Initial Environmental Examination

Project Number: 49042-005 (DRAFT)
January 2018

TAJ: CAREC Corridors 2, 5, and 6 (Dushanbe–Kurgonteppa) Road Project–Additional Financing (Part 2)

Prepared by the KOCKS Consult GmbH for the Asian Development Bank and the Ministry of Transport of Tajikistan.

268.

VII. BASELINE MEASUREMENTS

269. Baseline measurements have been conducted for air quality, water quality, noise and vibrations in September and October 2017.

A. Air Quality

270. Air measurements have been conducted in September 2017 according to Tajikistan standards for TSP, CO, NOx and SO2. Locations where measurements have been taken are at the same 18 buildings of public interest where measurements for noise and vibrations were carried out. The locations with the respective number are shown in the map in annex 6.

271. The underlying standards were the MAC (Maximum Allowable Concentrations) of the Republic of Tajikistan for pollutants in the athmosphere of populated areas. All standards were met. A detailled description of the conducted baseline measurement exercise is given in annex 5. During construction phase regular monitoring measurements will be conducted as described in the Monitoring Plan.

B. Water Quality Measurements

272. Water quality measurements have been conducted according to Tajikistan standards for pH, suspended solids, BOD5, dissolved oxygen, salinity, oil products and electrical conductivity. Samples were taken from the irrigation channel in Uyali and from Vaksh River. From Vaksh River 4 samples were taken (1st sample at confluence with Aksu River at right bank, second sample after confluence with Aksu River at right bank, 3rd sample from the centre of Vaksh River, 4th sample at left bank of Vaksh River). The measurement results are presented in the chapter on physical resources in the project area under the headline “water quality” and summarized in Table 19. The complete laboratory report is attached as annex 5. During construction phase regular monitoring measurements will be conducted according to the Monitoring programme.

C. Noise Measurements

273. Noise levels will be monitored during construction phase within the urban and settlement areas traversed by the Project road. Monitoring is required in Obikiik, Uyali, and Kyzylkhala.

274. Baseline measurements for noise were conducted during September 13th to 14th, 2017 and then again during October 15th to 16th. The first measurement campaign in September resulted in unrealistically low noise values (e.g. 32 dB at the hospital in Kyzylkala at about 20 m from the Project road). These low values were due to mal calibration of the instrument used. Therefore a second noise measurement campaign with a different instrument was conducted on October 15th and 16th. The instrument used was the noise level meter “TESTO-815”. The standards used are Tajikistan Standards (Sanitary Norms SN 2.2.4/2.1.8.562-96 – provided by Sanitary Epidemiological Surveillance Service of the Ministry of Health of the Republic of Tajikistan).

275. The measurements were taken outside the respective buildings. The exposure time during each individual measurement was between 15 and 20 minutes. As baseline index the average value was then taken. For measuring the noise meter was put on a stable and even surface. The methodology deployed is according to the SNIP CH 2.2.4/2.1.8.592-96, which is provided by the Ministry of Health of Tajikistan.

276. The measurement results are shown in the tables 35 and 36. Table 35 shows the noise measurement results for identified sensitive receptors of public interest, such as schools, Kindergartens and medical places. In addition noise measurements were taken at residential houses and other selected buildings nearby the road. The results of these measurements are shown in table 36.

Tab. 35 Baseline measurements for noise

№[26]	Location	Distance from Project Road	Noise standards in decibels (max)		Baseline indicators[27]
			07.00-23.00	23.00-07.00	15 – 16.10.2017
1	Central Hospital of Khuroson.	200 m	50	40	No measurement because of sufficient distance to road
2	School - Lyceum from left side of the road.	30 m	55	55	59,9
3	School is located in 150m from left side of the road.	150 m	55	55	No measurement because of sufficient distance to road
4	Health center from right side of the road is about 40m.	40 m	55	45	59,9
5	Kindergarten in Obi-Kiik village on right side of the road in 90m.	90 m	55	55	54,35
6	Stadium in Obi-Kiik village. Distance from current direction of road is about 30m from right side of the road.	30 m	75	75	No measurement because stadium is not sensitive to noise emissions from road
7	Professional Education Center on right side	140 m	55	55	No measurement because of sufficient distance to road
8	School No2 in southern part of Obi-Kiik village from left side. Distance from road is about 20 m.	20 m	55	55	57,5
9	Mosque is located on left side of the road.		55	45	No measurement
10	Hospital in Uyali, is located about 320 m from Project Road	320 m	50	40	No measurement because of sufficient distance to road
11	Kindergarten "Sitora" on right side of the road - 50 m	50 m	55	55	54,35
12	Big mosque on left side of the road. Distance from the road is 30m.	30 m	55	45	54,6
13	Health center in Chorbog village is located about 50m from the road to the left.	50 m	50	40	56,3
14	School No58 in Chorbog village on left side of the road, about 200 m from the road.	200 m	55	55	No measurement because of sufficient

[26] The numbers refer to the locations which are shown in the map in annex 6
[27] Exceedances of legal standards are marked with yellow colour

					distance to road
15	Mosque on right side of the Project road in Kyzyl-Kala center is about 30m away.	30 m	55	45	67,75
16	Kindergarten on right side of the road about 150m from Project road	150 m	55	55	53,15
17	Medical center and hospital in Kyzyl-Kala center, on right side in 20m from the road.	20 m	50	40	63,15
18	School in central part of Kyzyl-Kala village, about 110m on right side of the Project road.	110 m	55	55	50,4

Noise Standards (day time-night time):
55-45 dBA (max) - Residential area
75-75 dBA (max) - Commercial area
80-80 dBA (max) - Industrial area
50-40 dBA (max) - Hospitals
55-55 dBA (max) - Schools, Library

Tab. 36 Results of baseline measurements at residential and other selected buildings immediately adjacent to the Project road

No of Point	Location				Noise level			Noise standards in decibel (max)		Average value exceeds daytime standard[28]: yes / no	Remarks
	Chainage	Town	Road side	Distance to future road edge	Maximum	Minimum	Average	07.00-23.00	23.00-07.00		
1	39+810	Obikiik	RHS	13,97 m	76.1	43.6	59.85	55	45	Yes	
2	40+110	Obikiik	RHS	5,53 m	78.9	46.4	62.65	55	45	Yes	
3	40+340	Obikiik	RHS	5,46 m	76.4	42.2	59.3	55	45	Yes	
4	40+480	Obikiik	LHS	6,5 m	68.0	42.0	55	55	45	No	
5	40+520	Obikiik	LHS	5,0 m	75.1	45.1	60.1	55	45	Yes	
6	40+760	Obikiik	LHS	2,15 m	77.8	43.8	60.8	55	45	Yes	
7	60+970	Uyali	LHS	3,13 m	77.5	49.4	63.45	55	45	Yes	
8	61+240	Uyali	LHS	3,42 m	74.8	51.7	63.25	80	80	No	Cotton factory
9	61+710	Uyali	RHS	6,52 m	70.2	49.6	59.9	55	45	Yes	
10	61+740	Uyali	LHS	3,22	73.7	53.4	63.55	55	45	Yes	
11	61+870	Uyali	RHS	4,33 m	70.1	44.9	57.5	55	45	Yes	
12	62+030	Uyali	RHS	1,73	70.3	52.2	61.25	55	45	Yes	
13	69+300	Kizilkala	LHS	10,38	76.2	49.2	62.7	55	45	Yes	
14	69+360	Kizilkala	LHS	7,22	78.9	50.6	64.75	55	45	Yes	
15	69+880	Kizilkala	RHS	3,25	74.9	49.3	62.1	75	75	No	Small market
16	70+740	Kizilkala	LHS	7,38	73.3	58.5	65.9	55	45	Yes	
17	71+140	Kizilkala	RHS	8,05	80.4	45.9	63.15	55	45	Yes	
18	71+950	Kizilkala	RHS	8,98	77.5	52.3	64,9	75	75	No	Shop

[28] Only daytime baseline measurements were conducted.

277. Only daytime baseline noise measurements were carried out because according to the conducted traffic analysis it is evident that nighttime traffic is much lower. The corresponding noise levels will therefore be significantly less than during daytime and no additional measures are required on the mitigation side. The figure below illustrates the hourly traffic distribution based on the 24h hours count.

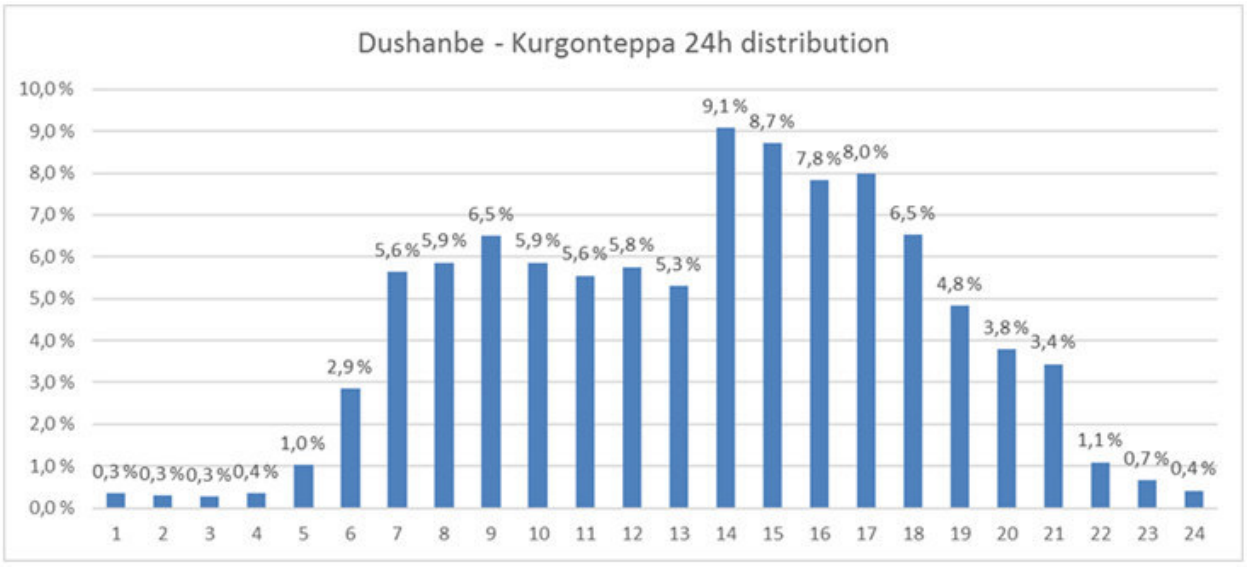

Fig. 33: 24 hour traffic distribution based on hourly traffic counts

In addition the hourly traffic distribution conducted by JICA (2013)[29] confirms the very low night time traffic load. The below figure which is based on traffic counts demonstrates that night time traffic is on average only about 20 % of day time traffic, whereas the truck traffic shows no significant decrease and is more or less constant over the whole day. Therefore the vehicle profile during night time differs in so far that the truck share during night time is higher due to the reduced amount of cars during night time. This is because the number of trucks/h remains relatively constant at abaut 30 vehicles/h for the road section at Obikhiik village and 50 vehicles for the road section at Uyali andKyzylkala villages.

[29] Japan International Cooperation Agency (JICA). 2019. Data Collection Survey on a Road between Dushanbe and Kurgan-Tyube in the Republic of Tadjikistan.

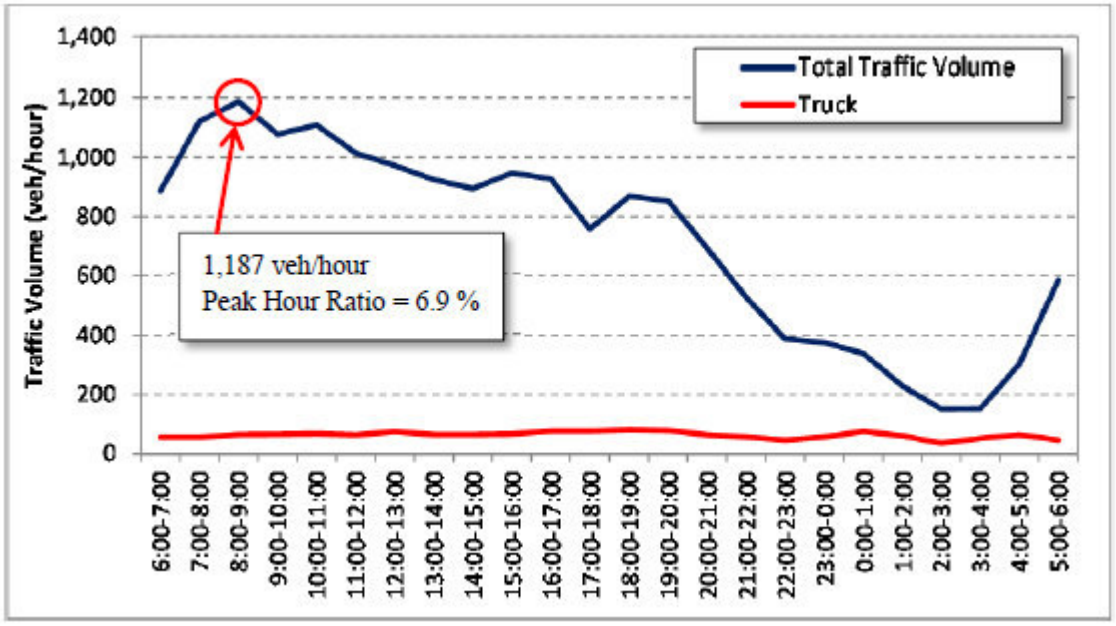

Fig. 34: Hourly Variation and Peak Hour Traffic Ration on Project Road (Station km 15. Source JICA 2013).

In order to assess the increase of night time noise level the current baseline (night time between 22:00 to 06:00 o'clock) was calculated by means of the software "soundplan" and exemplarily assessed for some receptors close to the road. The calculation is based on the conducted traffic counts which assume an average night time total traffic of 179 vehicles/h for the village Obikiik and 262 vehicles/h for the villages Uyali andKyzylkala. The truck (larger 2.5 tons) share is about 30 vehicles/h for the village Obikhiik and 50 vehicles/h for the villages Uyali andKyzylkala. The underlying speed is estimated to be 50 km/h for cars and 40 km/h for trucks. In the future the speed will be less due to the implemented safety features (speed humps). The result of the analysis is shown in table 50.

D. Vibration Measurements

278. Vibration levels will be monitored during construction phase within the urban and settlement areas crossed by the road. Monitoring is required in Obikiik, Uyali and Kyzylkhala. Baseline measurements were conducted on September 13th and 14th. The instrument used was the vibrometer "OCTAVA-101 VM".

279. Tadjikistan has no national standards for vibration but based on a mutual agreement within CIS states the following standard is used in Tajikistan: "Vibration Safety GOST 12.1.012-90 Interstate Standard, Moscow Standardinform, 2006".

280. The measured parameter is the vibrational acceleration expressed in dB or in/sec. The MAC is 107 dB (0,224 in/sec) for the Z axis (vertical axis) and 116 (0,63 in/sec) for the X and Y axis (horizontal axis) respectively. In summary no exceedances were measured. The measurement results are shown in the below table. The complete laboratory report is attached in annex 5 . During construction phase vibration levels will be monitored as indicated in the monitoring programme.

281. In order to have comparable results throughout the report the measurement unit is also expressed in in/sec. The formula for converting is the following.

$L_v = 20 * \log_{10}(v/v_{ref})$

Whereas

L_v = velocity level in decibels (VdB)

v = rms velocity amplitude

V_{ref} = reference velocity amplitude (The unit for V_{ref} is $1 * 10^{-6}$ in/sec.)

