137	184+70	185+45	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
138	186+30	186+45	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall

139	187+95	188+10	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
140	188+60	189+40	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
141	193+95	194+40	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
142	195+00	196+65	left	Fall of blocks of massive rock	Protective structures-retaining walls widened benched slope
143	195+55	195+75	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
144	196+48	197+51	right	Gullying	Organized rainwater runoff. Strengthening the slope from downstream slope of the retaining wall
145	197+30		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
146	197+50	198+24	left	Fall of blocks of massive rock	Protective structures-retaining walls widened benched slope
147	198+77	202+40	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
148	204+10	205+53	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
149	207+82		left	Mudflow and gullying	Rainwater removal by ditch nets. Strengthening the slope from down with retaining wall
150	209+10		Sebnok River	Mudflow dangerous	Protection measures of bridge No.4
151	209+20	212+00	enter to the Karagach tunnel	The whole territory is mudflow. Numerous mudslides flow to the axis of the road. Cutting along the axis of the road 21m	Complex of measures to remove mudflows



152	210+00	212+00	left and right	Talus of small gravel	Cut 21-22m will change the look of the relief
153	210+80	211+50	right	Snow avalanche	Cut 21-22m will change the look of the relief
154	212+00		on axis	Snow avalanche	Cut 21-22m will change the look of the relief
155	230		left	Snow avalanche, Active water-course during the high water is mudflow dangerous	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
156	230+55		left	Snow avalanche, Active water-course during the high water is mudflow dangerous	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
157	230+80		right	Snow avalanche	Protective measures from snow avalanche
158	230+45	231+50	right	The destruction of the road bench by gully formation	Backfill the gullies. Strengthen the slope by tree plantation. Regulate snow avalanche from Chainage 230+80 or to protect the road by the construction of avalanche protective structures
159	231+60	325+15	left	Small formations of crushed stone talus	Clearing the road as needed
160	231+77	232+00	right	The destruction of the road bench by gully formation	Strengthening the slope with retaining wall. Regulate the atmospheric run-off with ditch net
161	232+80		left	Mudflow. Gully formation from the right side of road	Rainwater removal by construction of culvert.
162	233+07	236+00	left	A series of snow avalanches with the destruction of the road bench	Protective structures-retaining walls widened benched slope
163	234+00	235+80	left	The destruction of wetlands on the road bench	Protective structures-retaining walls widened benched slope
164	235+96		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
165	236+13		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.

166	236+13	237+10	left	Small formations of crushed stone talus	Clearing the road as needed
167	237+20	252+80	left	Rockfalls (falling of rock fragments on the carriageway of the road.	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
168	247+10	242+20	left	Destruction of the road bench by mudflows and snow avalanches	Rainwater removal by construction of culvert.
169	243+90		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
170	242+20	245+30	left	A series of snow avalanches with the destruction of the road bench	Protective structures-retaining walls widened benched slope
171	243+80		left, right	Mudflow and Gullying	Backfill of the gully. Strengthening the soils from flood by forest plantation. Rainwater removal by ditch net. Construction of retaining wall
172	244+20	245+20	left and right	Small formations of talus with the height of 5-7 m	Clearing the road as needed
173	245+05		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
174	246+60		left	Mudflow	Rainwater removal by ditch nets through construction of culvert.
175	245+95	248+40	left	Small formations of talus with the height up to 15m	Widening of back slope bench. Clearing the road as needed
176	248+25	249+75	left	Snow avalanches and mudflows. The road bench is destroyed	Protective structures-retaining walls widened benched slope
177	249+90	250+80	left	Rockfalls (falling of rock fragments on the carriageway of the road with formation of talus at the foot with the height of 5,0m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
178	250+80	251+20	left	A series of mudflow channels with formation of ravines in the form of gullies	Rainwater removal by construction of culvert.
179	250+30	251+40	right	Destruction of downstream slope	Construction of retaining wall
180	251+15	251+45	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net

181	251+45	252+60	left, right	Rockfalls (falling of rock fragments on the carriageway of the road with formation of talus at the foot with the height of 5,0m Separate blocks up to 500mm	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
182	252+70	257+40	left	Rockfalls (falling of rock fragments on the carriageway of the road with formation of talus at the foot with the height of 10,0m Separate blocks up to 500mm	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
183	255+10		left	Snow avalanches with access to the road with a height of up to 2,0 m. The road bench is destroyed	Protective structures-retaining walls widened benched slope
184	251+20	257+00	along the road	Mudflow	Rainwater removal through construction of ditch nets
185	255+50	256+20	right	A series of mudflows from three watercourses	Rainwater removal through construction of ditch nets
186	257+80	259+80	right	A series of snow avalanches with the destruction of road bench	Protective structures-retaining walls widened benched slope
187	257+70	257+90	right	Gully formed by a snow avalanche	Backfill of the gully. Strengthening the slope by forest plantation. Regulate snow avalanche or protect road by the construction of anti-avalanche protection structure (installation of hedgehog)
188	259+30	259+60	right	Gully formed by a snow avalanche	Backfill of the gully. Strengthening the slope by forest plantation. Regulate snow avalanche or protect road by the construction of anti-avalanche protection structure (installation of hedgehog)
189	260+40	261+60	left	Rockfalls (falling of rock fragments on the carriageway of the road. Size of the fragments 500mm	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
190	259+40	259+90	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
191	261+49		left	Permanent watercourse crosses the carriageway of the road	Regulate the atmospheric run-off. Construction of culvert



