

# Initial Environmental Examination

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May 2013

## UZB: Amu Bukhara Irrigation System Rehabilitation Project

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## **INITIAL ENVIRONMENTAL EVALUATION (IEE)**

### **A. Executive Summary**

1. The Government of Uzbekistan requested ADB to provide a loan to rehabilitate the Amu Bukhara Irrigation System. The Project Preparatory Technical Assistance (PPTA) Feasibility Study (FS) provided by the Asian Development Bank (ADB), and the PPTA aims to design a proposed loan. This Initial Environmental Examination (IEE) was prepared as part of PPTA.
2. The Proposed project is categorized as a “B” project in accordance to ADB Safeguard Policy Statement 2009, and as a class 3 project in accordance to the Uzbekistan EIA requirement. The IEE complies was prepared by following the ADB and with the Government of Uzbekistan’s environmental assessment requirements. The IEE was prepared by following these steps: scoping to identify the scope of the IEE, assessment of the environment, evaluation of potential impacts and establishing mitigation measures, formulating environmental management plan, and consulting public to share the result and to obtain inputs. The report is presented by following ADB IEE reporting format. To submit the report to State Ecological Expertise (SEE) under the Nature Protection Committee (NPC), the report needs to be translated into Russian, and to be presented in SEE format.
3. The assessment found that area of impacts will be locally occurred mostly in project areas, because the proposed project will involve only rehabilitation of existing system. Most the environmental impacts occur only during the construction period and the mitigation measures would be easily implemented as part of the construction works. However, the environmental management plan and monitoring plan would need to be strictly implemented. The consultation with affected people shows that people can accept the project and they felt that impacts would not be a problem for their daily activities. The establish grievance redress mechanism is provided, in case, any complaint from affected people that need to be resolved.
4. The NPC through its Provincial State Ecological Expertise (PSEE) unit will review and issue the development consent for the project, provide clearances for removing trees. It will undertake monitoring as required.
5. The project management will responsible to implement the EMP, therefore environmental consultant will be worked for project management unit with responsibility to oversee the implementation of EMP, and handle any un-expected environmental impacts. The environmental consultant will responsible to monitor implementation of EMP in close coordination with the supervision consultant, and prepare report on implementation of EMP to be submitted to ADB in biannual basis. The environmental consultant has also responsible, to ensure that at least 1 time /year, joint monitoring works with the NPC will be carried out.
6. This Initial Environmental Examination (IEE) is based on a review of available reports, the analysis of existing data, discussions with stakeholders and various experts, and field visits. The findings of the study have been discussed with, and supported by representatives of the State Nature Protection Committee, Goskompriroda, and prospective beneficiaries in the workshop held on 23 November 2012 and stakeholder consultations held throughout the Project area. This IEE presents an analysis of the potential environmental impacts, both positive and negative, together with an Environmental Management and Monitoring Plan (EMP) for all components.

## **B. Policy, Legal, and Administrative Framework**

### **(i) Relevant National Laws**

7. The Law on Nature Protection was enacted in 1992. It provides the legal and institutional requirements for the conservation of the environment and the rational use of natural resources.

8. A system of laws and by-laws has been developed and adopted around the Law on Nature Protection. This system is aimed at regulating environmental protection, promoting the rational use of natural resources, and protecting human population from unfavourable changes in the environment. Currently, over 40 legislative acts and approximately 70 by-laws are enforced in Uzbekistan in the area of environmental protection and utilization of natural resources. These laws include "Protection of Nature", "About Protected Areas", "State Sanitary Supervision", "Water and Water Use", "About Subsoil", "About Protection and Utilization of the Fauna", "About Protection of the Atmospheric Air", "About Protection and Utilization of the Flora", "About Forests", "Safety of Waterworks", "State Cadastres", "About Waste", "About Environmental Impact Assessment", and Land Code", "About standardization", "About protection strengthening of plants and animals valuable and disappearing kinds and ordering of their use".