Tab. 37 Baseline measurements for vibration

№[30]	Measurement Location	Distance from Project Road	Maximum level of vibration-acceleration, dB / in/sec	Permissible values of vibration acceleration dB / in/sec Z_0 X_0Y_0	
1	Central Hospital of Khuroson.	200 m	20,4 / 0,00001	107 / 0,224	116 / 0,63
2	School - Lyceum from left side of the road.	30 m	87,2 / 0,023	107 / 0,224	116 / 0,63
3	School on left side of the road.	150 m	23,7 / 0,000015	107 / 0,224	116 / 0,63
4	Health center on right side of the road	40 m	84,1 / 0,016	107 / 0,224	116 / 0,63
5	Kindergarten in Obi-Kiik village on right side	90 m	67,9 / 0,00248	107 / 0,224	116 / 0,63
6	Stadium in Obi-Kiik village on right side of the road.	30 m	85,8 / 0,0195	107 / 0,224	116 / 0,63
7	Professional Education Center on right side of the road in 140m.	140 m	22,8 / 0,0000138	107 / 0,224	116 / 0,63
8	School No2 in southern part of Obi-Kiik village on left side.	20 m	93,6 / 0,0479	107 / 0,224	116 / 0,63
9	Mosque is located on left side of the road.		87.9 / 0,02483	107 / 0,224	116 / 0,63
10	Hospital in Uyali	320 m	10,5 / 0,000003	107 / 0,224	116 / 0,63
11	Kindergarten "Sitora" on right side of the road - 50 m	50 m	78,6 / 0,0085	107 / 0,224	116 / 0,63
12	Big mosque on left side of the road. Distance from the road is 30m.	30 m	86,9 / 0,022	107 / 0,224	116 / 0,63
13	Health center in Chorbog village on left side	50 m	79,3 / 0,0092	107 / 0,224	116 / 0,63
14	School No58 in Chorbog village on left side	200 m	15,2 / 0,0000058	107 / 0,224	116 / 0,63
15	Mosque on right side of the Project road in Kyzyl-Kala center	30 m	90,0 / 0,0316	107 / 0,224	116 / 0,63
16	Kindergarten on right side of the road	150 m	20,5 / 0,00001	107 / 0,224	116 / 0,63
17	Medical center and hospital in Kyzyl-Kala center, on right side in 20m from the road.	20 m	98,7 / 0,086	107 / 0,224	116 / 0,63
18	School in central part of Kyzyl-Kala village on right side of the Project road.	110 m	24,9 / 0,000018	107 / 0,224	116 / 0,63

[30] The numbers refer to the locations which are shown in the map in annex 6

VIII. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

282. Based on the results of the conducted field surveys and environmental assessment, the project's environmental impacts were identified and described and suitable mitigation measures prepared. The Project involves the reconstruction and widening of an existing road. Over most part of its length widening of the existing cross section will be required, which at certain sections will result in significant social and environmental interferences during construction stage, and, if not properly mitigated, during operation stage. There will however remain only low impacts once the Project has been finalized. This is because the road reconstruction scheme follows the existing alignment over most of its length. No valuable or protected natural habitats or other valuable environmental structures are significantly impacted after finalization of construction period, neither in their structure nor function.

283. This environmental assessment focuses on phase 2 only, with reference to the phase 1 where appropriate. The Phase 2 starts at km 33+475 and ends at Kurgonteppa at km 82+095. The phase 2 project cover two road sections: ADB-financed section (km 33 to-km 73) and JICA-financed section (km 73-km 82). For impact assessment a corridor of 200 meters on each side of the project road over its entire length is identified as the core impact area. The road sections where sensitive receptors are present, such as schools, hospitals or other places where people congregate are given particular attention so that adequate mitigation measures are formulated. For road sections that cross rivers, the impact assessment is expanded to cover the identified continuous extent of any ecologically important habitats / features along the Project Corridor. In addition the core impact area needs to be widened at certain locations to consider all ancillary facilities occurring outside the 200 m corridor such as borrow pits and quarries. This is the case for the Vaksh river valley which was identified as a potential source for aggregate extraction.

284. Main impacts refer to the human environment, particularly because loss of buildings and other valuable structures in the traversed towns and settlements such as Obikiik, Uyali, Kyzylkhala and Chakikho. Other interferences are due to noise emissions, emissions of pollutants and vibrations within the traversed settlements especially when the Project road runs close to sensitive receptors such as schools, hospitals, mosques, bazars or other.. In summary main impact categories arise from the following activities: (i) construction works within or close to settlements result in loss of trees and building structures, noise impacts, emission of pollutants to air and vibration which is especially of concern when the Project road comes close to sensitive receptors, (ii) site clearance activities result in loss of top soil and vegetation structures, (ii) aggregate sourcing, crushing of aggregates and asphalt plant operation may have severe impacts in case of unsuitable site selection or management. Additional impacts include (iii) impacts from bridge rehabilitation, (v) potential impacts on surface waters and potential impacts on natural habitats and biodiversity. In the following chapters named "pre-construction phase", "construction phase" and "operational phase" the impacts and mitigation measures are described.

A PRE-CONSTRUCTION (DESIGN PHASE)

1. Road alignment within ecologically sensitive areas

Impacts

285. There are no legally protected areas alongside the project road and only few structures of local environmental significance to be considered during the design stage.

286. Ecologically significant are the crossings of the Obikiik creek, Aksu creek and the Vaksh River with its associated floodplain. Potential impacts refer to possible oil spills from old or badly maintained vehicles, but also large scale water pollution may occur in case of severe casualties (e.g. if there is an accident of an oil transporting truck). Such casualties could have impacts on aquatic fauna and also pollute the crops in the irrigated fields.

287. Encroachment into valuable road side vegetation structures. Trees and shrubs in dense stands extend over many stretches of the road. Tree species are mainly elms (*Ulmus spec.*), cypresses, pines and willows (*Salix spec.*) Adjacent to the road are irrigation channels and small wetlands with reed (*Phragmites australis*).

288. Due to the widening to 4 lanes tree losses cannot beavoided. In some cases, tree losses that cannot be prevented. Based on the conducted surveys it is estimated that approximately 4000 trees need to be cut. Any tree losses are compensated by new plantations in the ratio of 1:2. Plantations shall be conducted after technical works have been completed. Planting time shall be restricted to spring (March till April) and/or autumn (September till October).

289. Additional potential impacts on the trees may include compaction of soil over the roots of the tree, alteration of ground levels besides the tree stem foot (fill up of more than 30 cm of tree stem area damages the tree), covering the soil around the tree with impervious material, release of materials that are toxic to the trees, or physical severance of the root system.

Mitigation Measures

290. In order to minimize impacts to the ecologically valuable surface waters a solid drainage system will be designed. In principle, the infiltration of surface run-off water into the slopes and in grass ditches is aimed at. Surplus water is evacuated to the nearest natural waterway. Drainage installations are designed in a way to allow for easy maintenance and operation.

291. Tree losses that cannot be prevented will be compensated by new tree plantings at the respective locations alongside the Project road, at a ratio of 1:2. Plantations shall be executed after technical works have been completed. Plantations shall be restricted to spring (March - April) and/or autumn (October). Locations for planting are within the new RoW at the locations where tree losses occurred. Therefore no additional land acquisition for tree planting is required. However the design will avoid tree losses as far as technically feasible by adjusting the roads center line. Tree losses on private land are compensated as set out in the Land Acquisition and Resettlement Plan (LARP). Suitable species for road side planting are pines (*Pinus spec.*), cypresses (*Juniperus spec.*), maples (*Acer platanoides*), poplars (*Populus alba*), willows (*Salix alba*), walnuts (*Juglans regia*), ashes (*Fraxinus angustifolia*) and platanes (*Platanus orientalis*). If irrigation channels are running alongside the road, then species requiring more moisture such as poplar (*Populus alba*) willow (*Salix alba*), maple (*Acer platanoides*) and ash (*Fraxinus angustifolia*) shall be planted. Only native species shall be planted from local genetic stocks.

292. Additional mitigation of impacts to trees can be done through refraining from storing construction material and other heavy equipment which could compact the soil near the roots, using only organic material at the tree stem zone for potential fill up, or fencing the area around the trees during construction works near the trees.

2. Road alignment dissecting cattle crossings

293. Alongside the project road pasture is the prominent land use Hence an important income source is from livestock breeding (mostly cattle and sheep). Consequently project affected people having their pasture land within the roads vicinity were requesting implementation of animal crossings. . The concern that animal crossings are required was raised during the consultation meetings that took place. There are regular migrations occurring using existing passages. The existing passages are not considered to be safe and the extension of the road from 2 to 4 lanes poses an additional barrier to cattle migrations.

Mitigation Measures

294. In total 4 animal crossings are included the Phase 2 of the Project. The proposed locations for animal crossings are shown in Table 9

295. The crossings B-6 at km 33+732 and B-10a at km 50+780 also cater for crossing of agricultural machinery.

296. . Apart from cattle underpasses, Possible mitigation measures would be the provision of warning signs and reflectors may be provided near pastures and in other critical sections . This is considered duly in the design documents.

3 Project road traversing several towns and villages

297. The Project road is traversing several villages and towns, most important here is the traverse of Obikiik, Uyali and Kyzylkala. In addition agricultural area, particularly pastureland is traversed. Hence the upgaraded Project road may cause community severance and also create obstacles for farmers and villagers in accessing their fields, etc..

Mitigation Measure

298. Suitable safety features and mitigation measures have been developed and integrated into the engineering design which will avoid or substantially minimize the impacts on settlements alongside the road. These design safety features consist of speed control signs, pedestrian crossings, livestock crossings, proper road markings, streetlights, and other visual means.

4. Bridge/Culvert Rehabilitation

299. The bridge works will have potential environmental impacts that need mitigation but the impacts of culvert works can be considered as minimal.

300. Culvert replacement will contribute to sustainable functioning of the irrigation systems alongside the project road sections. Without replacement of the culverts the local irrigation system might be damaged.

301. Regarding the bridge rehabilitation, clear distinction needs to be made between impacts of bridges that are subject to only rehabilitation and bridges that require partial or total reconstruction. For example: (i) bridges needing only rehabilitation and are in fair condition; (ii) bridges needing widening or partial reconstruction but which have enough loadbearing capacity are in satisfactory to poor condition; and (iii) bridges which need reconstruction for lack of loadbearing capacity are in poor condition. Bridges for rehabilitation may require corrosion treatment for rusted reinforcement structures, which can cause severe water pollution.

302. The Vaksh River bridge is the largest one in Phase 2. The bridge still has enough bearing capacity but need to be reconstructed because of cross section widening. The new bridge may trigger water erosion processes at bridge and river embankments. This was considered in the pre-construction-/design-phase of the project.

Mitigation Measures

303. The lower parts of the bridge embankments have to be protected against erosion. This refers to all bridges that are crossing surface waters, Erosion protection is achieved by using natural stones which will be embedded in concrete. . An example of the existing situation with deficient slope protection is presented in the below figure 28 for the Vaksh River bridge..

Fig. 35: Embankment of Vaksh River Bridge

B. CONSTRUCTION PHASE

1. Impacts due to site clearance activities

304. Site preparation and clearance includes stripping and temporary storage of top soil. If top soil is not properly managed it can lead to erosion, siltation, obstruction of water courses and drainage, and loss of top soil fertility. The associated impacts to site preparation and clearance activities are expected to be spatially limited to small strips

alongside the already existing road. It includes the remove of vegetation within the construction corridor.

Mitigation Measures

305. The removed top soil will be stored for re-use and long term stockpiles of top soil will be protected against erosion. This will be done for example through sowing fast growing vegetation such as grass on the stockpiles.

306. To ensure proper soil management the contractor will submit a soil management plan prior to commencing this operation. This plan will include measures for minimizing water and wind erosion, measures to minimize loss of fertility in top soil, timeframes, haul routes, disposal sites, and a re-cultivation plan in case of new borrow pits need to be opened. It will describe the mitigation measures to be taken from the beginning of the project until final disposal of spoil materials. Upon completion of the project, the contractor shall provide spoils stockpiles with grass cover.

2. Break up of old pavement layers and asphalt

307. The breaking up of the old pavement and asphalt layer will cause noise emissions, air emissions and vibrations. In addition a significant amount of spoil will be generated which will be reused as much as possible for the subbase for the new pavement.

308. Air quality impacts, noise and vibration will mostly be temporary. Sources include construction machinery, dust generated from construction works, haul roads, exposed soils, and material stock piles. Noise is temporary and results from operating construction machines. Vibration is caused by operating of construction machinery and hauling of materials.

309. In Obikiik, Uyali and Kyzylkala many residential buildings are stretching alongside the road. The distance of each building to the future road edge is indicated in the Table in annex 7. Construction noise and vibration are assessed in separate chapters. During construction phase there will be noise and vibration monitoring.

Mitigation Measures

310. Within settlements, of particular concern are Obikiik, Uyali, Kyzylkala and Chakikho a monitoring programme will be established for the construction stage. The parameters to be monitored are indicated in the Environmental Monitoring Plan.

311. For the preservation of evidence the contractor is advised by PIU to document the condition of houses close to the road. Photographs of all residential houses nearby the road will be taken as a protection for possible complaints regarding damages in house walls etc. This is part of the contract.

312. To avoid damages due to vibration, special construction techniques will be applied in areas where buildings and structures are close to the road and the vibration monitoring shows 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. A list of the potentially affected buildings is given in the table in annex 7.

313. For purpose of spoil reduction it is proposed to recycle construction materials. Recycled material from the existing pavement and special recycling techniques shall be used in the reconstruction of the new pavement layers. The cost effectiveness of reconstruction measures could be enhanced greatly by the application of recycled pavement materials. Recycling options include hot mix recycling (HMR) with/without new materials and cold mixing recycling with/without new materials.

314. Recycled material will be used to the largest extent feasible to reduce the volume of spoils that needs to be disposed of.

315. Prior to commencing the activities, the contractor will submit a waste management plan indicating detailed management of the waste produced in the project, including proper waste disposal sites.

3. Impacts due to earthworks

316. About 84,000.00 m³ of unsuitable excavation material will be generated by the Project which needs to be safely disposed. In addition there need to be storage locations for temporary disposal of aggregates and fill material.

Mitigation Measures

317. Temporary storage of surplus spoil shall be close to the excavation area preferably on barren land without any wooden vegetation.

318. For final and temporary disposal of surplus spoil suitable sites have been identified which are shown in figures 3 to 7. The identified sites have been agreed with respective authorities.

319. The contractor shall dispose the surplus material within the identified sites by adhering to the following measures for impact mitigation and erosion protection:

(i) Any stockpile of disposed surplus material will be allocated at least 100 m distance from any water course and no woody vegetation shall be filled up or cut. Height of stockpiles will not exceed 3 m. For purpose of erosion protection fast growing vegetation, e.g. grass species, shall be sawn for stabilizing the disposed material.

(ii) The selected disposal sites are not expected to be a source of erosion as unsuitable material will fill up the existent gullies and depressions. However the contractor is advised to compact end evenly distribute the surplus material by layers where possible,

to minimize piling and impacts to landscape. The stockpiles shall be sawn with fast growing grass to avoid erosion by the root system. During dry and windy periods, water should be spread on the disposed material to avoid dusting.

4. Reconstruction of pavement inclusive widening of existing road

320. The reconstruction activities cause air quality impacts, noise and vibration. The impacts are temporarily restricted to the construction phase. Impact sources include construction machinery, dust generated from construction works, haul roads, exposed soils, and material stock piles. Noise is temporary and results from operating construction machines. Vibration is caused by operating of construction machinery and hauling of materials.

321. The impacts on soil originate from the surface sealing due to the road widening, compaction of soil, site preparation and clearance, and improper storage of spoil material.

322. Compaction of soil on especially agricultural land can lead to degradation of its fertility. Agricultural lands are common along the whole length of the Project road.

Mitigation Measures

323. To prevent soil compaction the contractor shall limit the use of heavy machinery to the existing RoW especially in the vicinity of agricultural land.

324. The following mitigation measures will be implemented by the contractor to reduce emission levels of construction equipment: (i) maintenance of construction equipment in good condition and avoiding, as much as possible, idling of engines; (ii) banning of the use of machinery or equipment that cause excessive pollution (e.g., visible smoke); (iii) the contractor should utilize construction machinery with low emission levels.

325. Settlements next to the project road will be exposed to some degree of vibration. Therefore the potential magnitude of impact was assessed in a separate chapter.

326. Negative effects of noise are mitigated by limiting construction work to 07.00 am - 10.00 pm within 500 m of settlements, and by limiting hauling traffic through settlements. In addition the following measures need to be implemented: Noise control at source (using less noisier equipment, mufflers, dampeners, enclosures, proper maintenance of equipment, providing training to operators, etc), noise control at path (using natural structures with screening properties and acoustic barriers).

327. Construction stage monitoring is conducted for air quality, noise and vibrations as described in the EMP.

5. Impacts from borrow areas

328. The impacts related to establishment of borrow pits are largely dependent on the need for opening new pits. The proposed borrow area for Phase 2 of the Project is in Vakhsh river bed. The borrow area is already in operation and therefore environmental

impacts concerning potential disfigurement of landscape, vegetation losses and damage to access roads are kept to a minimum.

329. The proposed borrow area in Vakhsh River bed is located close to the Project road on the right bank of Vaksh River at a distance of 2 km downstream from the Vaksh Bridge. The investigations and previous test results indicate that the naturally occurring granular material in the project area is in most cases suitable for fill, capping and sub-base construction but requires in most cases further processing (crushing and screening). The impacts from utilizing borrow areas include siltation or obstruction of water ways and dust emissions from hauling of materials. The amount of river material that can be extracted is about 480,000.00 m³/a according to the geotechnical report.

330. An additional potential borrow area is located near Dahanikiik, at the beginning of phase 2. These are limestone and dolomite rock exposures which can be mined for obtaining aggregates and crushed-stone sand for concrete production. These potential quarries are located not far from the road and can be easily assessed. A few stone quarries are already in operation in the area. Approximate deposit of the quarry areas can be safely estimated to be about 250,000.00 m³.