192	261+70	2603+80	left, right	Slumping of wetlands during melting snow on the road bench. Avalanches and mudflows destructing slope	Regulate the atmospheric run-off.
193	262+22		left	Mudflow	Rainwater removal through construction of ditch nets
194	263+35		left	Snow avalanche, Temporary watercourse during the high water is mudflow dangerous	Organized rainwater runoff by the culvert. Protective measures from snow avalanche
195	246+05	265+60	left	Rockfalls (falling of rock fragments on the carriageway of the road with formation of sand talus	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
196	264+40	265+70	left	A series of avalanches and mudflows	Protective structures-retaining walls widened benched slope
197	265+20	270+80	along the road	Unregulated atmospheric run-off with formation of ravines at the form of gully	Backfill of the gully. Strengthening the slope by forest plantation. Regulate the atmospheric run-off
198	266+05	266+80	left	Slumping of wetlands during melting snow on the road bench. Avalanches and mudflows destructing slope	Regulate the atmospheric run-off.
199	267+00	271+20	left	A series of avalanches with overlapping the carriageway of the road. Height of snow avalanche 3,0m	Protective structures-retaining walls widened benched slope
200	267+30	269+85	left	Slumping of wetlands during melting snow on the road bench. Avalanches and mudflows destructing slope	Regulate the atmospheric run-off.
201	268+80	269+10	right	Gully	Backfill of the gully. Strengthening the slope by forest plantation. Regulate the atmospheric run-off by ditch net
202	271+00		R. Hakimi Bridge No.5	Mudflow danger	
203	274+00	с выходом на 272+00	left	Mudflow with formation of gully at Chainage 272+00	Backfill of the gully. Strengthening the slope by forest plantation. Regulate the atmospheric run-off by ditch net

204	276+20		left	Mudflow	Strengthening the slope by forest plantation. Regulate the atmospheric run-off by construction of culvert
205	277+35	278+05	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
206	278+20	278+60	left, right	Mudflow with gully formation	Strengthening the sides of the gully by forest plantation. Regulate the atmospheric run-off by construction of ditch net
207	278+65	279+65		Deep gullies along the road axis Depth of gullies 5-8m	Backfill of the gully. Regulate the atmospheric run-off by ditch net
208	279+65		left	Mudflow with gully formation	Strengthening the sides of the gully by forest plantation. Regulate the atmospheric run-off by construction of culvert
209	279+60	279+80	left	Moistening of soils in cut slope	
210	284+16		left	Permanent watercourse of spring water and irrigation water	Remove water through the construction of the culvert or ditches
211	284+20	284+60	left	Slumping of wetlands on the road bench, during anthropogenic human activity	Regulate flow of anthropogenic water (irrigation)
212	284+55	285+20	left	Rockfalls (falling of conglomerates fragments on the carriageway of the road with formation of talus	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material
213	285+80		axis of the road	Destruction of the embankment on the support of the existing bridge across Tagikamar River	Repair works
214	286+40		Tagikamar River	Mudflow danger	
215	287+00	292+40	left and along the road	From Chainage 292+40 towards Chainage 287 the seasonal action watercourse with the destruction of the road bed	Regulate the atmospheric and irrigation water run-off
216	288+60	299+00	right	Run-off of atmospheric water	Regulate the atmospheric and irrigation water run-off

217	290+00	291+00	right	A series of temporary water-courses with an accumulation of water on the road bench	Regulate the atmospheric and irrigation water run-off
218	29+65	290+80	right	Slipping over the rocky base of wetlands of loam	Cleaning road benches
219	291+74	291+81	right	Moistening of soils in cut slope	
220	291+80			Temporary watercourse	Regulate in ditch network
221	292+70			Temporary watercourse	Regulate in ditch network
222	293+28		right	Temporary watercourse	Regulate in ditch network
223	293+20	293+50	right	Overmoistening of soils in cut slope by melting snow	
224	293+20	294+40	right	A series of snow avalanche. Height 1,0m	Protective measures (retaining walls, hedgehogs)
225	294+80	296+20	right	Talus height 10m at the edge of the road	Retaining walls, use of scree material in construction of embankment. Expanded back slope bench
226	295+50	299+00	right	Rockfalls (falling of rock fragments on the carriageway of the road)	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material. Timely cleaning of non-stable blocks from the walls of the embankment.
227	297+13		right	Mudflow and snow avalanche with the removal of the large-sized stone on the road	Construction of protective measures
228	297+40		right	Mudflow with the removal of the large-sized stone on the road	Construction of protective measures. Periodic cleaning of the road bed
229	297+20	299+80	on bench of the road	Run-off of the temporary water-course along the road bench	Regulate run-off trough ditch network
230	298+00	299+60	right	Talus and rock falls. Height of talus 10m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material. Timely cleaning of non-stable blocks from the walls of the embankment.
231	299+48			Dangerous mudflow channel crossing the road and destruction of road bed	Construction of bridge

232	300+31			Dangerous mudflow channel crossing the road and destruction of road bed. Washing of the banks of the gully and channel broadening	Construction of bridge
233	300+96	301+24		Dangerous mudflow channel crossing the road and destruction of road bed and removal of debris cone to the road	Construction of bridge
234	305+20	306+00	right	Gullying. The gully is growing with the washing out of loose rocks to the rocky foundation	During the construction of the Tagikamar Tunnel, the relief of the area will change.
235	306+14	308+13		A series of mudflow channels with the release of debital material to the portal of the tunnel.	Protective measures and water flow to the safe distance from the tunnel portal
236	330+00	331+20		In the area of these Chainages along the road, numerous temporary and permanent watercourses with the danger of mudflow during floods to the access road of the Tagikamar Tunnel	Protective measures and water flow to the safe distance from the tunnel portal
237	330+00		left	The talus of rubble and boulders comes to the portal of the tunnel	
238				On the left side of Chepak River from the bridge and at a distance of up to 100 m, snow avalanches with the danger of overlapping the riverbed and the formation of jam	
239	331+20		Chepak River	Mudflow danger in spring season	
240	331+20	333+80		Rockfalls from remote distance of peaks on the carriageway of the road. The size of blocks up to 5m in diameter	Timely cleaning of blocks from the road. If possible, cleaning of unstable blocks from remote distances
241	33+80		left	Mudflow with the removal of the large-sized stone on the road	Timely cleaning of blocks from the road. Regulate the watercourse
242	334+60	334+85	on axis of the road	Washout by temporary watercourses	Regulate watercourse by ditch network
243	337+31		left	Mudflow with erosion of the slope	Regulate watercourse by culvert
244	337+80		left	Snow avalanche Height 1,0m	Retaining wall
245	338+00		left	Destruction of the slope by temporary watercourses	Regulate watercourse by ditch network