9. Among the by-laws, the following resolutions of the Cabinet of Ministers of Uzbekistan are particularly relevant: 'The National Environmental Action Program for 1999-2005', "The Cabinet Council regulation of Republic of Uzbekistan "About the statement of the monitoring program of environment in Republic of Uzbekistan for 2006-2010", 'Measures to Observe International Commitments of the Republic of Uzbekistan on the Protection of the Ozone Layer', 'The Red Book of the Republic of Uzbekistan', 'Improvement of the Hydrometeorological Service of the Republic of Uzbekistan', 'Approval of the Statute on the State Environmental Impact Assessment in the Republic of Uzbekistan', "Regulation about Environmental Impact Assessment", 'Measures to Establish and Maintain Hunting Entities in the Forestry Lands', 'Enhancement of Oversight of Rational Utilization, Import, and Export of Biological Resources of the Republic of Uzbekistan', 'Limited Water Use', 'Activities for Enhancement of Effectiveness of Land Use', "The Cabinet Council Regulation of Republic of Uzbekistan "About perfection of payments system for special nature management", 'Approval of the Scale for Calculation of Fines to be Levied for Damage Inflicted on the Flora', 'Approval of Regulatory Acts in accordance with the Law on the Subsoil of the Republic of Uzbekistan', 'Approval of the Statute on State Monitoring of the Environment in the Republic of Uzbekistan', and 'Approval of the Statute on Land Monitoring'.

10. The Law on Nature Protection establishes the State Committee for Nature Protection, Goskompriroda, as the agency responsible for implementing the law. Goskompriroda was formed in 1988. Goskompriroda is a supra-departmental coordinating body and is headed by a Chairman who is appointed by the Oliy Majlis (i.e. the Parliament). Goskompriroda has a wide scope of activities including assessing and monitoring the environmental resources of the nation, establishing environmental quality standards and monitoring pollution levels of agricultural and industrial production systems, establishment of protected areas and the protection of ecological resources. The basic divisions are available to attend to such functions in the Natural Protection Committee. Environmental assessment is the responsibility of the Main Directorate for State Ecological Expertise (i.e., Gosecoexpertisa) a directorate of Goskompriroda. Ecological Expertise Department.

11. Guidelines for preparation of the environmental assessment reports and approval (or rejection) of projects on environmental grounds (revealed in the environmental assessment reports) is regulated by the Decree of the Cabinet of Ministers No 491.31.12.2001 and № 152 5.06.2009 on the approval according to the regulations of the State Environmental Expertise. The Regulations stipulates 4 categories of projects as follows:

- (i) Category 1 – high risk projects
- (ii) Category 2 – moderate risk projects
- (iii) Category 3 – low risk projects
- (iv) Category 4 – Local impact projects

12. Category 1 and Category 2 projects are approved by the Main Directorate for State Ecological Expertise (i.e. Gosecoexpertisa) at the national level, whereas Category 3 and Category 4 projects are approved by the Provincial Directorate for State Ecological Expertise (i.e. Gosecoexpertisa).

13. Categorization is based on the scale of the proposed activities of the project and the significance of the potential environmental impacts. The scale of the proposed activities considered for different activities are clearly specified. The overall activities of the ABIS fall under category 1 because of the large volume of water at the intake, 300 m<sup>3</sup>/sec. However, when the Pre-Construction environmental assessment is conducted for each of the subprojects to be constructed, the category will be that appropriate to each subproject.

## **(ii) Institutional frameworks**

14. The Ministry of Agriculture and Water Resources (MAWR) is the national institution responsible for irrigation and drainage with offices at central, provincial (12) and district level. Since 2003, water management is based on natural irrigation boundaries with the formation of basin authorities, Basin Irrigation System Administration (BISA). BISAs are contained within the MAWR structure as semi-autonomous organizations. There are 10 BISAs and each BISA is further subdivided into (i) canal Administration which looks after the canal systems, and (ii) irrigation system administration (ISA) that look after the irrigated areas. The subproject is situated in the Amu-Bukhara BISA.

15. In 1992, the government issued a decree that formed water user associations (WUA). The decree states that I&D infrastructure of the former shirkat becomes the property of the WUA with the inter-farm I&D infrastructure being transferred to the MAWR. The establishment of WUAs to take responsibility for on-farm water management is a critical component of the institutional reforms and reorganization within the water sector; however, not all WUAs have been fully established due to incomplete legal and regulatory framework.