331. If borrow activities within the riverbed come closer than 1 km to the bridge over the Vakhsh iver there is the potential risk that due to changes in hydrology the bridge foundations might be impacted because of erosion processes in the channel bed.

332. According to the map on ground water resources in the study area the ground water level where the proposed borrow area is located is ranging between less than 1 and between 1 and 5 m below ground. In addition the upper layers are mainly gravel and sand and highly permeable which makes the ground water susceptible to pollution. An additional potential impact therefore refers to the possible change of the direction of ground water flow within vicinity of the extraction site.

Mitigation Measures

333. The contractor will refrain from storing material near surface waters to prevent siltation or obstruction of water ways.

334. The contractor will wet the unpaved routes which go next to settlements to suppress dust pollution when hauling material from borrow pits and provide covers for the load of all hauling vehicles to prevent dust pollution. Also wetting the aggregate load reduces potential dust emissions. The contractor will submit a Construction EMP which addresses also site specific dust reduction measures, including transportation and post-closure rehabilitation of borrow sites.

335. The access to selected the borrow area in Vakhsh River bed is via the project road. The contractor must include mitigation measures for dust pollution by the settlements along the way. The hauling traffic should be carried out only between 6.00 am and 9.00 pm.

336. For purpose of protection of bridge foundations from erosion processes due to changed hydrology any borrow activities with the Vakhsh river bed shall not be closer to the bridge foundations than 1 km.

337. In order to avoid any ground water pollution the used machinery needs to be in good technical condition and properly maintained, so that no leakages of oil or any other pollutants may occur. In addition before starting material extraction the contractor will need to obtain the environmental permit from the CEP which may also include provisions for landscaping measures after finalization of the extraction activities.

6. Asphalt Plants and Aggregate Crushers

338. Impacts from asphalt plants include pollutant and odor emissions, possible water pollution from bitumen spills, and safety risks. The impacts can be minimized by acquiring the needed asphalt from an existing asphalt plant. In case a new asphalt plant must be set up, certain provision and mitigation measures have to be taken.

339. Air quality impacts are temporary. Impact sources include construction machinery, fugitive emissions from asphalt plants, aggregate crushers, and dust generated from construction works, haul roads, exposed soils, and material stock piles. Noise is temporary and results from operating construction machines. Vibration is caused by operating of construction machinery and hauling of materials.

340. Aggregate crushers produce noise and dust emissions, and they require certain mitigation measures.

341. In road rehabilitation the most severe possible water quality impact could come from spilled bitumen or any petroleum products used to thin it with. Bitumen is stored in drums which may leak or which are often punctured during handling after long periods (more than 6 months in the elements) of storage.

Mitigation Measures

342. To ensure minimal impacts on settlements and productive land, the asphalt plants and aggregate crushers must be located downwind of settlements at a distance of 1000 meters or more.

343. Bitumen will not be allowed to enter either running or dry streambeds and nor can be disposed of in ditches or small waste disposal sites prepared by the contractor. Bitumen storage and mixing areas must be protected against spills and all contaminated soil must be properly handled. Storage areas should be lined with impermeable layer to mitigate impacts of potential spills. As a minimum, these areas must be designed so, that any spills can be immediately contained and cleaned up.

344. The contractor shall have provisions for spill and fire protection equipment and shall submit an emergency response plan (in case of spills, accidents, fires and the like) prior to operation of the plant, and asphalt plants shall not be located close to plantations and productive land.

345. Bitumen storage and mixing areas must be protected against spills and all contaminated soil must be properly handled according to legal environmental requirements. Such storage areas must be contained so that any spills can be immediately contained and cleaned up.

346. Prior to commencing operation of the asphalt plant, the contractor must receive all relevant permissions and the site selection for the asphalt plant and aggregate crusher must be approved by Construction Supervision Consultant.

347. Both, asphalt plant and aggregate crusher are sources of emission of noise, vibrations and air pollutants. Therefore regular monitoring measurements shall be conducted at these facilities as described in the monitoring table of the EMP.

7. Bridge and Culvert Reconstruction Works

348. The natural watercourses that are crossed within phase 2 are the Obikiik, Aksu and Vakhsh River. In addition there are several irrigation channels.

349. Potential impacts include the generation of turbidity and siltation including change of surface hydrology in the water body by increased sediment load, and pollution of these water ways.

350. The impacts of stockpiling of top soil and material are mitigated by storing the material at a safe distance from nearby surface waters and by providing for long term stockpiles a grass cover. These mitigation measures prevent also the impacts of increased sediment load on surface hydrology. Settlement ponds must be implemented to places where construction activities come near the natural water courses.

351. When construction activities are being carried out on or in the vicinity of watercourses improper handling and storage of materials (concrete, asphalt, lubricants, fuels, solvent) may pose the risk of water contamination. In addition embankments and construction materials (fill, sand and gravel) are subject to wash out with rainwater. Oil and grease concentrations in surface waters will increase especially if oil leaks from engines are not properly controlled.

352. During construction of the bridge over the Vakhsh River, mitigation measures to reduce silt load include silt traps and temporary cofferdams. Silt traps must be located at specific locations and not across the water course as this can interfere with the fish movement. In addition, the Contractor must ensure the water to be pumped from the cofferdam is put through a settling pond prior to discharge back into the river. In addition, the Contractor will closely monitor the status of the river in terms of pollution and silt load.

353. Within the floodplain of the Vakhsh River the ground water table is shallow, ranging in between 1 and 5 meters below ground.

354. Possible impact on water quality of surface waters refers to the rivers that are crossed by the Project road. There is the potential risk of leakage of hazardous substances such as oil into the shallow ground water during bridge construction activities.

Mitigation Measures

355. Appropriate mitigation measures must be taken for ground and surface water protection, such as regular maintenance of the construction equipment to prevent oil leaks, in addition chemicals and oil will be stored in secure, impermeable, and bound area far away from surface waters.

356. Water quality monitoring shall be conducted during construction stage for the following parameters: pH, dissolved oxygen, sulfate (mg/l), NH4-N (mg/l) and oil products. Reference measurements shall be conducted prior to construction start, monitoring measurements shall than be conducted during construction stage on a quarterly basis. At Obikiik and Aksu River the monitoring locations shall be 100 m up- and downstream the bridge. For the Vakhsh River the location for water sampling shall be 500 m up- and downstream the bridge.

357. Chemicals used for possible bridge corrosion treatment are especially hazardous for water ways and the treatment requires special provisions for preventing chemicals reaching the water. When carrying out corrosion treatment the contractor need to present a method statement on this.

358. The bridge reconstruction debris has to be removed in an environmentally safe manor and the costs of environmental measures have to be included in the unit costs of the contractor.

359. The contractor shall submit a method statement or plan for the execution of bridge construction works including measures that will be undertaken to address adverse environmental impacts such as erosion of river embankment and siltation of watercourses that may result from such activities. The plan shall be submitted to the Construction Supervision and PIU, which include: (i) installing of water diversion structures upslope for reducing gully erosion, (ii) installation of retention structures (e.g. shallow basins) during construction activities near river for capturing of sediments, and (iii) the watering of stockpiles during dry season to avoid wind erosion.

360. Storage of any hazardous construction material needs to be on sealed surfaces only in order to prevent leakages into the groundwater.

8. Operation of Working Camps

361. To mitigate the construction camp related impacts, the contractor shall arrange the facilities, services, and water supply of the work camp so that it won't compete on the same resources with nearby communities. The contractor shall also employ, to the largest extent feasible, people from the local communities to the workforce. Local communities will also be preferred, to largest extent feasible, when employing people for the tree planting works, drainage cleaning, and other suitable tasks.

362. Impacts produced by workers camps are manifold and include generation of solid and liquid waste, equipment maintenance related pollutants spills, potential spills from stored materials (chemicals, fuels, etc.), competition for water resources with local needs, and health and safety risks to workers and locals, including risk of HIV / AIDS and other STD's.

363. Construction worksites may place stresses on resources and infrastructure of nearby communities. This may lead to friction between local residents and the temporary workers.

364. In addition construction camps are likely to have public health impacts. There will be a potential for diseases to be transmitted, exacerbated by inadequate health and safety practices. Therefore the contractor will be required to recruit a health, and safety

specialist to address such concerns in the work sites. The specialist shall also liaise/work with the nearby communities when it is necessary for mitigation of health and safety concerns.

Mitigation Measures

365. Prior to construction works, the contractor shall provide a comprehensive Construction EMP covering the aspects that are described in the chapter "Environmental Management Plan". .

366. The camp shall not be set up on top of a ground water area, nor near any surface water areas.

367. Prior to commencing operation the contractor shall indicate proper sources of drinking and construction water which won't compete with local needs. This will be done together with local authorities.

368. For health and safety protection of workers and adjacent communities the following shall be provided: (i) Adequate health care facilities (including first aid facilities) within construction sites; (ii) Training of all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work; (iii) Personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection in accordance with legal legislation; (iv) Clean drinking water to all workers; (v) Adequate protection to the general public, including safety barriers and marking of hazardous areas; (vi) Safe access across the construction site to people whose settlements and access are temporarily severed by road construction; (vii) Adequate drainage throughout the camps so that stagnant water bodies and puddles do not form; (viii) Sanitary latrines and garbage bins in construction site, which will be periodically cleared by the contractors to prevent outbreak of diseases.

369. Where feasible the contractor will arrange the temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities. This shall be taken into consideration when deciding the place for the camp.

370. The contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual work place. Prior to the commencement of works, the work site personnel shall be instructed about safety rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint etc.) and also the cleaning of the equipment. In preparation of this the contractor shall establish a short list of materials to be used (by quality and quantity) and provide a rough concept explaining the training / briefing that shall be provided for the construction personnel.

371. The contractor shall provide information to workers, encouraging changes in individual's personal behavior and encouraging the use of preventive measures. The goal of the information is to reduce the risk of HIV / STD transmission among construction workers, camp support staff and local communities.

372. Contractors' conformity with contract procedures and specifications during construction will be carefully monitored. Contractors will be made to follow standard

construction practices, monitored and supervised by construction supervision consultants employed under the Project.

9. Traffic Impacts

373. Traffic impacts of the road rehabilitation project will include disturbance of traffic along the road sections.

374. Transport of potentially hazardous or toxic materials on the road poses a risk to the local population. Impacts in case of an accident which causes a spill may include pollution of surface water or ground water through leaching.

Mitigation Measures

375. Prior to commencing operations the contractor shall submit a traffic management plan to local traffic authorities, and provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions.

376. During the construction work the contractor will arrange for adequate traffic flow around construction areas.

377. The contractor shall enhance traffic safety by providing adequate signalization, lighting, traffic safety signs, barriers and flag persons for traffic control. Adequate training shall be provided to the workers on traffic control prior to commencing operations.

378. The contractor shall include action plan to mitigate impacts from transport of hazardous and toxic materials to the traffic emergency response plan for the operation phase of the road.

C. CONSTRUCTION NOISE ASSESSMENT AND CALCULATION

1. Introduction

379. During construction works, airborne noise is generated by construction equipment such as milling machines, excavators, bulldozers, pavers, compactors and generators.

380. Construction noise control should be based on a balance between the interests of those who want to build and possible annoyance by neighbours near the building site. The value of the construction activities for society is commonly recognized, however, people exposed to the involved noise emission expect a responsible approach to minimize the annoyance of such activities

2. Methodology for Construction Noise Assessment

381. The methodology for assessing the effects of construction noise from the Project can be divided into following general steps:

- Establish, through measurement, the current ambient noise environment for sensitive receptors that may in future be affected by construction noise from the Project
- Identify those construction activities with the potential to generate significant construction noise levels

- Determine distances from construction noise sources to sensitive receivers based on the proposed alignment and construction methodology;
- Analyse obtained equipment data and calculate noise emission at the source;
- Assess the noise effects of the Project for sensitive receivers in the vicinity;
- Develop best practicable noise mitigation measures.

3. Sensitive Receptors

382. Sensitive receptors of public interest concerning noise emissions are schools, hospitals mosques or other social infrastructure facilities. They are located within the settlements alongside the Project road. Sensitive receptors at which baseline measurements have been taken are listed in the Table below.

Tab. 38 List of sensitive receptors

№[31]	Location	Distance from Project Road	Noise standards in decibels (max)		Baseline indicators[32]
			07.00-23.00	23.00-07.00	15 – 16.10.2017
1	Central Hospital of Khuroson.	200 m	50	40	No measurement because of sufficient distance to road
2	School - Lyceum from left side of the road.	30 m	55	55	59,9
3	School is located in 150m from left side of the road.	150 m	55	55	No measurement because of sufficient distance to road
4	Health center from right side of the road is about 40m.	40 m	55	45	59,9
5	Kindergarten in Obi-Kiik village on right side of the road in 90m.	90 m	55	55	54,35
6	Stadium in Obi-Kiik village. Distance from current direction of road is about 30m from right side of the road.	30 m	75	75	No measurement because stadium is not sensitive to noise emissions from road
7	Professional Education Center on right side	140 m	55	55	No measurement because of sufficient distance to road
8	School No2 in southern part of Obi-Kiik village from left side. Distance from road is about 20 m.	20 m	55	55	57,5
9	Mosque is located on left side of the road.		55	45	No measurement
10	Hospital in Uyali, is located about 320 m from Project Road	320 m	50	40	No measurement because of sufficient distance to road
11	Kindergarten "Sitora" on right side of the road - 50 m	50 m	55	55	54,35
12	Big mosque on left side of the road. Distance from	30 m	55	45	54,6

[31] The numbers refer to the locations which are shown in the map in annex 6
[32] Exceedances of legal standards are marked with yellow colour

	the road is 30m.				
13	Health center in Chorbog village is located about 50m from the road to the left.	50 m	50	40	56,3
14	School No58 in Chorbog village on left side of the road, about 200 m from the road.	200 m	55	55	No measurement because of sufficient distance to road
15	Mosque on right side of the Project road in Kyzyl-Kala center is about 30m away.	30 m	55	45	67,75
16	Kindergarten on right side of the road about 150m from Project road	150 m	55	55	53,15
17	Medical center and hospital in Kyzyl-Kala center, on right side in 20m from the road.	20 m	50	40	63,15
18	School in central part of Kyzyl-Kala village, about 110m on right side of the Project road.	110 m	55	55	50,4

383. In addition all residential houses are sensitive receptors regarding noise impacts. A complete list of the noise affected houses alongside the Project road is given in annex 7.

384. Therefore in addition baseline noise measurements have been conducted at residential houses and other selected buildings alongside the Project road. Results are shown in the chapter on baseline measurements in table 36.

4. Working Hours

385. Normal working hours are from Monday to Saturday from 8 am to 6 pm. Night-time working and working on Sunday or public holidays is not foreseen.

5. Construction Method and Equipment

386. There is limited information available on construction methods, plant and equipment before the Works Contract is awarded, but based on the anticipated scope of works it can be assumed that standard construction methods and equipment would be used for the civil works for rehabilitation and upgrading of the Dushanbe – Kurgonteppa road.

387. The construction equipment expected to be employed for construction has been identified and Table 2 below lists the likely construction equipment usage at each of the major work sites. Stationary plants and equipment are not considered, as the location of the stationary plants should be select in sufficiently distance to sensitive receptors.

Tab. 39 Equipment likely to be used during major construction activities and location

Activity	Equipment	Work Site Location
Demolition / Breaking Up Concrete	Hydraulic hammers Wheeled Loader Trucks Excavators Breaker	Existing structures (bridges and culverts) and houses to be demolished
Site Clearance	Milling machine Wheeled Loader Trucks Excavators Dozer	Across the work site
Earthworks	Excavators Loaders Dump trucks Graders Dozers Vibrating rollers Compactors	Across the work site
Bridge/Structure Works	Excavators Drilling Rig Concrete Mixer Trucks Concrete pumps Trucks Crane Poker Vibrator	At all bridge location

	Diesel Generator	
Road Pavement Works	Water Tanker Graders Road Sweeper Bitumen Sprayer Paver Multi-tried Rollers	Across the work site

388. Ideally, noise data in calculations should be for the specific equipment to be used on site. However, at the assessment stage the equipment has not been selected, and data are not available. Therefore, for initial predictions reference noise data from BS 5228-1:2009 has been used.

389. BS 5228-1:2009 includes reference noise level data for typical construction equipment. These data have been obtained from measurements at construction sites in the United Kingdom on similar types of equipment to that used internationally. These data are used as a guide to establish the construction noise emissions.