246	338+80		right	Destruction of the slope by temporary watercourses	Regulate watercourse by ditch network
247	340+18		left	Mudflow	Regulate watercourse by culvert
248	340+18	341+05	left	Talus and Rockfalls. Height of talus 5,0m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material. Timely cleaning of non-stable blocks from cut walls.
249	341+93		left	Mudflow	Regulate watercourse by culvert
250	342+13		right	Destruction of the slope by temporary watercourses	Regulate watercourse by ditch network
251	342+60		left	Destruction of the slope by temporary watercourses	Regulate watercourse by ditch network
252	342+45	347+17	on axis of the road	Gully	Regulate watercourse by ditch network. Backfill gully.
253	344+18		right	Mudflow with the destruction of downstream slope	Regulate watercourse by culvert
254	344+70	346+00	left	Slumping of wetlands during melting snow on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
255	344+60		left	Snow avalanche Height 1,0m Downstream slope destructed	Retaining wall from the snow avalanche. Backfill gullies. Strengthening soil by forest plantation.
256	346+10		left	Snow avalanche Height 1,0m Downstream slope destructed	Retaining wall from the snow avalanche. Backfill gullies. Strengthening soil by forest plantation.
257	345+93	347+60	right	Gully in downstream slope	Backfill gully. Strengthening soil by forest plantation. Regulated watercourses
258	347+18		left	Mudflow	Regulate watercourse by culvert
259	349+65		left	Mudflow with the removal of the large-sized stone on the road	Regulate watercourse by culvert
260	351+05		left	Temporary watercourse	Regulate watercourse to the ditch
261	352+74		left	Temporary watercourse	Regulate watercourse to the ditch
262	353+65		left	Small gully	Backfill gully. Regulate the atmospheric run-off from the slopes

					to the ditch
263	354+30	355+05	left	Slumping of wetlands during melting snow and irrigating on the road bench.	Regulate the atmospheric run-off. Construction of the ditch net
264	354+40	356+95	left	Gully on the road bench.	Backfill gully. Regulate the atmospheric run-off from the slopes to the ditch
265	354+40	354+60	right	Gully	Backfill gully. Regulate the atmospheric run-off from the slopes to the ditch
266	356+95	359+20		Gully on the road bench m at the right side with discharge to Mujikharv River.	Backfill gully. Regulate the atmospheric run-off from the slopes to the ditch
267	357+55	358+50	left	Slumping of wetlands to road bench, at anthropogenic soaking	Regulate flow of atmospheric precipitation. Construction of ditch network
268	358+60			80-100 m the left side of the road large talus. It can be used as construction material for the subgrade	
269	360+30		Mujikharv River	Mudflow danger	
270	360+60		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
271	360+80		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
272	361+60	362+05	left	Temporary watercourses	Regulate watercourse by culvert
273	361+20	362+40	left	Slumping of crushed stone. There is a wall of breakaway.	Regulate the atmospheric run-off. Construction of ditch networks
274	361+20	366+80	left	A series of snow avalanches with overlapping the carriage-way of the road. Height of snow avalanche 3,0m. Avalanches threaten buildings of the village on the right side of the road. Residents do not live in the village in the winter time in the first line of houses	Protective structures-retaining walls widened benched slope

275	362+00	366+80	left	Rockfalls with the formation of talus from crushed stone at the foot of the mountain Height of talus 5,0 m	Protective structures-retaining walls widened benched slope
276	364+80	365+45	right	Growing small gullies	Backfill gullies. Strengthen the slope by forest plantation.
277	367+39			Mudflow with gully formation in the downstream slope	Strengthen the slope by forest plantation. Regulate the atmospheric run-off to the culvert
278	367+95	368+50		Small talus height 5.0m	Protective structures-retaining walls widened benched slope
279	368+05			Temporary watercourse	Regulate to the ditch
280	368+00		crosses the road	Large mudflow channel. With the movement of large-sized stone, the formation of blocking, erosion of the downstream slope	Regulate watercourse by culvert. Timely clearing of blockings
281	368+20	368+90	along the road	Permanent watercourse with gully formation	Regulate to the ditch
282	369+10		left	Mudflow channel	Regulate to the ditch
283	368+20	372+20	left	Potentially dangerous landslide zone. Numerous outlets of springs.	The study and observation of the occurrence of landslide processes
284	370+85	371+15	left	Soak the slope. Outlets of springs	Further study of engineering-geological conditions
285	371+05	377+03	across the road	Landslide occurred in 1992 with an active landslide with casualties among the population of a nearby village. Further activation of the landslide is possible. The height of the breakaway wall is 18 m. The whole body of landslide is permeated by springs of underground action	Dehumidification of the slope by the intercepting ditch. Study of the section on the qualitative and quantitative state of the landslide
286	371+65	391+00	left	Rockfalls with the formation of talus from crushed stone at the foot of the mountain Height of talus 5,0m	Protective structures-retaining walls widened benched slope
287	374+20	378+50	left	A series of avalanches with the removal of snow mass on the road	Protective structures

288	374+42		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
289	374+59		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
290	375+00		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
291	374+05		left	Outlet of two springs	
292	376+49		left	Outlet of two springs. Formation of mudflows along spillways	
293	376+26	376+78	right	Destruction of the road bench by snow avalanche	Regulate watercourse by culvert. Construction of retaining wall
294	376+78	377+79	left	Slumping of wetlands to the road bench during melting snow	Regulate the atmospheric run-off. Construction of ditch networks
295	380+43		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
296	381+04		left	Mudflow with gully formation in the downstream slope	Regulate watercourse by culvert
297	381+80		left	Destruction of the road bench, formation of gully	Regulate watercourse by culvert. Construction of retaining wall
298	381+83	382+60	right	Gully in the downstream slope	
299	383+20		left	Removal of stone material on the road bench by mudflow from the mountainside	Regulate watercourse. Construction of retaining wall
300	384+40		right	Destruction of downstream slope by mudflow	Regulate watercourse. Construction of retaining wall
301	384+69		left	Removal of stone material on the road bench by mudflow from the mountainside	Regulate watercourse. Construction of retaining wall
302	385+20		left	Temporary watercourse	Regulate watercourse to the ditch
303	385+00	385+60	right	Formation of gully in downstream slope	Regulate watercourse to the ditch. Construction of retaining wall
304	385+72			Outlet of springs	