16. At present, the Republic of Uzbekistan is signatory to the following international conventions and the project activities should not violate any of the condition agreed in the conventions:

**(iii) International Agreements**

- (i) Convention on Long-Range Trans-boundary Air Pollution (Geneva, 1979)
- (ii) Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985)
- (iii) Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987)
- (iv) Convention on the Control of Movements of Hazardous Wastes and their Disposal (Basel, 1989)
- (v) Convention on Environmental Impact Assessment in Trans-boundary Context (Espoo, 1991)
- (vi) Convention on the Protection and Use of Trans-boundary Water Courses and International Lakes (Helsinki, 1992)
- (vii) Convention on the Trans-boundary Effects of Industrial Accidents (Helsinki, 1992)
- (viii) United Nations Framework Convention on Climate Change (New York, 1992)
- (ix) Convention on Biological Diversity (Rio de Janeiro, 1992)
- (x) United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa (June 17, 1994)
- (xi) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITEC, Washington, 1997)
- (xii) Agreement on the Conservation of African-Eurasian Migratory Waterbirds (1995), signed in the Hague in the framework of the Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1998)
- (xiii) Convention on the Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 2001)

**C. Description of the Project**

**(i) Type of Project**

17. This is an irrigation rehabilitation project designed to improve water resources management and to enhance the productivity of irrigated agriculture in the ABIS command area.



## **(ii) Category of Project**

18. ADB conducted a Rapid Environmental Assessment (REA) of this irrigation rehabilitation project, and based on the results, ADB designated this to be a Category B project. In accordance to the Government EIA requirement, the project is classified as a class 3 project.

## **(iii) Need for the Project**

19. The economy of Bukhara and the health of its inhabitants are highly dependent on irrigated agriculture and the domestic water drawn from the ABIS. The supply of water for domestic use and for agriculture is dependent on the reliable operation of the Amu Bukhara Irrigation System, especially the pumps. To ensure the reliability of water delivery, Uzbekistan's irrigation and drainage (I&D) infrastructure has been targeted for modernization. Improving management capacity and upgrading operation and maintenance (O&M) will help to ensure reliable water deliveries and contribute to environmental protection strategies.

20. The reliance on vast pump stations for supplying a large portion of the irrigated area poses challenges. Pumping costs have risen considerably due to the increasing cost of electricity, while many ABIS pump sets are highly inefficient and in urgent need of rehabilitation. Substantial investment is required to improve efficiency and transform the pumped schemes into cost-effective and sustainable operations. New O&M cost recovery schemes and other financial initiatives are required to prevent further infrastructure deterioration and to sustain improvements.

21. The lack of fresh water resources in some areas results in the reuse of degraded quality drainage water comprised of saline surface return flows and pumped groundwater. This reuse of harmful salts in saline drainage water, combined with many challenges in system-level water management due to inadequate infrastructure and a lack of resources, is intensifying trends in declining POW.

## **(iv) Location**

22. The project area is located in the south central part of Bukhara Oblast, which is located in the southwest of Uzbekistan. Turkmenistan borders Bukhara Oblast to the south. The oblasts bordering to the north, east, and west are presented in Table 1. The distance from Bukhara to major Uzbekistan cities is presented in Table 2.

**Table 1: Oblasts bordering Bukhara**

<b><i>Oblast</i></b>	<b>Geographic Orientation</b>
Navoiy	North
Kashkararya	Southeast
Khorezm	West
Karakalpastan	West