390. Where there is a moving source, the BS 5228-1 data relates to the equipment at the nearest (loudest) point rather than being an average value. For slow-moving sources in a constrained area, BS 5228-1 makes allowance for the times when the equipment is further away from the houses and therefore quieter. This is done by effectively reducing the operating time, using the correction factor extracted from equation F9 within BS 5228-1:

$$L_{Aeq(T)} = 10\log 10 \frac{1}{T} \sum_{i=1}^{n} t_i 10^{0.1 L_i}$$

where:

$L_{Aeq(t)}$ is the is the combined equivalent continuous A-weighted sound pressure level, in decibels (dB), over a given period T;

L_i is the individual equivalent continues A-weighted sound pressure level, L_{Aeq}, for an item of plant or activity during a period t_i , in decibels (dB);

n is the total number of individual equivalent continuous A-weighted sound pressure levels to be combined.

391. The table below presents the A-weighted sound pressure level at 10 m for the anticipated generic construction equipment together with an estimate on the length of time the construction equipment is used.

Tab. 40 Sound pressure level of generic construction equipment

Equipment Description	BS 5228-1 Reference	Sound Pressure Level, dB, at 10 m	Duration of Activity as percentage of 10 h (On time) %
Asphalt Paver	Table C5, Ref. No. 33	75	60
Breaker (Pneumatic)	Table D2, Ref. No. 11	87	50
Concrete Mixer Truck	Table C4, Ref. No. 27	79	80
Concrete Pump	Table C4, Ref. No. 29	80	80
Compactor	Table C8, Ref. No. 1	80	80
Crane	Table C5, Ref. No. 37	76	60
Diesel Generator	Table C4, Ref. No. 85	66	100
Dozer	Table C2, Ref. No. 1	75	80
Drilling Rig	Table C3, Ref. No. 14	83	80
Excavator	Table C5, Ref. No. 18	80	80
Grader	Table D9, Ref. No. 7	83	80
Hydraulic hammers	Table C1, Ref. No. 7	93	50
Milling Machine	Table C5, Ref. No. 7	82	80
Multi-tired Roller (asphalt)	Table C5, Ref. No. 29	82	80
Poker Vibrator	Table C4, Ref. No. 34	69	80
Road Sweeper	Table C4, Ref. No. 90	76	20
Truck	Table C2, Ref. No. 30	79	60
Vibrating Roller	Table C5, Ref. No. 28	77	60
Water Tanker	Table C4, Ref. No. 89	79	50
Wheeled Loader	Table C2, Ref. No. 28	76	80

6. Calculated Noise Emissions

392. The tables below contain summary noise emission levels for major construction activities to be undertaken for rehabilitation and upgrading of the Dushanbe - Kurgonteppa road. To calculate the combined noise level for a construction activity the following equation has been used to combine the noise levels from the individual construction equipment:

Combined Noise Level = $10 \times \text{Log10}\ (10^{(L1/10)} + 10^{(L2/10)} + \ldots\ldots..+10^{(Ln/10)}$

where: L = individual noise events

Tab. 41 Noise emission for Demolition / Breaking up Concrete Works

Activity: Demolition / Breaking up Concrete

Equipment Type	Noise level at 10 m L_{Aeq} (dB)	Duration of Activity as percentage of 10 h	Correction to L_{Aeq} (dB)	Activity Noise Level $L_{Aeq(10)}$ (dB)
Hydraulic Hammer	93	50	-3.0	90.0
Breaker	87	50	-3.0	84.0
Excavator	80	80	-1.0	79.0

Wheeled Loader	76	80	-1.0	75.0
Truck	79	60	-2.2	76.8
Total Activity				**91.5**

Tab. 42 Noise emission for Site Clearance Works

Activity: **Site Clearance**

Equipment Type	Noise level at 10 m L_{Aeq} (dB)	Duration of Activity as percentage of 10 h	Correction to L_{Aeq} (dB)	Activity Noise Level $L_{Aeq(10)}$ (dB)
Milling Machine	82	80	-1.0	81.0
Dozer	75	80	-1.0	74.0
Excavator	80	80	-1.0	79.0
Wheeled Loader	76	80	-1.0	75.0
Truck	79	60	-2.2	76.8
Total Activity				**84.9**

Tab. 43 Noise emission for Earthworks

Activity: **Earthworks**

Equipment Type	Noise level at 10 m L_{Aeq} (dB)	Duration of Activity as percentage of 10 h	Correction to L_{Aeq} (dB)	Activity Noise Level $L_{Aeq(10)}$ (dB)
Excavator	80	80	-1.0	79.0
Wheeled Loader	76	80	-1.0	75.0
Excavator	80	80	-1.0	79.0
Truck	79	60	-2.2	76.8
Grader	83	80	-1.0	82.0
Dozer	75	80	-1.0	74.0
Vibrating Roller	77	60	-2.2	74.8
Compactor	80	80	-1.0	79.0
Total Activity				**87.3**

Tab. 44 Noise emission for Bridge/Structure Works

Activity: **Bridge/Structure Works**

Equipment Type	Noise level at 10 m L_{Aeq} (dB)	Duration of Activity as percentage of 10 h	Correction to L_{Aeq} (dB)	Activity Noise Level $L_{Aeq(10)}$ (dB)
Excavator	80	80	-1.0	79.0
Drilling Rig	83	80	-1.0	82.0
Concrete Mixer Truck	79	80	-1.0	78.0
Concrete Pump	80	80	-1.0	79.0
Truck	79	60	-2.2	76.8
Crane	76	60	-2.2	73.8

Poker Vibrator	69	80	-1.0	68.0
Diesel Generator	66	100	0.0	66.0
Total Activity				**86.7**

Tab. 45 Road Pavement Works

Activity:	**Road Pavement Works**			
Equipment Type	Noise level at 10 m L_{Aeq} (dB)	Duration of Activity as percentage of 10 h	Correction to L_{Aeq} (dB)	Activity Noise Level $L_{Aeq(10)}$ (dB)
Water Tanker	79	50	-3.0	76.0
Graders	83	80	-1.0	82.0
Road Sweeper	76	20	-7.0	69.0
Bitumen Sprayer	79	50	-3.0	76.0
Asphalt Paver	75	60	-2.2	72.8
Total Activity				**84.2**

393. The potential noise impacts during the construction are presented in Table 45 below. All noise predictions are for a circumstance where specific or general noise mitigation has not been implemented on site. Therefore, noise levels from the activity would generally be lower than shown in the tables. The predicted noise levels in the tables represent the highest noise level likely to be received from the construction site without any mitigation.

Tab. 46 Activity Noise Levels depended on Distance

Activity	Activity Noise Level				
	at 10 m (dB)	at 20 m (dB)	at 50 m (dB)	at 100 m (dB)	at 200 m (dB)
Demolition	91.5	85.5	77.5	71.5	65.5
Site Clearance	84.9	78.9	70.9	64.9	58.9
Earthworks	87.3	81.3	73.3	67.3	61.3
Bridge/Structure Works	86.7	80.7	72.7	66.7	60.7
Road Pavement Works	84.2	78.2	70.2	64.2	58.2

7. Construction Noise Prediction at Sensitive Receptors

394. The noise prediction has been modelled using the computer software package SoundPlan Essential 2.0. The noise prediction model takes account of losses due to geometrical spreading from the noise source, absorption from the ground and shielding from the ground topography and physical noise barriers where provided.

395. However, despite the sophisticated noise prediction model used for the calculation of the construction noise, the calculations suffer from accuracy limitations due to user-defined noise emission levels for each generic type of construction equipment. Consequently, the resulting predicted noise levels and noise contour lines are again only as good as the veracity of the input assumptions.

396. Since construction activities will be subsequently carried out, for the noise prediction modelling at sensitive receptors only the noisiest activity 'earthworks' in the vicinity of the receptor has been considered. However, the foreseen mitigation measures are valid for all construction activities, not only the noisiest and there is a regular noise monitoring during construction phase. No work at night-time is envisaged and therefore not included in the prediction model. Major construction works are anticipated in year 2019 and therefore in addition to the construction noise also the calculated noise from 2019 year traffic are included.

Tab. 47 Predicted maximum construction noise at sensitive receptors

No [33]	Sensitive Receptor Number[34]/Name	Side of Building	Floor	Calculated Construction Noise with calculated noise level for year 2019, max. dB (A) Day	Baseline Indicators 13 – 14.09.2017
	Obikiik				
2	4/School Lyseum	SW	Ground	83.5	59,9
3	3/School No. 1	SW	Ground	73.6	32,6
4	4/Health Center	NE	Ground	81.1	59,9
5	5/Kindergarten	NE	Ground	75.8	54,35
7	8/Professional Centre	E	Ground	75.8	47
7	8/Professional Centre	E	1st floor	76.1	--
8	9/School No. 2	W	Ground	80.3	57,5
	Uyali				
10	12/Hospital	SE	Ground	63.9	41
11	13/Kindergarten	SE	Ground	65.1	54,35
15	15/Large Mosque	N	Ground	65.4	54,6
	14/Mosque	SE	Ground	62.3	--
	11/Sunday market	E	Ground	83.1	--
	Kizil - Kala				
16	22/Kindergarten	E	Ground	59.5	53,15
16	22/Kindergarten	E	1st floor	59.9	--
17	23/Medical Centre/Hospital	E	Ground	64.1	63,15
17	23/Medical Centre/Hospital	E	1st floor	64.9	--
17	23/Medical Centre/Hospital	E	2nd floor	65.4	--
17	23/Medical Centre/Hospital	E	Ground	65.3	--
17	23/Medical Centre/Hospital	E	1st floor	65.8	--
17	23/Medical Centre/Hospital	E	2nd floor	66.3	--
15	20/Mosque	SE	Ground	60.1	67,75
	21/Mosque	E	Ground	63.0	--

[33] Number of Locations according to the map in annex 6
[34] Number of Sensitive Receptors according to List in Annex 3

	19/School	E	Ground	63.6	--
	19/School	E	1st floor	64.1	--
18	24/School	E	Ground	61.9	50,4
18	24/School	E	1st floor	62.2	50,4

397. Certain receptors are located adjacent to the project road and therefore highly affected by construction noise. An example is the building number 2 (school / lyseum in Obikiik) where a noise level of 81,1 dB is anticipated during construction.

398. In addition all residential buildings are sensitive receptors. A complete list is given in annex 7. All houses in this list will be affected by exceedance of noise standards during construction phase. During construction phase the noise level at this houses will be equal to the building number 2 cited in the para 379, which means above 80 dB. This cannot be avoided but will be mitigated by suitable measures as far as technically feasible. The mitigation measures are part of the EMP.

399. For specific operations (earthworks and road resurfacing) in close proximity to houses, noise levels may potentially exceed the noise daytime criteria. However, these predicted high noise levels would occur only during limited times and respite periods might be introduced by restricting the hours that the very noisy activities can occur. The affected community should identify times when they are less sensitive to noise, such as before and after school for works near schools or kindergartens.

8. Mitigation of Construction Noise

400. As a mitigation measure there will be strict noise monitoring and liaison with residents will be required to adequately manage noise effects.

401. In addition the noise impact of the construction phases can be minimised by use of the noise control measures, as suggested in Section 8 of BS 5228-1:2009. General principles for the control of noise during the construction works are presented below.

- Appropriate choice of equipment;
- Regular equipment maintenance to keep plant in good working condition and reduce noise from machinery;
- Careful phasing of the proposed operations, including working during school breaks when working close to the schools; and
- Provision of temporary noise barriers.

8.1 Noise Reduction at Source/Equipment

402. Most construction noise originates from internal combustion engines. A large part of the noise emitted is due to the air intake and exhaust cycle. All construction equipment should be fitted with suitable engine mufflers with tight fitting engine enclosures and panels. All mobile equipment should be maintained in good mechanical condition.

403. No plant and equipment shall be left running if not required for immediate use. Where this is not practicable, equipment shall be set to idle in the quietest manner to minimise noise emissions. □

404. Where equipment would operate near to noise sensitive locations additional noise attenuation measures may be required, such as improved residential mufflers. The construction contractor would be required to monitor construction noise levels at sensitive locations during construction activities to confirm that compliance with the noise criteria is achieved and that additional noise attenuation measures are not required for construction equipment, vehicles or activities.

405. Where feasible equipment modifications should be considered, such as dampening of metal surfaces, which is effective in reducing noise due to vibration.

8.2 Noise Barriers

406. Temporary noise barriers will be utilised for those areas where sensitive receptors are significantly affected during construction. Temporary barriers are typically constructed from plywood and should be of sufficient height to screen acoustic line-of-sight between the receiver and the noise source. Solid plywood site hoarding can often be effective as a temporary noise barrier.

407. Construction noise barriers should be implemented if effective and practicable. This would be decided on a case-by-case basis.

8.3 Scheduling of Construction Activities

408. The most effective method to control construction noise is through proactive management. This includes assessment of all activities and consideration of potential noise and appropriate mitigation.

409. Construction activities should be scheduled to minimise the multiple use of the most noisy items of equipment near sensitive receivers;

D. ASSESSMENT OF VIBRATION IMPACT DURING CONSTRUCTION

410. The Project road is traversing the cities of Obikiik, Uayli and Kyzylkala. Buildings within these settlements are located close to the road and during construction phase they will be effected by vibration to a certain degree. Therefore an assessment of the potential magnitude of vibration impacts is presented in this chapter.

411. Tadjikistan has no national standards for vibration.

412. As described in the chapter on baseline measurements vibration levels will be monitored during construction phase within the urban and settled areas crossed by the road. Baseline measurements were conducted on September 13th and 14th.

413. Monitoring of vibaration during construction phase is crucial because many residential houses and other building structures are located fairly close to the Project road. The table in annex 7 provides an inventory of all house adjacent to the road including distance from future road/embankment edge to existing houses.

414. The effects of vibration on structures depends on the construction machinery and equipment (emission source) and on the structural conditions of the potentially affected building structures (receptors).

415. Damages due to vibration are always a potential impact when construction activities come close to building structures. Therefore, as a common good practice, a preconstruction survey will 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.

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. 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.

416. 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.

417. The buildings within the Project area are relatively old structures and generally in poor to fair condition.

418. As there are no standards for vibration in Tajikistan the threshold criteria that are recommended in CALTRANS (2013)[35] were used for the assessment of the 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 the following table:

Tab. 48 Guideline Vibration Damage Potential Threshold Criteria

	Maximum PPV (in/sec)

[35] California Department of Transportation (2013): Transportation and Construction Vibration. Guidance Manual.

Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
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	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.

419. Existing buildings along the project road are predominantly buildings with plastered walls, wooden ceilings and walls in masonry. To take a conservative approach in assessing the structure, the criteria for historic and old buildings were taken as a reference for the vibration assessment. This categorization is based on the field survey carried out. No facilities with equipment sensitive to vibration were identified in the immediate vicinity of the Project road.

The following pictures give an impression of the building structures alongside the road and demonstrate that the categorization is justifiable.

Fig. 36: Typical old house alongside the project road (Km 62+065 to Km 62+095 Left Side). Constrution material is made of burnt bricks.

Fig. 37: Typical new house alongside the project road (Km 61+770 to Km 61+805). Construction material is made of clay brick mansonry.

Fig. 38: Typical fairly old house alongside the project road (Km 61+810 to Km 61+835). Construction material is made of clay brick masonry.

420. For historic and old buildings the given threshold value is 0.25 in/sec for continuous or frequent intermittent sources as it is typical for construction vibration.

421. 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 the following (Caltrans 2013)[36]:

Tab. 49 Vibration Source Amplitudes for Construction Equipment

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
Loaded trucks	0.076	97
Jackhammer	0.035	90
Small bulldozer	0.003	69

422. 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 receiver in feet.
N = 1.1 (the value related to the attenuation rate through ground)[37]

423. By transposing this formula the required minimum distance can be calculated as follows:

$$D = \frac{25}{n\ \overline{\frac{ppv\ equipment}{ppv\ ref}}}$$

424. 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, respectively 7.5 meters. The threshold value used for the building structures is valid for historic and old buildings and emission from a continuous source[38]. The reference PPV applied for the construction machinery (0,25 in/sec) is slightly above the standardized PPV_{Ref} of the vibratory roller in table 49. Hence the assessment can be considered to be on the safe side.

[36] California Department of transportation (2013): Transportation and Construction Vibration.
[37] 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).
[38] Threshold criteria according to table 48 (Table 19 in CALTRANS (2013))

425. As a result it can therefore be concluded that fragile buildings closer than 7.5 m to the future road edge are at risk of damages. The buildings are indicated in yellow colour in the table in annex 7 (buildings coloured red will be demolished). In total 122 buildings are within the defined contour of 7.5 m to the future road edge and may potentially suffer from vibration damages.

426. The following mitigation measures will be implemented during construction phase.

The bidding documents for civl 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 EMP. 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 damages (para 422).

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.

427. 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. Night work will be avoided.

E. OPERATIONAL PHASE

1. Population and Communities

Potential impacts

428. *Settlement patterns*. No significant changes in settlement patterns are anticipated as a result of proposed road upgrading.

429. *Community impacts*. Potential community-level impacts can include economic enhancement, split communities, bypassed loss of roadside community business and social activities, impacts on current mode of transportation, impacts related to culture shock, and conversion to higher value land users.