305	385+93		left	Several mudflows with merging into one	Regulate watercourse to the ditch. Construction of retaining wall
306	386+32	387+00	right	Formation of gully in downstream slope	Regulate watercourse to the ditch. Construction of retaining wall
307	386+93		left	Mudflow	Regulate watercourse to the ditch. Construction of retaining wall
308	387+53		left and right	Gullying	Regulate watercourse to the ditch. Construction of retaining wall
309	388+53		left	Mudflow takes away the crushed stone on the road. Gully formation	Regulate watercourse to the ditch. Construction of retaining wall
310	386+80	388+68	left	A series of avalanches. With taking away snow on the road at the height of 1,0m	Construction of retaining wall
311	389+00		left	Outlet of spring No.9	
312	389+21		left	Temporary watercourse	Regulate to the ditch network
313	389+75		left	Outlet of spring No.10	
314	389+79		left	Mudflow channel with removal of crushed stone	Regulate watercourse to the ditch. Construction of retaining wall
315	389+95		left	Mudflow channel with removal of crushed stone	Regulate watercourse to the ditch. Construction of retaining wall
316	390+43		left	Large mudflow channel. The threat of destruction of the road embankment	Regulate watercourse to the culvert
317	391+10		left	Temporary watercourse	Regulate watercourse to the ditch
318	392+00		left	Spring No.11	
319	392+00	397+83	left	Potentially dangerous landslide zone. Slumping of a loamy massif along the rocky base	The study and observation over occurring of landslide processes
320	392+56		left	Temporary watercourse	Regulate watercourse to the ditch
321	392+82		right	Gully in the downstream slope	Regulate watercourse to the ditch. Construction of retaining wall

322	392+62	393+20	left	Snow avalanches with the removal of snow on the road. Height 1,0m	Construction of retaining wall
323	393+24	393+76	left	Landslide penetrated with watercourses	The study and observation over occurring of landslide processes
324	393+83		left	Temporary watercourse	Regulate watercourse to the ditch
325	394+37		left	Temporary watercourse	Regulate watercourse to the ditch
326	394+88		left	Temporary watercourse	Regulate watercourse to the ditch
327	396+12	397+70	left	A large landslide with the length of 200 m. The breakaway walls 12 m.	The study and observation over occurring of landslide processes
328	399+46		right	Gully in the downstream slope	Backfill the gully. Strengthen the soil with forest plantation.
329	400+00	400+59	left	Temporary watercourses with outflow on the road bed	Regulate watercourses to the ditch
330	400+80	401+22	left	Slumping of wetlands to the road bench	Regulate the atmospheric run-off. Construction of ditch networks
331	400+95		left	Snow avalanche	Protective structures
332	402+80		left	Snow avalanche	Protective structures
333	402+60		left	Temporary watercourses with outflow on the road bed	Regulate watercourses to the ditch
334	402+60		right	Gully in the shale rocks	Retaining wall
335	404+60		left, right	Snow avalanche, gully, mudflow	Protective structures
336	404+85	405+15	left	Talus. Height of the talus 10m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material.
337	405+26		left and right	Snow avalanche, gully, mudflow with debris cone to the edge of the road	Protective structures
338	404+85	413+80	left	Rockfalls	Protective structures-retaining walls widened benched slope

339	406+00		left	Temporary watercourses with outflow on the road bed	Regulate watercourses to the ditch
340	406+07	407+80	left	Talus. Height of the talus 5-10m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material.
341	407+85		left	Temporary watercourses with outflow on the road bed	Regulate watercourses to the ditch
342	408+62		left, right	Snow avalanche, gully, mudflow with debris cone to the edge of the road	Protective structures
343	411+17	411+87	left	Talus. Height of the talus 5m	Construction of retaining wall. Widening of the benched slope with the subsequent removal of the collapsed material.
344	406+23	418+70	left and on the axis of the road	Landslide. Slumping of a loamy massif along the rocky base. The body of the landslide seasonal watercourses	Protective structures
345	421+74		left	Temporary watercourses with outflow on the road bed	Regulate watercourses to the ditch
346	425+28			Mudflow takes away the crushed stone on the road	Regulate watercourse to the ditch. Construction of retaining wall.

List of sections affected by exogenous geological processes and phenomena

№ s.s.	Location		Side	Type of Geological process	Recommended activities
	Survey Stake (SS)				
	from	to			
1	425+57		left	Temporary mudflow	Overchute device
2	427+00	432+13	left, right	Slumping of wetlands from the slope of the mountain (backslope and downstream slope). The sliding masses are represented by crushed stone, and filler is loam, more than 30%	Monitoring and study. Determining the power of sliding masses by drilling deep wells
3	433+46	440+29	left, right	Slumping of wetlands from the slope of the mountain (backslope and downstream slope). The sliding masses are represented by crushed stone, and filler is loam, more than 30%	Monitoring and study. Determining the power of sliding masses by drilling deep wells
4	435+62		left	Temporary mudflow	Overchute device

5	435+84	436+57	left	Slumping of wetlands from the slope of the mountain (backslope and downstream slope). The sliding masses are represented by crushed stone, and filler is loam, more than 30%	Monitoring and study. Determining the power of sliding masses by drilling deep wells
6	441+00	448+58	left	Destruction of downstream slope due to improper installation of the culvert	Competent organization of atmospheric water discharge through the culvert
7	441+46	444+05	bench of the road	Waterlogging by spring waters	Removal of atmospheric and nonmoving water into ditches
8	442+69		left	Temporary mudflow	Overchute device
9	444+57		left	Temporary mudflow	Overchute device
10	444+78	447+17	bench of the road	Waterlogging by spring waters	Removal of atmospheric and nonmoving water into ditches
11	444+80		left	Spring	Regulate spring water (tapping)
12	447+08		left	Temporary mudflow	Overchute device
13	447+08	448+58	bench of the road	Soil sediment Suffusion	Filling of suffusion funnels. The removal of atmospheric and nonmoving water into ditches
14	448+58	449+80	left and right	A series of physical and geological processes (temporary mudflows, gully formation in loamy sediments. Rock outcrops after slipping of waterlogged gravel with loamy aggregate	Removal of atmospheric and nonmoving water into ditches
15	450+74	451+64	bench of the road	Waterlogging by spring waters	Removal of atmospheric and nonmoving water into ditches
16	451+40		right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
17	451+66	452+64	left and right	Gully and temporary mudflow watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
18	452+00		left	Spring	Regulate spring water (tapping)
19	453+64	453+77	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
20	455+11	455+70	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.