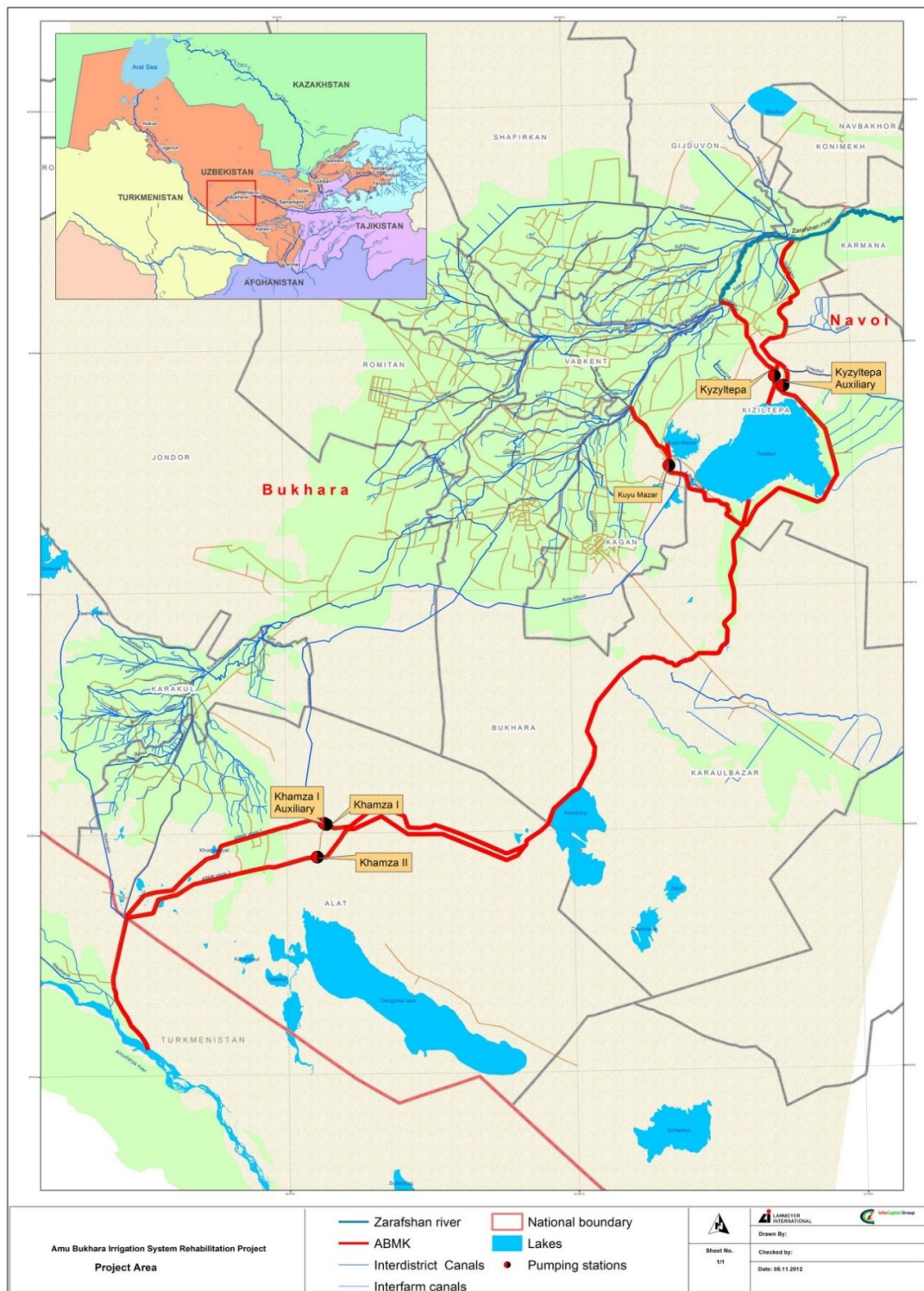
Source: [http://en.wikipedia.org/wiki/Outline\\_of\\_Uzbekistan](http://en.wikipedia.org/wiki/Outline_of_Uzbekistan)

**Table 2: Distances from Bukhara to Major Cities of Uzbekistan**

<b>Tashkent</b>	<b>Samarkand</b>	<b>Khiya</b>	<b>Nukus</b>
555 km / 333 miles	273 km / 164 miles	470 km / 282 miles	556 km / 334 miles