- *Split communities*. As the project will upgrade the road from 2 to 4 lane with separation it can cause split communities, and create obstacles for farmers and villagers in accessing their fields, etc.

- *Impacts on Current Modes of Transport*. As the project will upgrade the road category to the one with higher speed limit it can impede road crossings, restrict parking of informal public transport vehicles and reduce the attractiveness of current transport modes such as cartage.

- *Impacts on Bypassed Communities.* No bypasses are included in the project.

- *Impacts on Tourism*. The project could a positive impact on the tourism potential of the areas served by the improved roadways.

- *Impacts Related to Culture Shock*. Rapid exposure of isolated communities to increased communication and contact with the outside world may lead to significant community impacts referred to as “culture shock”. No significant impacts of this nature are anticipated as a result of the project.

Mitigation Measures

In order to preserve the cohesion of the community, the project design includes several type of improved crossings for cattles and pedestrians such as (i) at grade intersections and pedestrian crossings secured by refuges in the median, (ii) two overpasses in Uyali and Kizilkala villages, and (iii) several underpasses, most of which are suited for cattle crossings and agricultural machineries. The Project design also paid specific attention to safety for all road users. Gateaways treatments -including flat topped humps and adequate road signs- will be used in populated areas to mark the change in speed environement (speed limit set at 40 km/h in towns and villages) and ensure safe crossings for all.

2. Traffic impacts

430. The proposed project will result in better road condition. In combination with the implemented road safety features and crossing facilities for pedestrians, cattle and agricultural machinery this is expected to result in better traffic flow and less congestion within urban areas and in addition to less accidents and better safety for the population alongside the Project road. Due to improved traffic flow also local communities who access the road via side roads will benefit from the Project because there is less delay from congestion.This is also valid for the many residential and retail units alongside the Project road.

431. In order to assess noise impacts during operational Phase noise levels within the traversed settlements of Obikiik, Uyali, Kizil-Kala and Kurgonteppa were calculated by using the software “Soundplan” for the expected opening year 2022 and in addition for

the year 2031. The calculation was conducted for day and night time. The generated detailed maps showing the outcome of the noise calculation are presented in the annex 4.

432. Below table 50 show the results of noise calculation for the identified sensitive receptors in Obikiik, Uyali and Kurgonteppa respectively.

Tab. 50 Results of Noise Modelling for the Identified Sensitive Receptors

No[39]	Sensitive Receptor Number[40]/Name	Distance to road edge	Side of Building	Floor	Noise Standard. Max. dB (A)		Calculated Noise Level 2021 in dB (A) / Difference to Baseline Measurements[41]		Calculated Noise Level 2031 in dB (A) / Difference to baseline measurements		Conflicts / Exceedance in year 2021 in dB		Conflicts / Exceedance in year 2031in dB		Baseline measurements[42] dB		Requirement of additional noise protection measures (see footnote 44)
					day	night	day	night	day	night	day	night	Day	night	day	night	
Obikiik																	
2	4/School Lyseum	30 m	SW	Ground	55	45	61,3 / + 1,4	.	62,7 / + 2,8	55,6	yes	n.a.	yes	n.a.	59,9	55,2	no
3	3/School No. 1	150 m	SW	Ground	55	45	51,4	n.a.	52,8	45,7	no	n.a.	no	n.a.	----	45,3	no
4	4/Health Center	40 m	NE	Ground	55	45	58,7 / -1,2	n.a.	60,2 / + 0,3	53.	yes	n.a.	yes	n.a.	59,9	52,7	no
5	5/Kindergarten	90 m	NE	Ground	55	45	53,5 / -0,85	n.a.	55 / +0,65	47,8	no	n.a.	no	n.a.	54,35	47.5	no
7	8/Professional Centre	140 m	E	Ground	55	45	53,5	n.a.	55,	47,9.	no	n.a.	no	n.a.	---	47,5	no
7	8/Professional Centre	140 m	E	1st floor	55	45	53,8	n.a.	55,3	48,1	no	n.a.	yes	n.a.	---	47,8	no
8	9/School No. 2	20 m	W	Ground	55	45	58 / +0,5	n.a.	59,5 / +2	52,3	yes	n.a.	yes	n.a.	57,5	52,0	no
Uyali																	
10	12/Hospital	320 m	SE	Ground	55	45	46,3	39,0	47,8	40,4	no	no	no	no		38,8	no
11	13/Kindergarten	50 m	SE	Ground	55	45	51,9	n.a.	53,4	46	no	n.a.	no	n.a.	54,35	43,5	
12	15/Large	30 m	N	Ground	---	---	57,5	n.a.	58,9	51,6	no	n.a.	no	n.a.	54,6	49,4	no

[39] Number of Location where baseline measurements were taken (locations shown in map in annex 6)
[40] Number of Sensitive Receptors according to List in Annex 3
[41] According to IFC EHS guidelines at receptors where standards are already exceeded without the Project an additional maximum increase of 3dB (A) is acceptable and no additional noise protection is required
[42] Baseline day measurements drawn from table 42. No night time measurements were conducted. Average night time values were calculated for selected receptors.

No[39]	Sensitive Receptor Number[40]/Name	Distance to road edge	Side of Building	Floor	Noise Standard. Max. dB (A)		Calculated Noise Level 2021 in dB (A) / Difference to Baseline Measurements[41]		Calculated Noise Level 2031 in dB (A) / Difference to baseline measurements		Conflicts / Exceedance in year 2021 in dB		Conflicts / Exceedance in year 2031in dB		Baseline measurements[42] dB		Requirement of additional noise protection measures (see footnote 44)
					day	night	day	night	day	night	day	night	Day	night	day	night	
	Mosque																
--	14/Mosque		SE	Ground	---	---	48,8	n.a.	50,3	42,9	no	n.a.	no	n.a.	---	40,3	no
--	11/Sundaymarket		E	Ground	75	75	60,2	n.a.	61,6	n.a.	yes	n.a.	no	n.a.	---		no
Kizil-Kala																	
15	20/Mosque	30 m	SE	Ground	---	---	59,3	n.a.	60,7	53,4	no	n.a.	no	n.a.	67,75	50,7	no
--	21/Mosque		E	Ground	---	---	60,7	n.a.	62,1	54,8	no	n.a.	no	n.a.	---	52,1	no
--	19/School		E	Ground	55	45	50,0	n.a.	51,5	44,1	no	n.a.	no	n.a.	---	42,9	no
--	19/School		E	1st floor	55	45	50,8	n.a.	52,2	44,9	no	n.a.	no	n.a.	---	43,5	no
16	22/Kindergarten	150 m	E	Ground	55	45	49,7	n.a.	51,2	43,9	no	n.a.	non	n.a.	53,15	41,4	no
16	22/Kindergarten	150 m	E	1st floor	55	45	50,1	n.a.	51,6	44,2	no	n.a.	no	n.a.	---	41,9	no
17	23/Medical Centre/Hospital	20 m	E	Ground	55	45	61,1 / -2,05	53,7	62,6 / -0,55	55,2	yes	Yes	yes	Yes	63,15	52,6	no
17	23/Medical Centre/Hospital	20 m	E	1st floor	55	45	62,5	55,1	63,9	56,6	yes	Yes	yes	Yes	---	53,9	no
17	23/Medical Centre/Hospital	20 m	E	2nd floor	55	45	63,2	55,8	64,7	57,3	yes	yes	yes	yes	---	54,6	no
17	23/Medical Centre/Hospital	20 m	E	Ground	55	45	60,1	52,7	61,6	54,2	yes	yes	yes	yes	---	51,9	no
17	23/Medical Centre/Hospital	20 m	E	1st floor	55	45	61,0	53,6	62,5	55,1	yes	yes	yes	yes	---	52,6	no
17	23/Medical	20 m	E	2nd floor	55	45	61,9	54,5	63,3	56,0	yes	yes	yes	yes	---	53,1	no

No[39]	Sensitive Receptor Number[40]/Name	Distance to road edge	Side of Building	Floor	Noise Standard. Max. dB (A)		Calculated Noise Level 2021 in dB (A) / Difference to Baseline Measurements[41]		Calculated Noise Level 2031 in dB (A) / Difference to baseline measurements		Conflicts / Exceedance in year 2021 in dB		Conflicts / Exceedance in year 2031in dB		Baseline measurements[42] dB		Requirement of additional noise protection measures (see footnote 44)
					day	night	day	night	day	night	day	night	Day	night	day	night	
	Centre/Hospital																
18	24/School		E	Ground	55	45	48,0	n.a.	49,4	42,1	no	n.a.	no	n.a.	50,4	40,4	no
18	24/School		E	1st floor	55	45	49,0	n.a.	50,5	43,1	no	n.a.	no	n.a.	---kk	41,1	no

433. The above table shows that exceedances of noise standards with regard to the identified sensitive receptors are anticipated to occur in Obikiik and Kizil-Kala. In Uyali the night standard is exceeded for the Kindergarten, but this is considered of being of no relevance because there is only day time use. For the Sunday market in Uyali the standard for commercial areas was taken which is met.

434. –In Obikiik exceedances were calculated for the health centre, for 2 schools and for the professional centre.

435. In addition exceedances were calculated for the medical centre / hospital in Kizilkala which also keeps patients during night time. Also the baseline indices exceeds the standards. The increase for the prognosis horizon 2031 is less than 3 dB. Therefore according to IFC standards no mitigation measures are required. For certain facilities that are not in use during night only the day time values were considered and the night values are indicated as not applicable (n.a.) in the above tables.

436. When comparing the modelled figures with the baseline noise measurements it can be seen that for the buildings at which the modelling shows exceedances also the baseline indices are above the applied standards. Therefore the IFC EHS guidelines need to be considered which specify a maximum increase of 3 dB(A) at receptors. When applying these guidelines none of the identified receptors is above this threshold and therefore no additional noise protection measures are required at the identified receptors for the operational phase. However, for the hospital in Kyzylkala noise protection windows should be implemented, since the noise level exceeds the applicable standard value and the 3 db threshold is only mariginal failed.

437. Also for the residential houses alongside the Project road baseline measuerments are above the legal standards of Tajikistan (see table 36 in the chapter on baseline measurements for noise). In analogy to the conclusions for the public sensitive receptors also for the residential houses the IFC EHS standards need to be applied therefore. For none of the identified residential houses an increase above the threshold value of 3 dB(A) is anticipated. Therefore no further action is required for the operational phase in terms of noise protection measures. This is also valid for day and night time.

438. Based on the results of the noise forecast, it is recommended to monitor the future traffic volumes and consider installation of noise protected windows in the identified school buildings and the medical centers, and built a high wall around the school to decrease effects of operational noise levels to the students.

439. Other alternatives such as acoustic screens and tree belts were also considered but were not found suitable under the given conditions in Obikiik and Uyali. The reason is that acoustic screens usually are not installed within urban areas or villages due to the damaging effect they have on the overall appearance of the scenery. Vegetation belts only have a limited effect on noise reduction. Therefore the option “noise protected windows” is preferred. Additional measures to mitigate noise emissions include a speed limit which is set to 4o km/h within sections passing through settlements and also speed bumps and other road safety installations.

440. Road safety features such as speed control signs, proper road markings, streetlights, pedestrian crossing, livestock crossings and other visual means has been duly provided in the design of the new road.

3. Damages to Drainage and Erosion

441. Damaged drainage can result in damage to local irrigation systems, and erosion can have adverse effect on the road.

Mitigation Measures

442. These damages will be mitigated by conducting routine monitoring of drainage and erosion at least twice a year. In case there are any damages identified these have to be repaired. Defects liability period from the side of the contractor is for 1 year. After this year maintenance and repair, if required have to be done by MoT.

F. Positive Impacts

443. There are many positive impacts associated with the Project. Main positive impacts refer to accessibility, regional cooperation and community impacts.

1. Accessibility and Regional Cooperation

444. The improvement of the Dushanbe – Kurgonteppa road is extremely important for a landlocked country such as Tajikistan It provides access to domestic and regional markets. It will help provide services throughout the country and generation of employment is also enhanced. In addition it is the most important direct surface link between Dushanbe and Afghanistan.

2. Community Impacts

445. Proposed improvements in the road carrying capacity and surface condition are expected to facilitate movement of people, produce, and products along these established travel corridors. Local residents will benefit from easier access to the market

place and improved traffic safety. Manufacturers and processors will benefit from more reliable transportation links between suppliers of raw materials and major markets both within and outside the immediate area. Consumers may be able to more readily access these markets to obtain goods that were previously unobtainable or prohibitively expensive. Within the project area many agricultural households cultivate fruits and vegetables for sale in local markets. The project road is crucial for transporting these products to market where they can be sold to consumers. The project will help alleviate poverty by facilitating transport of produce to more distant markets where grower can receive higher prices.

G. Cumulative Impacts

446. Cumulative impacts can be described as the combined changes of environment that are the result, not only of a single project, but of all human activities, past, present and future (as far as it is foreseeable) in the study area. Hence cumulative impact assessment requires the assessment of the combined effects resulting from implementation of Phase 1 and Phase 2 together, including all the ancillary facilities such as temporary diversions, access roads, borrow areas and disposal sites for surplus material. It thus integrates the identified impacts of Phase 1 and Phase 2 and analyses the social and environmental implications regarding the area of influence when both Project components are considered together.

447. As an example the impacts associated with the implementation of contractor's yard are assessed. Cumulative impacts may arise regarding the potential spread and increase of transmissible diseases due to a significantly larger workforce within the Project area of influence.

448. There are also positive cumulative impacts when considering both Project phases and their ancillary facilities like increased spending capacity.

449. In general it can be concluded that most of the identified Phase 2 specific impacts, positive and negative, will aggravate when assessed together. This is because additive, multiplicative and synergetic effects might occur.

IX. ENVIRONMENTAL MANAGEMENT AND MONITORING

A. INSTITUTIONAL REQUIREMENTS

450. The EMP included in this IEE together with the Construction EMP that need to be prepared by the contractor provide the overall Project environmental management framework.

451. The Construction EMP must be submitted within 30 days of the contract award and Preconstruction and Construction cannot commence until the Construction EMP is approved by the MoT and the Engineer.

452. The Bid Documents for the potential Contractor(s) shall contain two sections relating to environmental issues, firstly a basic clause indicating that the Contractor will be responsible for following the requirements of this IEE EMP and that he should prepare his own Construction EMP for the Project. Secondly, the EMP of the IEE shall be repeated in its entirety as an Annex to the Bid Documents so as the bidder is aware of his environmental requirements under the Project (both Pre-construction, Detailed Design and Construction) and help him put costs to his proposal (such as costs for noise monitoring, etc).

453. The Contract Documents should follow a broadly similar pattern to the Bid Documents. It is not considered necessary to repeat the mitigation measures. The Contract should specify that the Contractor(s) is responsible for implementation of the EMP via his Construction EMP. Again, the EMP should be included at an Annex to the Contract so the Contractor(s) is liable for any non-conformance with the EMP, and thereby this IEE.

454. The Contractor(s) will be responsible for the preparation of the Construction EMP. The preparation of the Construction EMP requires a qualified environmental person. The work will need to be fully compliant with the EMP and will need to be prepared within 30 days of Contract award.

455. During the Construction phase the Contractor must retain the expertise of an Environmental Officer (EO) to update the SSEMP and to oversee and report on the operation throughout the contract period. The EO should be full-time member of contractor's staff.

456. The Construction Supervision Consultant team will include a national and international Environmental Specialist to ensure that the Contractor is compliant with his environmental obligations. Specifically, the Engineer should be responsible for preparing a monthly environmental report outlining the Contractors environmental performance during that period. The national specialist shall be engaged on a full time basis to undertake day to day monitoring of the contractors activities. He will be assisted by the International specialist who will provide intermittent inputs.

B. Environmental Management Plan

457. The EMP describes the various measures proposed under this Project, which were designed to avoid, mitigate, or compensate the adverse environmental impacts that may result from the Project. As such the EMP considers all phases of the Project cycle, namely the detailed design, construction and operational phases of the Project.

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

459. The EMP consists of two tables. Table 1 summarizes the environmental mitigation measures, and table 2 describes the environmental monitoring requirements. At the end is a statement which includes the timeframes and responsibilities for carrying out the environmental monitoring.