21	455+11	455+70	left	Temporary mudflow	Overchute device
22	457+20		left	Temporary mudflow	Overchute device
23	457+55		left	Temporary mudflow	Overchute device
24	458+09	458+17	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
25	458+89		left	Temporary mudflow	Overchute device
26	460+10		left	Spring	Regulate spring water (tapping)
27	461+68		left	Spring	Regulate spring water (tapping)
28	461+82	462+34	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
29	461+82		left	Temporary mudflow	Overchute device
30	462+49		left	Temporary mudflow	Overchute device
31	463+70		left	Spring	Regulate spring water (tapping)
32	464+33		left	Temporary mudflow	Overchute device
33	464+53		left	Spring	Regulate spring water (tapping)
34	465+56		left	Snow avalanche, Temporary watercourse	Avalanches, regulate temporary watercourse by culvert
35	465+57		right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
36	466+45		left	Mudflow, Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff through installation of culverts.
37	467+05		left	Spring	Regulate spring water (tapping)
38	467+05	467+47	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
39	468+45		left	Temporary mudflow, Gully	Overchute device. Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
40	469+08		left	Temporary mudflow, Gully	Overchute device. Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
41	471+60		left	Temporary mudflow	Overchute device
42	466+83	471+90	left	Slumping of wetlands loam, Soaking by leakage of atmospheric and spring waters	Regulate spring and atmospheric water with monitoring of slumping masses of soil
43	474+10		left	Temporary mudflow	Overchute device
44	475+46		left	Temporary mudflow	Overchute device

45	475+25	475+57	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
46	475+57	479+00	left	Snow avalanche	Avalanches
47	477+14	477+45	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
48	478+25	478+52	right	Temporary mudflow	Overchute device
49	478+25	478+52	left	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
50	479+43		right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
51	480+11		right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
52	481+36		left	Temporary mudflow	Overchute device
53	481+37		right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
54	482+39		left	Temporary mudflow	Overchute device
55	482+39		right	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
56	483+00	490+00	left	Snow avalanche	Avalanches
57	483+45	482+78	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
58	483+45	482+78	left	Temporary mudflow	Overchute device
59	484+54		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
60	485+00	485+15	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
61	486+28		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
62	486+61	487+07	right	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
63	487+82		right	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff

64	489+18		left	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
65	492+52			Mirzosharifon mudflow river	strengthening of the supports of the bridge with gabions, reduce flow velocity
66	492+68	493+10	left	Outcrops of rock as a result of slipping wetted gravel aggregate loam more than 30%	
67	493+76		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
68	495+27		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
69	496+65		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
70	497+59		left and right	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
71	502+80	522+50	right	Snow avalanche	Avalanches
72	505+38	505+66	left	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
73	507+95	508+78	left	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
74	509+62	509+72	left	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
75	510+14	510+40	left	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
76	513+48	516+24	left	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
77	518+10	518+83	left and right	Gully (were formed as a result of an avalanche descent)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
78	526+48	527+60	right	Erosion of the embankment to the bridge	Filling of washouts, Strengthening by concreting
79	528+97		right	Permanent watercourse	Construction of culvert
80	529+36	530+70	left	Rockfalls	The retaining wall with the broadening of backwall space for trapping debris
81	530+74		left	Permanent watercourse	Construction of culvert



82	531+60	531+90	left	Gully and mudflow water-course	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
83	531+17	537+00	left	Rockfalls, talus	The retaining wall with the broadening of backwall space for trapping debris
84	536+65	537+22	right and across the axis of the road	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
85	537+12		left	Temporary mudflow	Overchute device
86	538+00	540+00	left	Rockfalls, talus	The retaining wall with the broadening of backwall space for trapping debris
87	536+80	540+60	from left to the road	Outlet to the road of mud-flow masses	Construction of culvert.
88	540+60	547+62	left	Rockfalls, talus	The retaining wall with the broadening of backwall space for trapping debris
89	540+60	541+86	right	Rockfalls	The retaining wall with the broadening of backwall space for trapping debris
90	541+75	542+32	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
91	541+48		left	Temporary mudflow	Overchute device
92	541+92		left	Temporary mudflow	Overchute device
93	544+46	546+20	left with access to the bench of the road	2 temporary mudflowing watercourses	Overchute device
94	547+33		left	Temporary mudflowing watercourses	Overchute device
95	549+00		left with access to SS 547+33	Temporary mudflowing watercourses	Overchute device



96	548+56	550+10	left and right	Rockfalls, talus	The retaining wall with the broadening of backwall space for trapping debris
97	550+66		left	Gully and temporary watercourse	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
98	550+62		left	Spring	Regulate spring water (tapping)
99	551+35	552+59	left and right	Destroying the bench of the road by atmospheric water	Regulate the flow of atmospheric water
100	553+29	553+90	left	The cone of the debris flow on the road. Mudflow channel at SS 563+65	Construction of culvert.
101	553+29	553+90	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
102	554+42	554+42	left	Temporary mudflowing water-courses	Overchute device
103	554+60		left	Temporary mudflowing water-courses	Overchute device
104	555+87		left	Temporary mudflowing water-courses	Overchute device
105	556+15		left	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
106	556+15		left	Temporary mudflowing water-courses	Overchute device
107	557+40		left	Permanent mudflow water-courses	Overchute device
108	559+18		left	Temporary mudflowing water-courses	Overchute device
109	560+35	562+80	left	Talus	The retaining wall with the broadening of backwall space for trapping debris
110	562+09		left	Temporary mudflowing water-courses	Overchute device
111	562+29	562+71	left	Multiple temporary mudflow watercourses	Overchute device
112	563+24		left	Temporary mudflowing water-courses	Overchute device
113	564+31			Temporary mudflowing water-courses	Overchute device
114	564+31	565+05	left	Waterlogging. Stagnation of spring waters	Drying-out of wetlands
115	565+47			Mudflow channel of Tegirmi-1 River. Erosion of both banks	Gabions, it is Desirable to use angular fragments for good adhesion between fragments