Source: <http://www.bukhara.net/history/history.htm>

**Figure 1: Location of Amu Bukhara Irrigation System**



Source: Present Study, 2012

23. The ABIS command area is 315,000 ha and it extends over 14 districts (Table 3).

**Table 3: ABIS Command Area**

No.	Districts	Command Area (ha)
<b>Bukhara</b>		
1	Bukhara	27,967
2	Vopkent	24,792
3	Jondor	33,066
4	Kogon	18,845
5	Olot	21,475
6	Peshku	22,756
7	Romitan	27,241
8	Shofirkon	28,402
9	Korakul	25,065
10	Karaulbozor	16,078
11	Gijduvan	27,074
12	Bukhara City	2,350
<b>Total in Bukhara</b>		<b>275,111</b>
<b>Navoi</b>		
1	Kiziltepa	32,360
2	Karmana	7,529
<b>Total in Navoi</b>		<b>39,889</b>
<b>Total in ABIS BISA</b>		<b>315,000</b>

Source: ABMK, 2012

24. The economy of Bukhara and the health of its inhabitants are highly dependent on irrigated agriculture and the domestic water drawn from the ABIS. The supply of water for domestic use and for agriculture is dependent on the reliable operation of the Amu Bukhara Irrigation System, especially the pumps. To ensure the reliability of water delivery, Uzbekistan's irrigation and drainage (I&D) infrastructure has been targeted for modernization. Improving management capacity and upgrading operation and maintenance (O&M) will help to ensure reliable water deliveries and contribute to environmental protection strategies.

25. The reliance on vast pump stations for supplying a large portion of the irrigated area poses challenges. Pumping costs have risen considerably due to the increasing cost of electricity, while many ABIS pump sets are highly inefficient and in urgent need of rehabilitation. Substantial investment is required to improve efficiency and transform the pumped schemes into cost-effective and sustainable operations. New O&M cost recovery schemes and other

financial initiatives are required to prevent further infrastructure deterioration and to sustain improvements.

26. The lack of fresh water resources in some areas results in the reuse of degraded quality drainage water comprised of saline surface return flows and pumped groundwater. This reuse of harmful salts in saline drainage water, combined with many challenges in system-level water management due to inadequate infrastructure and a lack of resources, is intensifying trends in declining POW.

#### **(v) Structure of the Project**

27. Expected impact of the proposed Project is a sustainable economic and social welfare of communities dependent upon ABIS. Expected outcome is a sustainable and reliable irrigation water supply in the ABIS. This will be achieved through the following outputs:

- (i) **Output 1: One replaced and four modernized and rehabilitated pump stations in ABIS provide reliable and sustainable water supply to the ABIS.** This covers: (i) the replacement of Khamza 1 including its auxiliary pump stations with a new Khamza 1 pump station; (ii) modernization and rehabilitation (M&R) of Kuyu Mazar pump station; (ii) M&R of Khamza 2 pump station; and (iv) M&R of Kizil Tepa and its auxiliary pump stations. These are major existing pump stations in ABIS, and Khamza 1 and Kuyu Mazar pump stations commissioned in 1965 exceeded their economic life spans, and the other pump stations commissioned in 1975. The benefits of the replacement and M&R of these pump stations are: (i) reduction of energy-consumption; (ii) sustained and reliable water supply without operational and system failures; (iii) reduction of GHG emission by 23%, leading to an estimated emissions reduction of 178,090 tCO<sub>2</sub>e/year upon project completion. The M&R includes the replacement of pumps and motors, mechanical and electrical equipments, screen gates, gantry cranes, and strengthened building structures, depending on pump station.
- (ii) **Output 2: Conveyance efficiency in ABIS main canal is increased.** This covers: (i) the M&R of 22 key regulatory and/or diversion structures; (ii) installation of water measurement gauges; (iii) installation of wireless radio communication systems; and (iv) de-silting works around regulatory and/or divisions structures along ABIS main canal. These structures were built between 1930 and 1967 and are in poor condition. The conveyance efficiency in ABIS main canal will be achieved by M&R of these structures closely associated with modernized irrigation system management to reduce ineffective water discharge from the main canal to inter farm irrigation systems.
- (iii) **Output 3: Climate change adaptation capacity of BISA, ISA, WCAs, and farmers is increased.** This covers: (i) M&R of inter- and on-farm canals and regulation structures in selected areas; (ii) introduction of climate adaptive agronomic practices, cropping pattern, and water saving irrigation technologies in demonstration farms in selected areas; (iii) the development of modernized water operation and management plan based on the detailed water balance assessment with the use of remote sensing and actual water measurements; and (iv) capacity development of BISA, ISA, and WCAs in Bukhara.