Tab. 51 Summary of Environmental Mitigation Measures

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
DETAILED DESIGN PHASE				
Road alignment in areas of tree plantations. There is a considerable number of tree losses involved.	In some cases, tree losses that cannot be prevented. Main species are pines, cypresses, elms, poplars, willows and robinia.	Any tree losses are compensated by new plantations in the ratio of 1:2. Plantations shall be conducted after technical works have been completed. Planting time shall be restricted to spring (March till April) and/or autumn (September till October). Locations for tree plantings are within the existing Right of Way (RoW) at the locations where tree losses occur. Trees to be planted shall have the following parameters: 1.5 – 2 m height, age 5 – 6 years. Distance in between individual trees shall be 10 – 12 m. The following species mix shall be planted: Species: Pines (Pinus spec.), cypresses (Juniperus spec.), maples (Acer platanoides), poplars (Populus alba), willows (Salix alba), walnuts (Juglans regia), ashes (Fraxinus angustifolia) and platanes (Platanus orientalis). Where irrigation channels are running alongside the road, species requiring more moisture such as poplar (Populus alba), willows (Salix alba), maple (Acer platanoides) and ashes (Fraxinus angustifolia) shall be planted. Only native species shall be planted from local genetic stocks.	Design Consultant	PIU
Reconstruction of culverts	Potential damage to local irrigation system if new culverts should not be sufficiently dimensioned or in case that not all existing culverts should be rehabilitated in the course of the road rehabilitation.	In the course of the road rehabilitation all existing culverts will be replaced. All culverts are sufficiently dimensioned in order to prevent any damages or blockages to the existing local irrigation systems.	Design Consultant	PIU

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
Reconstruction of bridge over Obikiik creek, Aksu creek and Vakhsh River	Potential water erosion processes at bridge and river embankments.	Design of erosion protection measures at lower parts of bridge embankments. Prefabricated concrete protection plates prevent erosion processes at the lower and lateral parts of bridge and river embankments. Detailed design of the respective protection measure is drafted in the technical design documentation for the respective bridges.	Design Consultant	PIU
Road traversing through Obikiik, Uyali and Kyzylkala.	Current cross section is too narrow for 4 lanes. If standard cross section is implemented than there is encroachment in environmental structures and private and social property assets (tree losses, masonry retaining wall, private yards, building structures).	The chosen alignment and cross section will aim on reducing the loss of building structures as far as technically feasible. Loss of structures that cannot be prevented will be compensated according to the LARP.	Design Consultant	PIU
Road in close proximity to archaeological relevant areas	Destruction of artefacts	Two phased archaeological investigation Phase 1: Walk over survey Phase 2: Excavation	Archaeological Institute Dushanbe	Archaeological Institute Dushanbe
Road traversing cattle crossings	Accidents because of collision with cattle	Design of cattle crossings or improvement of safety of existing crossings. In total six animal crossings are implemented. Location has been identified based on the public consultation process and approved by the respective authorities	Design Consultant	PIU
CONSTRUCTION PHASE				
Top soil preservation	Loss of top soil.	Removing of top soil occurring within site clearing corridor. Topsoil shall be removed and stored for reuse. Long-term stockpiles of topsoil will immediately be protected to prevent erosion or loss of fertility. For erosion protection it will be sawn with a fast growing vegetation, e. g. grass	Contractor	Construction supervision Consultant (CS)
Disposal areas for stockpiling demolished pieces of structures, surplus soil, pieces of asphalt pavements etc.	Loss of valuable ecological structures if the selected disposal sites are not carefully selected.	No agricultural area or river floodplain shall be selected as disposal site. Minimum distance to any watercourses must be at least 100 m. Disposal sites shall be preferably on barren land without any wooden vegetation.	Contractor	Construction supervision (CS)

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
Selected disposal sites for cut material	Potential wind and water erosion	The contractor is advised to compact end evenly distribute the surplus material by layers where possible, to minimize piling and impacts to landscape. The stockpiles shall be sawn with fast growing grass to avoid erosion by the root system. During dry and windy periods, water should be spread on the disposed material to avoid dusting.	Contractor	Residential Engineer
Road alignment in areas of tree plantations. Embankment filling of the tree stem area.	Tree losses due to embankment fill.	A maximum fill up of the tree stem area of 30 cm can be accepted. Fill up material in the tree stem area has to be organic soil. A filling up of more than 30 cm will damage the tree. In this case cutting can't be prevented and a new tree is to be planted as a compensation measure at the respective location within the existing RoW. Species to be planted are pines, cypresses, elms, poplars, willows, walnuts and robinia Plantings shall be conducted after technical works have been completed. Planting time shall be restricted to spring (March till April) and/or autumn (September till October). Quality of newly to be planted trees shall be 16 to 18 cm of stem circumference in 1 m height.	Contractor	Construction supervision (CS)
Bottom of embankment of designed road lying very close to tree rows	Potential damaging of trees during construction activities	Implementation of a temporary vegetation protection fence during construction activities.	Contractor	Construction supervision (CS)
Construction activities nearby valuable surface waters, in particular Obikiik creek, Aksu creek, Vakhsh River and several irrigation channels	Possible alteration of surface water hydrology resulting in increased sediment by increased soil erosion at construction site	Implementation of settlement ponds at locations where construction site comes close to natural watercourses to retain sediments and mitigate possible impacts on water hydrology. Oil and solid waste management need to be described in the SSEMP and consider these sensitive receptors (rivers and their floodplains). No campsite is allowed near river floodplains. Mitigation measures to reduce silt load include	Contractor	Construction supervision (CS)

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		silt traps and temporary cofferdams. Silt traps must be located at specific locations and not across the water course as this can interfere with the fish movement. In addition, the Contractor must ensure the water to be pumped from the cofferdam is put through a settling pond prior to discharge back into the river.		
Operation of borrow areas and quarries	Potential disfigurement of landscape, vegetation losses and damage to access roads Increased dust emission Siltation and obstruction of surface waters	The proposed borrow area in Vakhsh River is already in operation. Therefore environmental impacts concerning potential disfigurement of landscape, vegetation losses and damage to access roads are kept to a minimum. Wet aggregates and/or provide cover on haul trucks to minimize dust emission and material spillage. In addition watering of unpaved access roads for reduction of dust emission. The hauling traffic should be carried out only between 6.00 am and 9.00 pm. Locate stockpiles away from surface waters. Prior to start material extraction the contractor submit his SSEMP through the Construction Supervisor (CS) to the Executing agency of the PIU indicating the location of the proposed extraction site as well as rehabilitation measures and implementation schedule for the borrow areas and access roads. Rehabilitation measures may not be necessary for borrow areas still in operation after road works have finished. The SSEMP needs to address the sensitive issues of avoidance of transportation through residential areas as far as technically feasible and closure rehabilitation.	Contractor	Construction supervision (CS), PIU
Operation of aggregate crusher	Increased dust emission and noise emission	Careful site selection of aggregate crusher in order not to interfere with any sensitive receptor. Distance to next settlement and residential	Contractor	Construction supervision (CS), PIU.

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		houses at least 1000 m downwind. Site selection for aggregate crusher has to be approved by the PIU..		
Operation of asphalt plant	Odor emission and safety risks	Asphalt plants shall be 1000 m downwind from any settlements and residential houses. Provide spill and fire protection equipment and submit an emergency response plan (in case of spills, accidents, fires and the like) to the authority in responsibility prior to operation of the plant. Secure official approval for installation and operation of asphalt plants from MoT.	Contractor	Construction supervision (CS), Executing agency of PIU.
	Water pollution due to spilled bitumen	Bitumen will not be allowed to enter either running or dry streambeds nor shall it be disposed of in ditches or small waste disposal sites prepared by the contractor. Bitumen storage and mixing areas must be protected against spills and all contaminated soil must be properly handled according to legal environmental requirements. Such storage areas must be contained so that any spills can be immediately contained and cleaned up.	Contractor	Construction supervision (CS)
Site selection, site preparation and operation of contractor's yard	Potential soil and water pollution	The contractor shall submit documents for approval (short statement and site plan in appropriate scale) which indicate: • Site location, surface area required and layout of the work camp. The layout plan shall also contain details of the proposed measures to address adverse environmental impacts resulting from its installation. • Sewage management plan for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses; • Waste management plan covering provision of garbage tons, regular collection and	Contractor	Construction supervision (CS); Safeguard Department in IPIG of MoTC

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with appropriate regulations; • Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from water sources and irrigation facilities. Storage facilities for fuels and chemicals will be located away from watercourses. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination. Prior to the commencement of works the site installations shall be inspected for approval. The selected site will not be on top of ground water area or near surface waters.		
	Competition for water resources	Prior to establishment of the work camps, conduct consultations with local authorities to identify sources of water that will not compete with the local population.	Contractor	Construction supervision (CS)
Site selection, site preparation and operation of contractor's yard (continuation)	Health and safety risks to workers and adjacent communities	For health and safety protection of workers and adjacent communities the following shall be provided: • adequate health care facilities (including first aid facilities) within construction sites; • training of all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work; • personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection in accordance with legal legislation; • clean drinking water to all workers; • adequate protection to the general public, including safety barriers and marking of	Contractor	Construction supervision (CS); PIU

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		hazardous areas; • safe access across the construction site to people whose settlements and access are temporarily severed by road construction; • adequate drainage throughout the camps so that stagnant water bodies and puddles do not form; • sanitary latrines and garbage bins in construction site, which will be periodically cleared by the contractors to prevent outbreak of diseases. Where feasible the contractor will arrange the temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities;		
Work site operation / Operation of equipment maintenance and fuel storage areas	Worker's health and soil / water pollution	The contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual work place. Prior to the commencement of works, the work site personnel shall be instructed about safety rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint etc.) and also the cleaning of the equipment. In preparation of this the contractor shall establish a short list of materials to be used (by quality and quantity) and provide a rough concept explaining the training / briefing that shall be provided for the construction personnel. Locate storage facilities for fuels and chemicals away from watercourses. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination. Store and dispose waste/used oil consistent with environmental legal requirements.	Contractor	Construction supervision (CS); EA of PIU.

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		Work site restoration: After completion of construction works the contractor shall execute all works necessary to restore the sites to their original state (removal and proper disposal of all materials, wastes, installations, surface modeling if necessary, spreading and leveling of stored top soil).		
Operation of construction camp	Road construction projects bear a high potential risk to affect local communities and the health and well-being of those that live in or near to the temporary work camps by supporting the spread of STD and HIV/AIDS. In addition, the transport sector itself actually helps the epidemic, as infrastructure and associated transport services give people and infections mobility.	Providing information to workers, encouraging changes in individual's personal behavior and encouraging the use of preventive measures. The goal of the information is to reduce the risk of HIV / STD transmission among construction workers, camp support staff and local communities.	Contractor	Construction supervision (CS), Ministry of Health
Earth works and various construction activities	Loss of topsoil Water erosion in river	Topsoil shall be removed and reused to cover areas where excess materials will be dumped and on road embankments. In addition a soil management plan shall be provided detailing measures to be undertaken to minimize effects of wind and water erosion on stockpiles, measures to minimize loss of fertility of top soil, timeframes, haul routes and disposal sites. As erosion protection measure at river banks natural stone fillings shall be used as additional measures if required.	Contractor	Construction supervision (CS)
Earth works and various construction activities (continuation)	Siltation of surface waters and/or impact on soils due to improper disposal of excess materials	Mostly all excavated material will be reused. In addition the reclaimed asphalt pavement will be recycled for the construction of new pavement. Thus potential impacts due to the need for disposal of excess material will be kept to a minimum.	Contractor	Construction supervision (CS)
	Competition for water resources	Conduct consultation with local authorities to identify sources of water (for spraying and other construction requirements) that will not compete	Contractor	Construction supervision (CS)

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		with the local population. Water use shall be minimized by recycling and reuse. Technical waste water which will be generated as a result of cleaning and washing equipment, trucks and Batching Plant shall be used for dust suppression measures after treatment, as far as technically possible.		
	Air pollution due to exhaust emission from the operation of construction machinery	The contractor will maintain construction equipment to good standard and avoid, as much as possible, idling of engines. Banning of the use of machinery or equipment that cause excessive pollution (e.g., visible smoke).	Contractor	Construction supervision (CS)
	Disturbance of adjacent settlements due to elevated noise levels	Restrict work between 06.00 am to 9.00 pm within 500m of the settlements. In addition, a limit of 70 dBA will be set in the vicinity of the construction site and strictly followed. In addition the following measures need to be implemented: Noise control at source (using less noisier equipment, mufflers, dampeners, enclosures, proper maintenance of equipment, providing training to operators, etc), noise control at path (using natural structures with screening properties and acoustic barriers).	Contractor	Construction supervision (CS)
	Soil compaction due to operation of heavy equipment	Confine operation of heavy equipment within the corridor that is absolutely necessary for the road construction to avoid soil compaction and encroachment into agricultural used land close to the road.	Contractor	Construction supervision (CS)
Earth works and various construction activities (continuation)	Traffic impairment	Submit a traffic management plan to local traffic authorities prior to mobilization. Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions Allow for adequate traffic flow around construction areas. Provide adequate signalization, appropriate	Contractor	Construction supervision (CS), EA of PIU.

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		lighting, well - designed traffic safety signs, barriers and flag persons for traffic control.		
Archaeological chance finds	Potential damage to archaeological artefacts due to construction activities, particularly earthworks	In the event of the unexpected discovery of archaeological objects during construction operations the contractor shall immediately inform the residential engineer who will notify the Institute of Archaeology / Ministry of Culture and the PIU for further instructions. In this case the construction works at the localized site would be stopped until Institute of Archaeology give clearance for the continuation of the operations. Works will resume only after appropriate measures have been taken as requested by the Institute of Ministry of Culture and confirmation has been received that works may continue.	PIU, Residential Engineer and Contractor	PIU and Institute of Archaeology
Within settlements, encroachment into building structures private assets and residential land	Dislocation or involuntary resettlement of people.	Resettlement Specialist will issue LARP covering assessment of loss and compensation procedure.	EA of PIU	EA of PIU
Within settlements. Potential damage due to vibration at locations where the Project road comes close to residential buildings in Obikiik, Uyali and Kizilkala.	Damages to buildings	For the preservation of evidence the contractor is advised by PIU to document the condition of houses close to the road. Photographs of all residential houses nearby the road will be taken as a protection for possible complaints regarding damages in house walls etc. This is part of the contract.	Contractor	CS
As above	As above	Where the results of the vibration monitoring show that the specified construction vibration limit is reached at a particular location, the Contractor shall suspend instantly the construction activities that generate the excessive vibration at such location, notify the Engineer and take mitigative actions necessary to keep the construction vibration within the specified limit. Such actions may include, but shall not be limited to alternative construction methods such as: • decrease of vibration emission from the particular equipment item	Contractor	CS

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		• substitution of the particular equipment item at such location by a modern equipment capable of efficient vibration control • use of smaller equipment • decreasing the thickness of material layers below the maximum thickness permissible under the specification • compaction without vibration rollers, or • any other method of Contractor's choice that may be used in order to comply with this specification. • During construction phase vibration levels will be monitored as indicated in the monitoring programme.		
Within settlements, encroachment on business assets and / or Disturbance to business, people, activities and socio-cultural resources due to construction work	Loss of businesses and income of people operating their business within the existing RoW	Resettlement Specialist will issue LARP covering assessment of loss and compensation procedure. In addition the following mitigation measures shall be implemented: Inform all residents and businesses about the nature and duration of work well in advance so that they can make necessary preparations. Limit dust by removing waste soil quickly; by covering and watering stockpiles, and covering soil with tarpaulins when carried on trucks Increasing workforce and use appropriate equipment to complete the work in minimum time in the important areas Avoid construction work in sensitive times like festivals near religious places	EA of PIU	EA of PIU
Within settlements disproportionate encroachment on poor people's assets.	Loss of wealth and property of poor people. Poor and vulnerable households might be affected.	Resettlement Specialist will issue LARP covering assessment of loss and compensation procedure.	EA of PIU	EA of PIU
Construction activities in close vicinity to existing infrastructure such as water supply pipes and other	Damage to infrastructure, supply cuts of infrastructure services.	Measures will be ensured in engineering designing to avoid any disturbance to the existing infrastructure.	Contractor	Construction supervision (CS); PIU

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
facilities, waste water discharge facilities, electricity lines etc.		Prior to construction start the respective service agencies shall be informed about the construction work. Coordinate with respective agencies and provide prior information to the public in case of any required disruption in services during construction		
Rehabilitation works within villages, settlements and along sensitive receptors such as schools and hospitals.	Noise exceeding applicable noise standards. Vibrations may result in damage to local infrastructure, including private property and local (haulage) roads. Within the settlements of Obikiik, Uayali and Kyzylkala there will be noise monitoring according to the stipulations in the montoring programme.	For sensitive receptors of public interest such as schools and hospitals and also for residential houses alongside the Project road applicable noise standards shall be complied with as far as technically feasible by means of noise measurements. In case of exceed of standards, ascribe of time restrictions for construction activities between 7 am and 6 pm. Close to schools, construction work to be undertaken only during school breaks. For potential damages to local infrastructure, including private property and local (haulage) roads, compensation procedures will have to be established prior to the beginning of construction and approved by the engineer. In addition grievance redress procedures shall be put in place to facilitate communication between the contractor and potentially affected people. In addition haul routes and construction site access roads should be discussed and jointly approved between the contractor and local officials to minimize the risk of conflicts.	Contractor	Construction supervision (CS); PIU.
As above	Construction noise	To avoid excessive noise levels near sensitive receptors the following mitigation measures are foreseen. All construction equipment should be fitted with suitable engine mufflers. All mobile equipment should be maintained in good mechanical condition.	Contractor	CS

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		No plant and equipment shall be left running if not required for immediate use. Where this is not practicable, equipment shall be set to idle in the quietest manner to minimise noise emissions. Where feasible equipment modifications should be considered, such as dampening of metal surfaces, which is effective in reducing noise due to vibration. Temporary noise barriers will be utilised for those areas where sensitive receptors are significantly affected during construction. Temporary barriers are typically constructed from plywood and should be of sufficient height to screen acoustic line-of-sight between the receiver and the noise source. Construction noise barriers should be implemented if effective and practicable. This would be decided on a case-by-case basis.		
Construction activities close to building structures, particularly within settlements of Obikiik, Uayali and , Kyzylkala. Aggregate extraction. Haulage of aggregates and construction equipment.	Potential Impact on Community Health and Safety	a. The community members will be advised on road safety with the key messages reinforced with communities throughout construction. b. Clear signs will be placed at construction sites including borrow pits, in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials and excavation and raising awareness on safety issues. c. Heavy machinery will not be used after day light and all such equipment will be returned to its overnight storage area/position before night. d. All sites including storage areas will be made secure, prohibiting access by members of the public by fencing when appropriate.	Contractor	Construction supervision (CS); PIU.