116	566+70	569+00	left and right	Waterlogging. Stagnation of spring waters	Drying-out of wetlands
117	571+49			Mudflow channel of Tegermi-2 River. Erosion of both banks. Outlets of springs from bank of river and in channel.	Gabions, it is Desirable to use angular fragments for good adhesion between fragments
118	582+66		left	Spring	Regulate spring water (tapping)
119	584+32	585+75	left and right	Soils in excavation slopes, waterlogged	Retaining wall. Put on 0,25 of a regulated 1:1,5 steepness of the excavation slope
120	588+73	579+23	right	Gully	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
121	589+23	590+15	right	Landslide. Waterlogged soils will slide from the downstream slope destroying the bench of the road	To dry-out and fill up with draining soil
122	589+87	595+15	left	Landslide. Waterlogged soils will slide from the upstream slope destroying the bench of the road	To dry-out and fill up with draining soil
123	563+59	594+80	left	A series of springs caused waterlogging on the road	Regulate spring water (tapping)
124	595+64		left	Temporary watercourse	Overchute device
125	597+00	599+00	left	Rockfalls the size of the fragments more than 1.0 m	The retaining wall with the broadening of backwall space for trapping debris
126	597+26	598+00	left	The collapse and slumping of clayey boulder. Clayey boulder has waterlogged loamy filler	Dry-out. Construction of retaining wall
127	599+24	601+00	On the road	Waterlogging from the spring waters on the road bench. Permanent spring	Dry-out and Regulate spring water
128	599+90	620+25	left	Series of springs	Regulate spring water (tapping)
129	599+71	603+72	left	The collapse and slumping of clayey boulder. Clayey boulder has waterlogged loamy filler	Dry-out. Construction of retaining wall
130	600+25	602+13	left	Rockfalls the size of the fragments more than 1.0 m	The retaining wall with the broadening of backwall space for trapping debris

131	604+28	608+40	left	The collapse and slumping of clayey boulder. Clayey boulder has waterlogged loamy filler	Dry-out. Construction of retaining wall
132	604+33	605+05	bench of the road	Waterlogging from the spring waters on the road bench. Permanent spring.	Dry-out and Regulate spring water
133	606+90		left	Permanent watercourse. Channel of spring.	Construction of culvert
134	606+85	607+75	left	Waterlogging from the spring waters on the road bench. Permanent spring	Dry-out and Regulate spring water
135	609+90		left	The collapse of rocks with the size of more than 0.7 meters.	The retaining wall with the broadening of backwall space for trapping debris
136	611+90	614+00	left	Rolling of blocks larger than 0.5 m from a distance of more than 100 m.	The retaining wall with the broadening of backwall space for trapping debris
137	613+83	614+45	bench of the road	Landslide.	To dry-out and fill up with draining soil
138	613+80	619+00	left	Snow avalanche	Avalanches
139	615+33	615+76	left	Waterlogging from the spring waters on the road bench	To dry-out and regulate the flow of spring water
140	615+25	617+20	left	Slumping of the slope	To dry-out and fill up with draining soil
141	617+20	618+22		The road passes through the body of the landslide	To dry-out and fill up with draining soil. Monitoring
142	617+20	618+22		In the downstream slope is gully formation	To dry-out and fill up with draining soil. Monitoring
143	618+00	621+80	left	Rockfall, the size of the fragments more than 1.0 m	The retaining wall with the broadening of backwall space for trapping debris
144	618+15		On the road	Suffusion funnels passes through the body of landslide	To eliminate slumping of the slope
145	618+70	619+10	left	Waterlogging from the spring waters on the road bench. Permanent spring	To dry-out and regulate the flow of spring water
146	618+70	619+50	left	The collapse of rocks with the size of more than 2 meters.	The retaining wall with the broadening of backwall space for trapping debris
147	619+00		left	Temporary mudflowing watercourses	Overchute device
148	619+11		left	Temporary mudflowing watercourses	Overchute device
149	622+29		left	Snow avalanche, mudflow watercourse	Avalanches



150	622+60	623+00	left	The yield of springs and moist slopes	To dry-out and regulate the flow of spring water
151	622+95	624+00	right	Rockfalls.	The retaining wall with the broadening of backwall space for trapping debris
152	623+10	623+90	left	moist slopes	To dry-out and regulate the flow of spring water
153	624+10	625+90	left	moist slopes	To dry-out and regulate the flow of spring water
154	625+10	625+90	left	Waterlogging from the spring waters on the road bench	To dry-out and regulate the flow of spring water
155	626+22	627+48	bench of the road	The bench of the road and the downstream slope crawl over the rocky base	To dry-out and fill up with draining soil. Monitoring
156	629+00	630+30	left	The collapse and rockfalls.	The retaining wall with the broadening of backwall space for trapping debris
157	629+45		right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
158	631+00	631+16	right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
159	636+50		left	Temporary mudflowing water-courses	Overchute device
160	637+05		Left and on the road	Suffusion funnels	Filling of funnels and remove the atmospheric water
161	637+10		left	Temporary mudflowing water-courses	Overchute device
162	636+48	637+45	right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
163	637+59		left	Temporary mudflowing water-courses	Overchute device
164	637+00	641+26	left	The collapse and rockfalls.	The retaining wall with the broadening of backwall space for trapping debris
165	641+27		left	Temporary mudflowing water-courses	Overchute device
166	646+00		left	Temporary mudflowing water-courses	Overchute device
167	645+20	645+69	right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.