- (iv) **Output 4: Project and ABIS are managed efficiently.** This covers project management, institutional and operational supports during project implementation to ABISA responsible for O&M and management of major pump stations and ABIS main canal. The first includes: (i) implementation of safeguards requirements; and (ii) project supervision, tender design, procurement, and financial management. The second includes strengthening institution, human capacity, ABIS operation and management in ABISA. Remote monitoring and controlling system will be introduced, and a modernized energy-water efficient operation and management plan will be adopted for effective and efficient operation and management of pump stations and main canals. Capacity building will also be provided for ABISA to integrate GHG monitoring-reporting-verification systems to ensure environmental integrity of the GHGs mitigated in the pumps' O&M. The commercialization of carbon credits will be pursued through clean development mechanism (CDM) or other carbon market mechanisms to fill the financing gap for O&M.

28. In addition, poor-conditioned drainage channels will be rehabilitated by Government's Amelioration Fund<sup>1</sup> and ADB's Loans: Land Improvement Project to reduce soil salinity and water logging to compliment to the outcome and the impact of the proposed Project.

#### **(vi) Project Area of Influence**

29. Potential environmental impacts and risks will be analyzed in the context of the subproject's area of influence. This area of influence encompasses:

- (i) The primary project and subproject sites and related facilities that the borrower/client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, access roads, borrow pits and disposal areas, and construction camps;
- (ii) Associated facilities that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project;
- (iii) Areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken; and
- (iv) Areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location

30. The area of influence include potential impacts that might occur for all relevant stages of the project cycle, including preconstruction, construction, and operations.

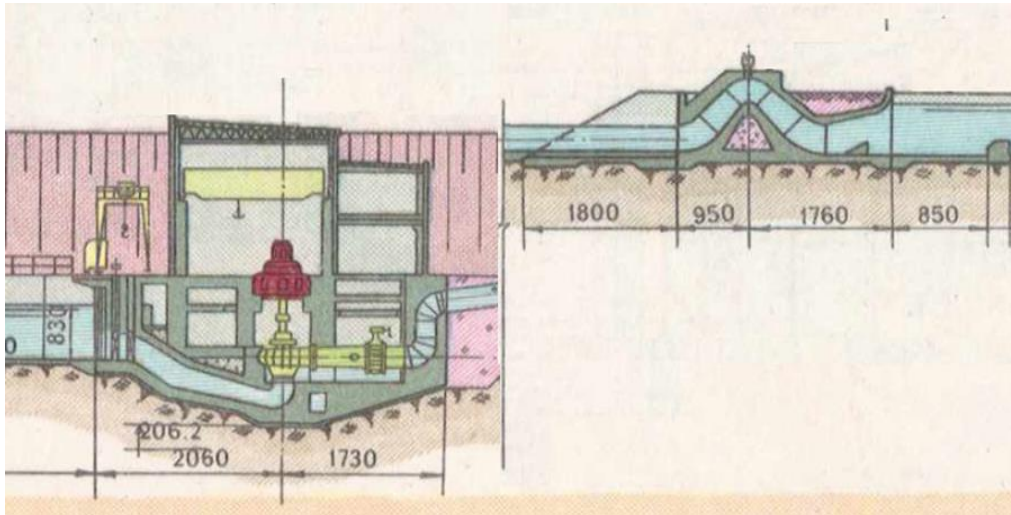
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<sup>1</sup> In 2007, the Government established the Amelioration Fund to improve drainage conditions to address water-logging and soil salinity problems.



31. Within the Republic of Uzbekistan, the physical components consist of structures that are all owned by the Ministry of Agriculture and Water Resources (MAWR) and operated by the Amu Bukhara Basin Irrigation System Authority (BISA).

**Figure 2: Typical Pump Station Configuration**



Source: ABIS 2012.