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		e. Install barriers to keep pedestrians away from hazardous areas such as constructions sites and excavation sites. f. Install signage at the periphery of the construction site advising road users that construction is in progress. g. Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, medical places and other populated areas located. h. Provide security personnel in hazardous areas to restrict public access. j. If necessary, provide safe passageways for pedestrians crossing the construction site and for people whose access has been disrupted due to construction woks.		
Utilities Provision All sites where utilities will be interrupted	Potential impact on community health and safety	a. The affected people will be consulted during project implementation and will make the project contractors aware of any significant issues resulting from loss of electricity. b. People will be informed in advance of any power cuts and the duration of the cut will be made clear in order that they can plan around the lack of power.	Contractor	Construction supervision (CS); PIU.
Traffic Management. All construction sites	Potential impact on community health and safety	a. Implement a traffic management plan that will set out how access along the project road will be maintained safely during construction. b. Provide clear signs to guide road users and advise them on changes to road priorities in order to make their journey as smooth as possible and to ensure road safety as unanticipated changes e.g. change of lane, will be avoided.	Contractor	Construction supervision (CS); PIU.

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		c. Ensure access in areas to be closed temporarily by providing temporary/alternative access.		
Possible damage to properties and community facilities. Construction sites.	Community Health and Safety impacts	a. Immediately repair and/or compensate for any damage caused by construction works and activities to existing communities and their property and facilities b. Maintain access roads used for transport of construction materials and other construction related activities are maintained to ensure that they remain in at least in their pre-project condition for the duration of the project.	Contractor	Construction supervision (CS); PIU.
OPERATION PHASE				
4-lane road passes through Obikiik, Uayali and Kyzylkala.	Within this section noise levels during operational phase might exceed the standards at identified sensitive receptors (school, medical center and residential buildings nearby the <Project road).	Based on the results of the conducted baseline measurements already now the Tajikistan legal standards are exceeded. Based on the conducted modelling no further exceedances above the EHS threshold of 3 dB(A) is anticipated. Therefore no noise protection measures are required for the operational phase. However, it is recommended to monitor the future traffic development and consider installation of noise protected windows at the hospital in Kyzylkala and other sensitive receptors of public interest such as schools and Kindergartens. To the school located closest to the road built a high wall around the school to decrease effects of operational noise levels to the students.	PIU	PIU
Increased traffic flow	Elevated levels of gaseous and noise emissions due to increased traffic. In addition increased pedestrian vs. vehicle accidents due to traffic volume and higher speed as a result of improved road design	Integrate in the engineering design safety features such as speed control signs, proper road markings, streetlights, pedestrian crossing, livestock crossing and other visual means.	Design Consultants	Construction Supervision (CS)
Increased traffic volumes and higher vehicle speeds	Increased risk of accidents with possible spills of harmful substances	Spill-contingency plan A contingency plan or emergency response plan is a set of procedures to be followed to minimize the effects of an abnormal event on the Project roads, such as a spill of oil, fuel or other	PIU	PIU

MITIGATION MEASURES DURING DESIGN, CONSTRUCTION AND OPERATION				
Activity / Location	**Potential Impact**	**Mitigation measures**	**Institutional Responsibility**	
			Implement	Monitor
		substances that may harm drinking water resources or have adverse effects on the natural balance of sensitive areas. Additional measures to mitigate risk of accidents and spill of harmful substances are speed control and weight stations.		
Damaged drainage or uncontrolled erosion.	Harmful environmental impacts resulting from damaged drainage or uncontrolled erosion.	Routine monitoring of drainage and erosion control at least twice a year.	EA in PIU	EA in PIU

460. Prior to construction works, the contractor shall provide a comprehensive Construction EMP covering the following aspects:

- Dust management which shall include schedule for spraying on hauling and access roads to construction site and details of the equipment to be used
- Layout of the work camp and details of the proposed measures to address adverse environmental impacts resulting from its installation
- Sewage management including provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses
- Waste management covering provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with appropriate regulations
- Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from water sources and irrigation facilities. Storage facilities for fuels and chemicals will be located away from watercourses. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination
- Soil Management Plan detailing measures to be undertaken to minimize effects of wind and water erosion on stockpiles of topsoil and excess materials, measures to minimize loss of fertility of top soil, timeframes, haul routes and disposal sites for excess materials.
- Emergency response plan (in case of spills, accidents, fires and the like) prior to operation of the asphalt plant
- Method statement or plan for the execution of bridge construction works including measures that will be undertaken to address adverse environmental impacts such as erosion of river embankment and siltation of watercourses that may result from such activities
- Traffic Management Plan
- Borrow Pit Management Plan
- Tree cutting and planting plan
- Asphalt plant and concrete plant plan

461. The Construction EMP shall be submitted by the contractor for approval to the Construction Supervision Consultant

C. Environmental Monitoring Plan

462. Environmental monitoring is an important aspect of environmental management during construction and operation stages of the project to safeguard the protection of environment. During construction, environmental monitoring will ensure the protection of embankment from potential soil erosion, borrow pits restoration, quarry activities, location of work sites,

material storages, asphalt plants, community relations, and safety provisions. During operation, air, noise, and surface water quality monitoring will be important parameter of the monitoring program.

463. The parameters to be monitored are outlined in the following plan. The client shall supervise the road project regularly, and submit quarterly reports based on the monitoring data and laboratory analysis report.

Tab. 52 Environmental Monitoring Plan

Issue	What parameter is to be monitored?	Where is the parameter to be monitored	How Is the parameter to be monitored?	When is the parameter to be monitored? Frequency	Institutional responsibility
Construction stage					
Water quality in surface waters (rivers). Natural surface waters are Obikiik creek, Aksu creek and Vakhsh river. River. In addition water quality in the large irrigation channels at km 60+880 in Uyali (Bridge 11) and km 46+750 before Mekhnat (Bridge 10)	pH, suspended solids, BOD5, dissolved oxygen, salinity, oil prodicts and electrical conductivity	Down- and upstream where the Project road crosses the rivers. For Vakhsh river 500 m, for Obikiik, Aksu creek and the irrigation channels at at km 60+880 in Uyali (Bridge 11) and km 46+750 before Mekhnat (Bridge 10)100 m up and downstream the existing bridge.	Measurement either directly in river water with a suitable measurement device or sample taking and measurement in a certified laboratory.	Baseline measurements before construction activities commence. Than measurements on a quarterly basis during construction stage.	SC (Supervision Consultant) and EA of PIU.
Noise Rehabilitation works within settlements at locations where the Project road runs close to sensitive receptors such as schools, hospitals, mosques, bazars or other sensitive socioeconomic infrastructure. Affected settlements are Obikiik, Uyali and Kyzylkala. ,	Measurement of noise and vibrations-	Measurements shall be undertaken within the traversed settlements of Obikiik, Uyali and, Kyzylkala.	By means of portable noise / vibration measurement device	Prior to construction and during construction activities. Establishment of baseline conditions before construction start. Than monitoring measurements on a quarterly basis during construction stage.	SC (Supervision Consultant).

Issue	What parameter is to be monitored?	Where is the parameter to be monitored	How Is the parameter to be monitored?	When is the parameter to be monitored? Frequency	Institutional responsibility
Air quality deterioration	Dust, SO2, NOx, CO	Measurements shall be undertaken within the traversed settlements of Obikiik, Uyali and Kyzylkala. In addition there need to be air quality measurements near the asphalt plant and the aggregate crusher.	By means of suitable portable measurement device	Prior to construction and during construction activities. Establishment of baseline conditions before construction start. Than monitoring measurements on a quarterly basis during construction stage.	SC (Supervision Consultant).
Potential tree losses because tree stem area is subject to embankment filling.	Trees located within the newly designed embankment.	At respective tree locations.	Inspections; observation. An embankment fill of up to 30 cm at the bottom of the tree stem area can be accepted. A filling up of more than 30 cm will damage the tree and cutting will be necessary. Decision is to be made by the construction supervision engineer.	During construction phase.	Construction Supervision (CS)
Top soil preservation	Stockpiling and means of protection	Job site	Inspections; observation	Upon preparation of the construction site, after stockpiling and after completion of works on shoulders	Construction Supervision (CS
Equipment servicing and fuelling	Prevention of spilling of oil and fuel	Contractor's yard	Inspections; observations	Unannounced inspections during construction	Construction Supervision (CS)

Issue	What parameter is to be monitored?	Where is the parameter to be monitored	How Is the parameter to be monitored?	When is the parameter to be monitored? Frequency	Institutional responsibility
Worker's safety and health	Official approval for worker's camp; Availability of appropriate personal protective equipment; Organization of traffic on the construction site Provision of safety training to the staff according to the requirements of the individual work place	Job site and worker's camp	Inspection; interviews; comparisons with the Contractor's method statement	Weekly site visits by the hired Health and safety expert. Unannounced inspections during construction and upon complaint.	Construction Supervision (CS)
Worker's education on AIDS and STD	Has relevant education been provided?	To be determined by assigned Construction Supervision	To be determined by assigned Construction Supervision	After beginning of works and at appropriate intervals throughout construction	Construction Supervision (CS)
Material supply Asphalt plant	Possession of official approval or valid operation license	Asphalt plant	Inspection	Before work begins	Construction Supervision (CS)
Borrow areas	Possession of official approval or valid operation license	Sand and gravel borrow pit and / or quarry	Inspection	Before work begins	Construction Supervision (CS)
Material transport Asphalt	Are the truck loads covered or wetted?; Compliance with the Contractor's method statement	Job site / haul routes	Supervision	Unannounced inspections during work	Construction Supervision (CS)
Stone		Job site / haul routes	Supervision spot checks	Unannounced inspections during work	Construction Supervision (CS)

Issue	What parameter is to be monitored?	Where is the parameter to be monitored	How Is the parameter to be monitored?	When is the parameter to be monitored? Frequency	Institutional responsibility
Sand and gravel	(restricted working hours; haul routes) dust suppression methods where required	Job site / haul routes	Supervision	Unannounced inspections during work	Construction Supervision (CS)
Surface water protection	Contractor's compliance with his approved method statement	Bridges and Culverts	Inspection	Unannounced inspections during bridge and culvert works	Construction Supervision (CS)
Air pollution from improper maintenance of equipment Asphalt plant and Machinery	Exhaust fumes, dust	At site	Measurement at asphalt and crushing plants. Regular check certificate of vehicles and equipment	Unannounced inspections during construction works	Construction Supervision (CS
Planting of new road side trees	Regular monitoring and control of successful growth of new planted trees	At locations of new planted trees	Replanting of trees that have died	Monitoring to be conducted in autumn so as to allow for replacement of failures	Contractor 1st Year / EA of PIU in the subsequent Year(s)
Operational stage					
Increased road kills of animals due to higher traffic loads and vehicle speeds	Road kills of animals	Along the new road	Keep records of accidents. In the case that accident hot spots with large mammals are identified, appropriate protective measures shall be elaborated (e.g. reflectors / local fencing, warning signs, speed reductions etc.)	Throughout the Year	MoT
Increased traffic volumes may increase possible spills of harmful substances	Accidents that cause spills of harmful substances	Along the new road	Counting of accidents	Throughout the Year	MoT

Issue	What parameter is to be monitored?	Where is the parameter to be monitored	How Is the parameter to be monitored?	When is the parameter to be monitored? Frequency	Institutional responsibility
Damaged drainage or uncontrolled erosion	Leakages in drainage system and damages due to erosion	Culverts and drainage facilities	Documentation	Throughout the Year	MoT
Based on the results of the noise forecast there might be possible exceedances of noise standards at the school buildings and the health centre in Obikiik and at the medical centres in Kyzylkala.	Noise level	At the school buildings and the health centre in Obikiik and at the medical centres in Kyzylkala.	By means of portable noise measurement device	In the opening year 2020. In subsequent years until 2030 one measurement per year.	MoT

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Tab. 53 Cost Estimate for Mitigation Measures (USD)

Description	Unit	Quantity	Rate USD	Amount USD
Protection of Environment				
Planting, maintenance and watering (during construction stage) of trees on the road side as explained in the EMP. Section 1	Pieces	8.000,00	22.00	176.000,00
Protection of trees during the construction activities.	l.s.			3.000,00
Preparation of Construction EMP	L.s.			10.000,00
Clearing of Construction Corridor.	l.s.			Included in civil engineering works
Removal and Storage of Topsoil.	l.s.			Included in civil engineering works
Protection of Water Resources.	l.s.			Included in civil engineering works
Management of Solid Waste and Sewage Waste from the Construction Camp.	l.s.			Included in civil engineering works
Potential restoration of Work and Storage Sites, Quarries and Borrow Pits, Construction Site Roads.	l.s.			Included in civil engineering works
Dust suppression measures during dry period (water spraying)	L.s.	Daily during dry summer period (3 periods)	10.000,00	30.000,00
Securing of Storage and Equipment Maintenance Areas.	l.s.			Included in civil engineering works
Contractor's Safeguard Specialist	month	30	2.000	60.000,00
Supervision Consultant's National Safeguard Specialist	month	16 (includes one month training)	3.000	48.000,00
Supervision Consultant's International Safeguard Specialist	month	6	20.000	120.000,00
HIV / AIDS Seminar	Every 4 months during construction time	9	1.000	9.000,00
Noise protected windows (double glass windows). Delivery and installation.	l.s. Estimate in m²	1000 m²	100 USD per m²	100,000,00
Training of PIU Safeguard Department	L. s.			30,000.00

Description	Unit	Quantity	Rate USD	Amount USD
Archaeological Inverstigation	L. s.			25.000,00
Subtotal (Mitigation and Management Measures)				**611.000,00**

Tab. 54 Cost Estimate for Baseline Monitoring (USD)

Description	Unit	Quantity	Rate USD	Amount USD
Baseline Monitoring				
Noise Monitoring. Baseline measurement. Than quarterly measurements over construction time in Obikiik, Uayali and Kyzylkala.	Number	195: 15 locations multiplied by 13. (1 baseline measurement and 12 construction period measurements)	100,00	19.500,00
Vibration Monitoring over construction period,	Number.	130: 10 locations multiplied by 13. (1 baseline measurement and 12 construction period measurements)	100,00	13.000,00
.Dust and air pollutants measurement over construction period. Location Obikiik, Uayali and Kyzylkala. Asphalt plant and aggregate crasher	Number	225 Quantity as noise measurements plus asphalt plant and aggregate crusher.	150,00	33.750,00
Water quality monitoring in Obikiik creek, Aksu creek and Vakhsh River. In addition water quality monitoring in the large irrigation channels at km 60+880 in Uyali (Bridge 11) and km 46+750 before Mekhnat (Bridge 10)	. Number	140 20 baseline measurements (2 for each waterbody) plus 120 monitoring measurements.	200,00	28.000,00
Subtotal (Monitoring)				**94.250,00**
Total (Mitigation Measures plus Monitoring)				**705.00,250**

X. STAKEHOLDER CONSULTATION AND INFORMATION DISCLOSURE

A. Consultation Process

464. The IEE process for the Dushanbe – Kurgonteppa road rehabilitation project includes stakeholder participation and consultation to help MoT to achieve public acceptance of the project. The purpose of the Public Consultation is 1) inform people about the project, 2) receive a feedback, 3) incorporate all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, etc. According to the SPS of ADB the Public Consultation begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle". Consequently starting from the initial project stage consultations were conducted in all project affected villages. People were invited on Jamoat basis. All chairmen of Project affected Jamoats were contacted and invitation of all Project affected people in the villages arranged. In addition with there have been consultations with Hukomat and city authorities in order to assure that all project affected people, stakeholders and officials were reached and informed about the Project.