168	648+90		left	Temporary mudflowing water-courses. Deep channel.	Overchute device
169	661+41	665+90	left and bench of the road	Slumping of wetlands from the slope. The road passes through the body of the landslide	To dry-out and fill up with draining soil.
170	622+60		right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
171	663+00	663+26	right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
172	664+21		left	Temporary mudflowing water-courses. Permanent spring	Overchute device
173	664+18	664+63	left and right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
174	665+68	666+11	left and right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
175	666+40	666+67	left and right	Sliding of the wetlands above the rocky basis.	To dry-out and regulate the flow of spring water
176	666+84	67+50	left and right	The road passes through the body of the landslide. The yield of springs.	To dry-out and regulate the flow of spring water
177	668+85	669+80	right	In the downstream slope is gully formation	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
178	670+49		left	Temporary mudflowing water-courses	Overchute device
179	671+19	975+20	left	The collapse and rockfalls. Slope is destroying	The retaining wall with the broadening of backwall space for trapping debris
180	671+19	672+35		The landslide occurred in 2017. The cut walls of more than 10 m. Wetting occurs by spring waters. The danger of landslide development is not excluded. Slumping occurs on rocky base	To dry-out and fill up with draining soil. Monitoring
181	672+35	674+60	left	The collapse of wetlands to the road. The slope is composed by the remoistened loam	To dry-out and regulate the flow of spring water, Strengthening the soils by forest plantation

182	674+84		along the road	Permanent watercourse	Construction of culvert
183	675+85	676+49	along the road	Waterlogging from the spring waters on the road bench. Permanent spring	To dry-out and regulate the flow of spring water
184	675+91		along the road	Permanent spring	Regulate the flow of spring water
185	679+20	679+66	Right and left bank of the Kalod river	The collapse of both banks by the channel and waste water are from watering gardens	Protection by gabions
186	679+43			Mudflow watercourses of the Kalod river	
187	479+66	480+30	right	The collapse of both banks by the channel and waste water are from watering gardens	Protection by gabions
188	685+05			Permanent watercourse	Regulate by culvert.
189	578+83		left	Temporary mudflow	Overchute device
190	688+28	688+98	left and axis of the road	mudflow watercourse	Overchute device
191	690+00	691+12	bench of the road	Waterlogging	Dry-out by removal of spring waters
192	692+39		left	Temporary mudflow	Overchute device
193	701+30		left	Temporary mudflow	Overchute device
194	701+79		On the road	Outlet of spring	Piping of spring waters
195	702+00		left	Temporary mudflow	Overchute device
196	702+01		left and right	Gully (atmospheric waters)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
197	703+86		left and right	Gully (atmospheric waters)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
198	707+40		left and right	Temporary mudflow	Overchute device and regulate the flow of spring water

199	709+64		left to right	Temporary mudflow	Overchute device and regulate the flow of spring water
200	712+05	717+28		Landslide. Occupies the big space. Failure walls up to 15 m. Power of the slipping masses more than 50 m. Border sliding on rocky breeds. Soaking by Spring water	Monitoring and study. Determining the power of sliding masses by drilling deep wells
201	712+19	712+30	left	nonmoving spring water	Removal of atmospheric and nonmoving water into ditches
202	712+68	715+19	left and right	nonmoving water.	Removal of atmospheric and nonmoving water into ditches
203	715+00		Across the road	Permanent watercourse (becomes mudflow in rain)	Regulate by culvert.
204	715+19	717+10	along the road and left and right	Gully (atmospheric waters)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff
205	715+63		left to right	Temporary mudflow	Overchute device and regulate the flow of spring water
206	712+69	713+15	left	Soaking of soil from left side by Spring. Outlet of spring	Regulate the flow of spring water into the ditch network
207	713+48	813+80	right	Gully (spring and atmospheric waters)	Backfill of the gully. Forest plantation. Organization of atmospheric water runoff.
208	715+15		left	Spring	Regulate the flow of spring water into the ditch network
209	715+70	715+82	left	Outlet of spring	Regulate the flow of spring water into the ditch network
210	722+14			Permanent watercourse	Regulate by culvert.
211	722+20	722+59	along the road	nonmoving water	Removal of atmospheric and nonmoving water into ditches
212	724+15	726+80	along the road	Landslide. Numerous of wall cuts up to 2m. Power of sliding masses 3-15m. The boundary of sliding at the rock. Wetting by spring waters	Monitoring and study.



213	724+15	726+80	along the road	Series of physical-geological processes (gully formation, wetting the soil by spring water, nonmoving water, water logging areas, natural water springs)	Regulate the flow of spring water into the ditch network
214	726+68		Left and right	Permanent stream. Small river. The collapse of the coastline	Construction of culverts, Strengthening the banks before and behind the culvert
215	727+00	727+45	left	Rockfalls	The retaining wall with the broadening of space behind the retaining wall
216	740+30	K.X	Left	In 93 261m from the axis of the road is the river Obi Lurd. Washout and collapse of the left Bank	Protection by gabions for the future