**Figure 3: Khamza 1 Pump Station**  
**KHAMZA-1 PUMP STATION**

No. of Pump Units:	9+1
Motor capacity:	5,000 kW
Pump Type:	Vertical Centrifugal Design
Pump Head:	48,5 – 50,6 m
Pump Station Design:	64m <sup>3</sup> /s
Discharge pipe:	2 x 750 m, Dia. 3640 mm



- First pump station in ABMK irrigation system
- Butterfly valves are worn with heavy leakage over shaft
- Radial wooden pump bearings on Unit 1, 2, 4, 6, 7
- Low efficiency of trash rack cleaning machine
- Heavy siltation of intake structure slopes
- Pumps and motors are worn out
- Burst on main discharge pipe on 09.09.2005 after sudden loss of power supply (pressure surge, pipe thickness !)

Source: ABIS 2012.

Figure 4: Khamza 1 Auxiliary Pump Station

## KHAMZA-1 AUX. PUMP STATION

No. of Pump Units:	30
Motor capacity:	1.600 kW
Pump Type:	Horizontal Double Suction
Pump Head:	55 m
Pump Station Design:	40 m <sup>3</sup> /s
Discharge pipe:	2 x 900 m, Dia. 1400 mm



- No pump control, complicated pump start up
- Only 20 out of 30 pumps are operational
- Pump reliability is very low due ineffective maintenance (spare part availability)
- Heavy siltation load
- Main pumps, motors and pipes are worn
- Increased maintenance requirement (interval 1200 h)

Source: ABIS 2012.

Figure 5: Khamza 2 Pump Station

## KHAMZA-2 PUMP STATION

No. of Pump Units:	10
Motor capacity:	12.500 kW
Pump Type:	Vertical Centrifugal Design
Pump Head:	52,3 – 54,1 m
Pump Station Design:	135 m <sup>3</sup> /s
Discharge pipe:	2 x 609 m, Dia. 4240 mm



- Inspection of discharge pipeline required
- All electromechanical equipment exceeded the lifespan
- Discharge shut off valves extremely worn out
- Heavy leakage on main pump units
- Heating and ventilation system not functioning

Source: ABIS 2012.



Figure 6: Kuyu Mazar Pump Station

## KUYU MAZAR PUMP STATION

No. of Pump Units:	6
Motor capacity:	5.000 kW
Pump Type:	Axial Vertical Design
Pump Head:	18 – 24 m
Pump Station Design:	100 m <sup>3</sup> /s
Discharge pipe:	6 x 70 m, Dia. 2840 mm



- Heavy erosion/abrasion on pump impeller
- Building structure severe deterioration
- Flow compensation by additional floating pump station
- Heavy floating debris accumulation
- Lack of pump house ventilation
- No cleaning system provided for intake trash rack
- Pump control not existing

Source: ABIS 2012.

Figure 7: Kizil Tepa Auxiliary Pump Station

## KIZAL-TEPA AUX. PUMP STATION

No. of Pump Units:	26
Motor capacity:	2.000 kW
Pump Type:	Horizontal Double Suction
Pump Head:	75 m
Pump Station Design:	30 m <sup>3</sup> /s
Discharge pipe:	1 x 2860 m, Dia. 3640 mm



- Main pumps, motors and pipes are worn
- Pump station design with only one main discharge pipe
- Recent pipe burst on main discharge pipe section - (power cut, pressure surge)
- Difficulties during start up of pumps (no pump control system)
- High wear of impeller (replacement every 2000 h)

Source: ABIS 2012.