465. During the consultation meetings the Project and the potentially occurring environmental and social impacts including possible mitigation measures were explained. The minutes of the meetings are attached in the annex.

466. The environmental specialist took part in communication meetings with social team undertaken in village of Mehnat, Hiloli jamoat, Huroson district and village of Chahkiko, Bohtaryen Jamoat and Bohtar district. It was found that environmental issues are not a priority concern for most of people living near the right of way. Main concerns were on compensation issues, also regarding anticipated impacts such as noise and air pollution during construction, this was for instance mentioned in the village of Mehnat.

467. During consultation in the village of Chahkiko of Bahtoryian jamoat a local man living near the road stated that even noise from the current road creates many of problems for his family. By his words, he and his family often feel headache, and discomfort due to traffic noise. He was concerned by the anticipated increase of the level of noise after widening of the road and increase the traffic.

468. It was answered that this issues requires further investigation. In the case if the level of predicted noise will increase the valid Tajik standards values for allowed level of noise in residential areas the noise reducing barriers may be designed if possible and necessary.

469. On the whole people living along the road expressed the support to the Project.

470. The following consultations has been conducetd (Table 22). MoM of the consultations are attached.

Tab. 55 Consultations with Communities

No	Date	Location (Jamoat/Rayon)	No of participants		
			Males	Females	Total
1	07.03.2017	Khurason Rayon, Obikiik Jamoat,	33 men	14	47

		Village: I. Somoni			
2	09.03.2017	Galaobod Jamoat, Village: Chashmasor	9		9
3	10.03.2017	Hiloli Jamoat, Village: Mehnat	13	1	14
4	13.03.2017	Ayni Jamoat, Village: Chorbog/Khurason	52	13	65
5	14.03.2017	Kizil-Kala Jamoat, Village: Bandar	59		59
6	15.03.2017	Village Chahiho	16	1	17
Total			**182**	**29**	**21198**

B Information Disclosure

471. MOT will make the environmental assessment and other environment-related documents available in accordance with Tajikistan's and ADB requirements for disclosure. Timing for disclosure is scheduled immediately after obtaining of the SEE (State Ecological Expertise) m which is the clearance (environmental permit) from the State Agency of Environmental Protection.

472. After finalization the IEE report documenting the mitigation measures and consultation process will be submitted to MoT and ADB and will be disclosed on ADB and MOT websites.

C. Grievance Redress Mechanism

1 Objectives

473. The scope of the GRM addresses issues related to involuntary resettlement, social and environmental performance, and information disclosure.

474. The LARP includes in its scope the establishment of a responsive, readily accessible and culturally appropriate grievance redress mechanism (GRM) capable of receiving and facilitating the resolution of affected persons' concerns and grievances related to the project. There is one GRM which applies to social, resettlement and environmental concerns of project affected people and stakeholders. The GRM is a formalized way for the PIURR to identify and resolve concerns regarding environmental and social issues including DPs' grievances. It offers stakeholders and DPs a forum to voice their concerns, seek clarifications to their queries, or register complaints related to the Project's performance.

475. Any stakeholders and the DPs will have the right to file complaints and/or queries on any aspect of the Project, including environment, land acquisition and resettlement. Under the adopted grievance mechanism, the DPs may appeal any decision, practice or activity related to the Project. All possible avenues will be made available to the DPs to voice their grievances. The PIURR will ensure that grievances and complaints on any aspect of the project are addressed in a timely and effective manner.

476. The fundamental objectives of the Grievance Redress Mechanism are:

- To reach mutually agreed solutions satisfactory to both, the Project and the DPs, and to resolve any grievances locally, in consultation with the aggrieved party;
- To facilitate the smooth implementation of the LARP, particularly to cut down on lengthy litigation processes and prevent delays in Project implementation;
- To facilitate the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people.
- To consider raised concerns and complaints on environmental issues as far as it is technically feasible;

477. The MOT issued a letter No 516 on 20 May, 2016, requiring the establishment and development of the GRM at the jamoat (sub-district) level. (Annex 5-1 in the LARP document) The Grievance Redress Committees (GRC) are established at the jamoats at each Project district and the PIURR levels. The GRCs include the following institutions and their representatives:

- Rayon jamoat's chairman or person authorized by jamoat (raisi mahala);
- Land planning engineer
- The jamoat chairman (focal point to accept and register grievances);
- Rayon's State Committee on Land Use and Geodesy;
- Rayon's architecture department;
- State executive authority/ deputy head of district.

478. All grievances related to the Project will be addressed with the participation of the PIURR, Consultant and Contractor's representatives. In more complex cases, representatives of other authorized institutions will be invited. The GRM covers issues related to social, environmental and other safeguard issues under the ADB SPS 2009 and applicable laws of Tajikistan.

479. The PIURR members of the GRCs include:

- Chief Engineer
- Social safeguard specialist
- Environmental safeguard specialist
- MoT lawyer
- Other specialists as necessary

480. There are five Grievance Redress Committees at the jamoat level - one in each Project jamoat and one at the central level. A Focal Person (FP) is appointed at each Project jamoat and at the PIURR. The PIURR FPs participated in all consultations with communities and shared their 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.

481. The GRCs will function for the duration of the project implementation. The PIURR and the PPTA Consultant conducted training for members of five GRC at the jamoat's level. (Annex 5-2 in the LARP document).

2 Grievance Resolution Process

482. Grievances can be lodged with the Focal Person at the jamoat's GRC. The jamoat's FP, in consultations with the PIURR safeguard specialist, will screen the grievance for eligibility. If eligible, the jamoat's FP will organize a meeting of the Grievance Redress Committee (GRC). The PIURR representatives will be informed and invited to the meeting.

483. The complaint registered with the GRM should be reviewed, addressed and a decision made on its relevancy to the Project within 14 calendar days of lodgment. If the case is complex or requires more detailed investigation (e.g. inspection by technical experts or legal opinion from the state or certified private entities) the complaint review period may be extended to 30 calendar days or more, if necessary. In such cases, written notification should be sent to the complainant explaining the reasons for extension, describing the process and indicating the expected dates for the delivery of the results of the revision.

484. All supporting documents such as, photographs, related certificates and legal and technical expert opinions, if required, should be prepared, reviewed and assessed. Once the complaint is resolved, the GRC will organize a complaint closure meeting, where the complainant confirms the closure of the complaint. The PIURR representative will oversee the resolution of the complaint.

485. If the complaint is found to be invalid, the GRC formulates a response and sends a written letter to the complainant, explaining the reasons for the rejection. The complainant may lodge the case in the local court or at the ADB Accountability Mechanism at any time of the grievance process. The GRM at the Project level does not impede the access of DPs to the ADB Accountability Mechanism (AM) or to the country's judicial or administrative remedies. All complaints and resolutions will be properly documented by the PIURR and made available for review, monitoring and evaluation purposes.

486. If DPs want to register a complaint with the ADB AM, the Focal Person will provide the complainants the following contact information:

- National Social Safeguards Focal Point
- Resident Mission of Asian Development Bank in Republic of Tajikistan
- 45 Sovetskaya Street, Dushanbe. Tajikistan
- Tel: 992 372 210558

- and/or

- Special Project Facilitator Asian Development Bank
- Email: to be access from www.adb.org/site/accountability-mechanism/contacts
- Fax number: (63-2) 636-2490

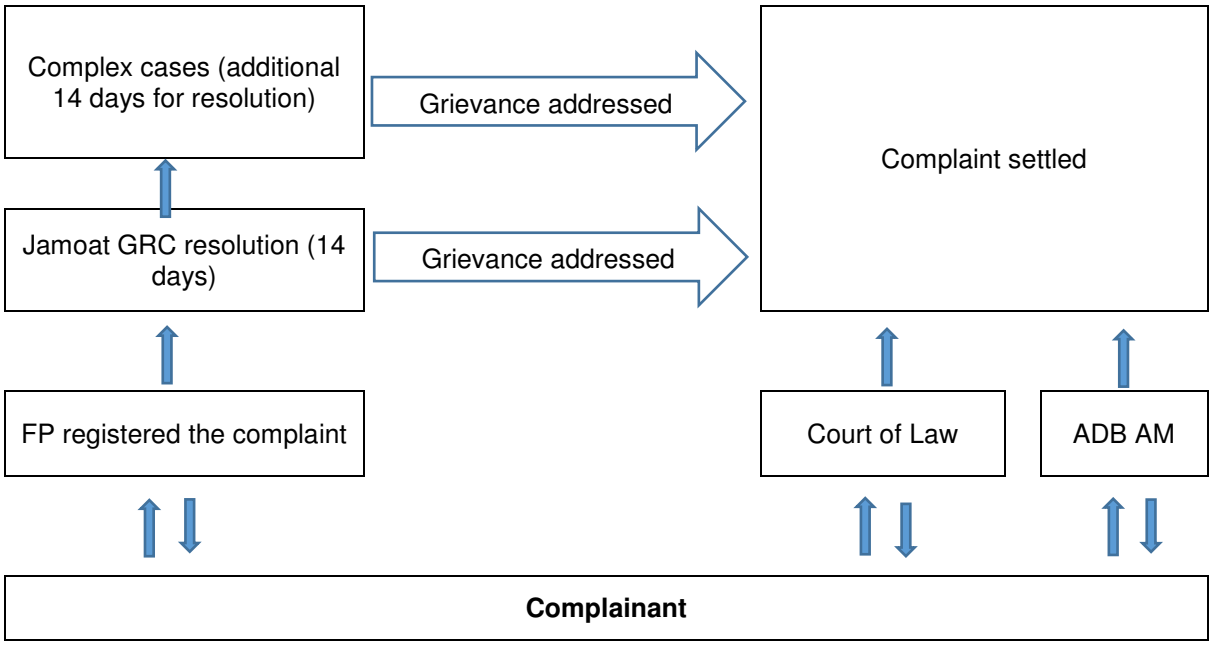
487. When the grievance is forwarded to ADB (TJRM), ADB will contact PIU/MoT to review the case and suggest the resolution at the project level. In case of complex

issues and not reaching an agreement, the case will be logged to the AM of ADB. All reports on the GRM decisions and evidences will be included.

488. All efforts will be made to settle issues at the Project level. All complaints and resolutions will be properly documented by the PIURR and made available for review, monitoring and evaluation purposes. PIU safeguard specialist keeps regular contact and will have a database for the whole project grievances cases including status of grievances. This report will be regularly included in monthly project progress reports.

489. The grievance redress process is shown in the Figure below.

Fig. 39: Grievance Redress Process



490. GRM proceedings may need one or more meetings for each complaint and may require field investigations by specific technical or valuation experts. Grievance cases shared by more than one complainant may be held together as a single case.

491. For appeals lodged directly to the MoT, the FP at PIURR will review the case together with the respective GRC at jamoat level and attempt to find a resolution together with the aggrieved person.

492. At each level of appeal, the GRC will be assisted, as required, by the professional capacity needed to solve specific cases. This may include among others:

- Jamoat and/or hukumat representatives
- Rayon land committee

- Representatives of the State Agency for Architecture
- The State Committee for Land Management and Geodesy (SCLMG)Ministry of Architecture
- State Agency for Environment and Forestry
- State Unitary Enterprise for Housing and Communal Services
- Technical expertise from professional engineers
- Other specialized organizations as necessary

3 Duties of GRC Members

Focal Point (FP)

493. Once the FP receives a written notification of a complaint s/he will:

- Based on the simple screening procedure, asses the grievance and determine if the grievance is eligible for the GRM; if eligible, register the grievance in the complaints logbook;
- Wright a grievance summary to be signed by the complainant and the FP indicating name of the complainant, date and place of presentation of complaint, description of complaint and supporting documents, if any;
- Send the complaint summary to all members of the local level GRC;
- Convey requests and enquiries of the complainants to PIURR/MOT and to the other members of the GRC at the local level;
- Organize a grievance redress meeting;
- Maintain records of each meeting and each communication between the FP/GRC and the complainants;
- Participate at appeal cases at all levels;
- Ensure the administrative and organizational support for GRC members.

Supervision Consultant Resettlement Specialist

494. Once notified of a complaint and invited the FP to a grievance meeting the Consultant will:

- Participate to all grievance meetings, provide opinions and analysis;
- Accompany eventual assessment/valuation specialists in the field,
- Provide other GRC members as relevant with opinion and suggestion for resolution to be reflected in the final meeting report.

GRC Chairperson / Head/Deputy of PIURR of MoT

495. Once notified that a complainant has lodged an appeal case at the central level, the GRC chairperson will:

- Review the local level GRC decision;
- Invite the GRC members to the meeting;
- Chair the GRC meetings and ensure that the minutes of the meeting are taken and shared with all relevant parties;
- Inform the aggrieved person of the GRC's decision;
- Ensure the administrative and organizational support for GRC members to work;
- Support the decision made by the GRC and follow up to ensure action is taken.

PIURR Project Coordinator

496. Once notified that a complainant has lodged an appeal case at central level project coordinator will:

- Participate in all grievance redress meetings at jamoat and central level, provide opinions and analysis;
- Ensure that records at jamoat GRC are maintained;
- Request additional assessment/valuation specialists' opinions and accompany them in the field if needed;
- Request that the chairperson organizes meetings, as necessary;
- Ensure a proper PIURR Complaint Register is maintained.

Representatives of the PIURR Safeguards Unit

497. Once notified that a complainant has lodged at the central level, the representatives of the PIURR safeguard and technical unit will:

- Participate in GRC meetings at local and central level;
- Prepare the chronology of events to understand the sequence of developments prompting the complaint;
- Provide opinion on resettlement impacts claimed by the claimant;
- Request that the chairperson organizes meetings, as necessary;
- Maintain communication between the GRC and the complainants.

Technical Experts

498. When requested by the PIURR to provide a technical expertise for the assessment of an impact claimed by the complainant, the relevant expert will:

- Examine the case, perform relevant tests or an investigation;
- Prepare a short report based on the results of the examination completed;
- Recommend if further or additional legal opinion or expertise is needed to make a judgment on the substance of the case.

4 GRC Complaint Register, Records and Documentation

499. The PIURR of the MoT will maintain the complaint register. This will include a record of all complaints for regular monitoring of grievances and results of services performed by the GRCs for periodic review by the ADB. A sample of the GRC Grievance Registration Form can be found in Annex 5-2.

D. Implementation Arrangements

500. The overall responsibility for implementation of the Project lies at the GoT. The relevant organizational entity for the project implementation is the Execute Agency of the PIU which is part of the MoT.

501. MoF (Ministry of Finance) is the responsible government body for coordination with ADB and other donors for foreign assistance.

502. Environmental permitting and monitoring of Project implementation is within the responsibility of the State Ecological Review Committee and its regional offices. Furthermore, according to the 2012 Law on State Ecological Expertise, all civil works, including rehabilitation ones, should be assessed for their environmental impacts and the proposed mitigation measures should be reviewed and monitored by the CEP (Committee for Environmental Protection under the Government of Tajikistan).

503. Responsibilities for the implementation of the environmental mitigation measures and monitoring measures during construction phase will be taken over by the Supervision Consultant who will report to the PIU on a regular basis.

504. The tender and contract documents will clearly set out the contractor's obligations to undertake environmental mitigation measures set out in the Environmental Management Plan.

505. PIU will monitor and measure the progress of implementation of the EMP. In this regard semiannual monitoring reports during construction stage will be prepared by the Construction Supervision Consultant and submitted to within 1 month after the reporting period.

XI. CONCLUSION

506. The IEE has been prepared for the Phase 2 (48+620 km) of 82 km long road section from Dushanbe to Kurgonteppa. The road forms part of CAREC (Central Asia Regional Economic Cooperation) corridors 2, 5 and 6.

507. The 82 km long road section was divided into two phases according to priority. The Phase 1 covers 33.2 km of road section from Dushanbe to the village Chashmasoron. The Phase 2 covers the remaining road section until Kurgonteppa.

508. IEE is required for category B Projects in order to warrant compliance of the Project with the ADB Safeguard Policy Statement (June 2009). As such the IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the development project. The IEE also provides a detailed description of the direct and indirect environmental effects associated with the Project during key periods of work, namely the design, construction and operational phase.

509. Based on the IEE Environmental impacts of the Dushanbe – Kurgonteppa road rehabilitation are evaluated as medium. This is because there will be widening of cross section required over nearly the whole Project length which will result in significant social and environmental interferences during pre-construction and construction stage. After Project implementation, during operational stage, there will be however only very low remaining impacts, mainly because the reconstruction follows the existing alignment and no valuable or protected natural habitats or other valuable environmental structures are significantly impacted after finalization of construction period, neither in their structure nor function.