## 12 Annex 4: Noise Monitoring Data

Location	co-ordinates	Date of sampling	№	Sampling time.	Field result (dB(A))	Day	Evening	Night	Mean Day	Mean Evening	Mean Night
						07:00 to 19:00	19:00 to 23:00	23:00 to 07:00	07:00 to 19:00	19:00 to 23:00	23:00 to 07:00
Obi-Garm jamoat, Gurun village, school №6	38°45'12.55"   69°42'8.25"	04-Oct-18	1	10 <sup>00</sup>	42,5	42.5					
			2	13 <sup>00</sup>	42,4	42.4					
			3	16 <sup>00</sup>	42,0	42.0					
			4	19 <sup>00</sup>	40,0		40.00		42.25	39.9	38.5
			5	22 <sup>00</sup>	39,8		39.8				
			6	01 <sup>00</sup>	38,9			38.9			
			7	04 <sup>00</sup>	38,1			38.1			
			8	07 <sup>00</sup>	42,1	42.1					
Sicharog jamoat, Lugur village	38°47'42.32"   69°45'3.43"	05-Oct-18	1	10 <sup>00</sup>	41,7	41.7					
			2	13 <sup>00</sup>	41,5	41.5					
			3	16 <sup>00</sup>	40,8	40.8					
			4	19 <sup>00</sup>	40,6		40.6		41.45	40.65	39.4
			5	22 <sup>00</sup>	40,7		40.7				
			6	01 <sup>00</sup>	39,8			39.8			
			7	04 <sup>00</sup>	39,0			39			
			8	07 <sup>00</sup>	41,8	41.8					
Hakimi jamoat, Sadokat village	38°50'35.77"   69°48'50.03"	06-Oct-18	1	10 <sup>00</sup>	46,8	46.8					
			2	13 <sup>00</sup>	47,5	47.5					
			3	16 <sup>00</sup>	47,0	47					
			4	19 <sup>00</sup>	46,7		46.7		45.4	45.3	41.4
			5	22 <sup>00</sup>	43,9		43.9				
			6	01 <sup>00</sup>	42,1			42.1			
			7	04 <sup>00</sup>	40,7			40.7			
			8	07 <sup>00</sup>	40,3	40.3					
Mujiharf jamoat, Mujiharf village	38°51'59.41"   69°52'44.51"	07-Oct-18	1	10 <sup>00</sup>	47,3	47.3					
			2	13 <sup>00</sup>	46,3	46.3					
			3	16 <sup>00</sup>	46,6	46.6					
			4	19 <sup>00</sup>	51,0		51		47	47.55	42.55
			5	22 <sup>00</sup>	44,1		44.1				
			6	01 <sup>00</sup>	43,1			43.1			
			7	04 <sup>00</sup>	42,0			42			
			8	07 <sup>00</sup>	47,8	47.8					

Location	co-ordinates	Date of sampling	№	Sampling time.	Field result (dB(A))	Day	Evening	Night	Mean Day	Mean Evening	Mean Night
						07:00 to 19:00	19:00 to 23:00	23:00 to 07:00	07:00 to 19:00	19:00 to 23:00	23:00 to 07:00
Komsomolobod jamoat, Tutkhor village	38°52'45.72"   69°57'45.82"	08-Oct-18	1	10 <sup>00</sup>	54,0	54					
			2	13 <sup>00</sup>	53,5	53.5					
			3	16 <sup>00</sup>	46,0	46					
			4	19 <sup>00</sup>	53,3		53.3		51.175	50.85	44.25
			5	22 <sup>00</sup>	48,4		48.4				
			6	01 <sup>00</sup>	43,2			43.2			
			7	04 <sup>00</sup>	45,3			45.3			
			8	07 <sup>00</sup>	51,2	51.2					
Safedchashma jamoat, Ulfatobod village	38°52'38.97"   69°57'40.89"	09-Oct-18	1	10 <sup>00</sup>	44,0	44					
			2	13 <sup>00</sup>	50,4	50.4					
			3	16 <sup>00</sup>	45,6	45.6					
			4	19 <sup>00</sup>	46,3		46.3		46.325	44.15	44.05
			5	22 <sup>00</sup>	42,0		42				
			6	01 <sup>00</sup>	43,0			43			
			7	04 <sup>00</sup>	45,1			45.1			
			8	07 <sup>00</sup>	45,3	45.3					
Urban-type settlements Darband center of Nurabad district	38°54'38.73"   70°7'15.63"	10-Oct-18	1	10 <sup>00</sup>	42,0	42					
			2	13 <sup>00</sup>	58,2	58.2					
			3	16 <sup>00</sup>	55,6	55.6					
			4	19 <sup>00</sup>	56,1		56.1		50.35	56.7	54
			5	22 <sup>00</sup>	57,3		57.3				
			6	01 <sup>00</sup>	56,0			56			
			7	04 <sup>00</sup>	52			52			
			8	07 <sup>00</sup>	45,6	45.6					

## 13 Annex 5: Abbreviations Used in This Report

ADB	Asian Development Bank
AH	Affected Households
AIIB	Asian Infrastructure and Investment Bank
AM	Accountability Mechanism
AP	Affected Persons
CAREC	Central Asia Regional Economic Cooperation
CEP	Committee for Environmental Protection
CESMP	Contractors Environmental and Social Management Plan
CIS	Commonwealth of Independent States
CLO	Community Liaison Officer
CoC	Code of Conduct
dB(A)	Decibels
DP	Displaced Person
E&S	Environmental and Social
EA	Executing agency
EASM	Euro-Asian Council for Standardization, Methodology and Certification
EBRD	European Bank for Reconstruction and Development
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESP	EBRD Environmental & Social Policy
ESS	AIIB Environmental and Social Standards
EU	European Union
FP	Focal Person
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIP	Good International Practice
GOST	Technical Standards of EASM
GRC	Grievance redress committee
GRM	Grievance redress mechanism
H&S	Health and Safety
Ha	Hectare
HPP	Hydro Power Plant
IFC	International Finance Corporation
IFI	International Financial Institution
km	kilometre
LARP	Land Acquisition and Resettlement Plan
LEPP	Local Employment and Procurement Plan
m	Metres
mg / m <sup>3</sup>	Milligrams per cubic metre
MADL	Maximum Allowable Discharge Levels
MoT	Ministry of Transport
MPC	Maximum permissible concentration
NGO	Non-government organization
NTS	Non Technical Summary
OESMP	Operational Environmental and Social Management Plan
OFID	OPEC Fund for International Development
OPEC	Organisation of Petroleum Exporting Countries
OVOS	Tajik Local Environmental Impact Assessment

PIURR	Project Implementation Unit for Road Rehabilitation (of MoT)
PMC	Project Management Consultant
PRs	EBRD Performance Requirements
REA	Rapid Environmental Assessment
RoW	Right of way
RT	Republic of Tajikistan
SanPIN	Sanitary rules and norms
SEE	State Ecological Expertise
SEP	Stakeholder Engagement Plan
SES	Socio Economic Survey
SNiP	Technical construction standards
SPS	Safeguard Policy Statement
TJS	Tajikistani Somoni (currency)
TRTA	Transaction Technical Assistance
ToR	Terms of Reference
USD	US dollars
VOC	Volatile Organic Compounds
WB	World Bank
WHO	World Health Organisation
ZoI	Zone of Influence