#### D. Description of the Environment (Baseline Data)

##### (i) Physical and Ecological Environment

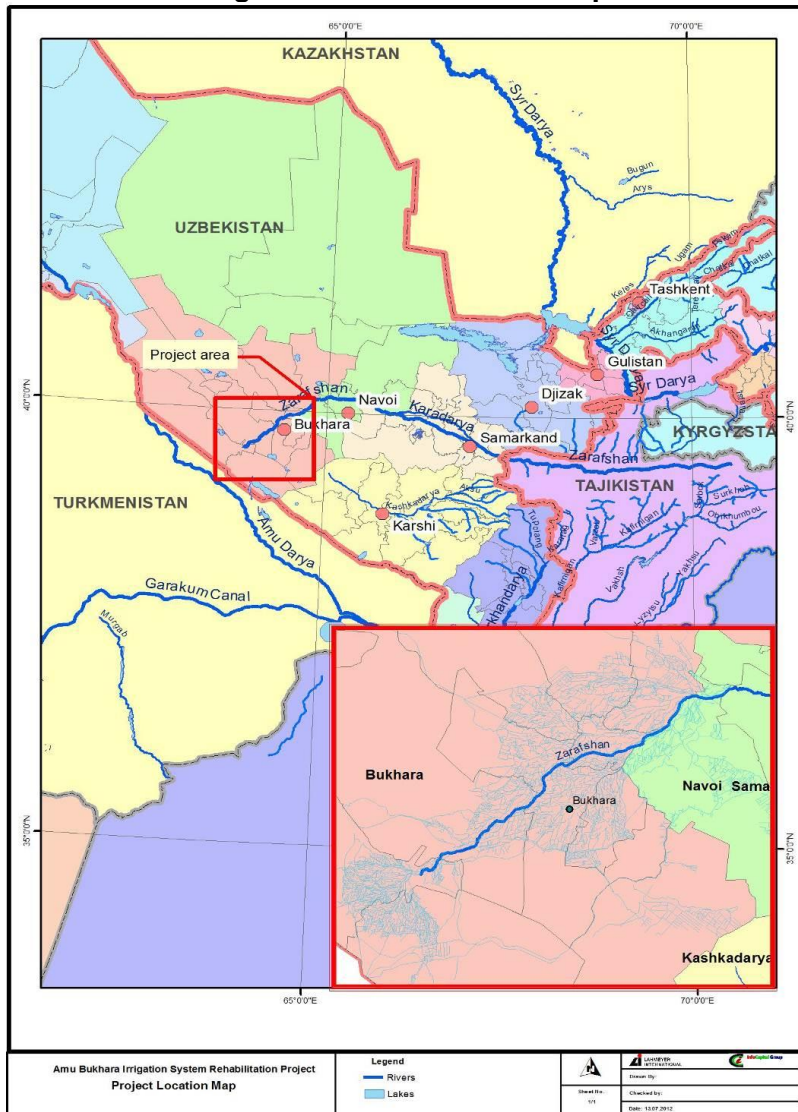
32. The ABIS and its subprojects' areas of influence are within the ROU oblasts of Bukhara and Navoi. Bukhara Oblast is located at the southwest of Uzbekistan and has boundaries with Kashkadarya and Navoi Oblasts and with Turkmenistan. It was established on 15 January 1938. The total area covers 1,432,000 thousand km<sup>2</sup>.

**Figure 8: Location Map**



33. The city of Bukhara is in an ancient desert oasis on the open plain adjoining in the west with desert Kyzylkum on other directions with Karshinsky and Karnapchulsky steppes.

**Figure 9: Administrative Map**



Source ABIS 2012.

## (ii) Air Quality

34. Air pollution in large cities and industrial centres is a major environmental hazard in Uzbekistan. Since 1992, air pollution has been decreasing primarily due to the reduction in emissions from industrial waste. However, air quality in some cities and regions has degraded further with an increase in pollution from vehicles. From 1999 to 2004, the total amount of atmospheric emissions fell by 1,957,400 tons or 14.8%. It is worth noting that the share of pollution from non-vehicular sources in 2004 remained at nearly the same level as 1999 (33%) (SCS, 2006).

35. Emission from vehicles is the major source of air pollution in the country. In 2004 emission from mobile sources stood at 67% of total atmospheric pollutants. In cities like Tashkent, Samarkand, Bukhara and Ferghana the figure exceeds 80% (SCS, 2006).

### **(iii) Climate**

36. The desert and steppe landforms that comprise the region influence the sharply continental, arid character of the climate. This continental climate is characterized by cold winters and hot, dry summers. During the summers there are strong winds that carry sand and dust.

37. Average air temperature in January is 8°C in the north, and 2°C in the south. Summer is long, hot and dry; average air temperature in July of 28°C. The annual average air temperature is 16.0°C. The average monthly minimum temperature of the coldest month is -3.0°C, and the average monthly maximum temperature of the hottest month is 37.2°C.

38. There is high solar radiation up to 150 kcal and more is characteristic of this region. The average number of sunny days per year is 300.

39. There are 217 frost-free days per year. The annual precipitation is 125 mm to 175 mm.

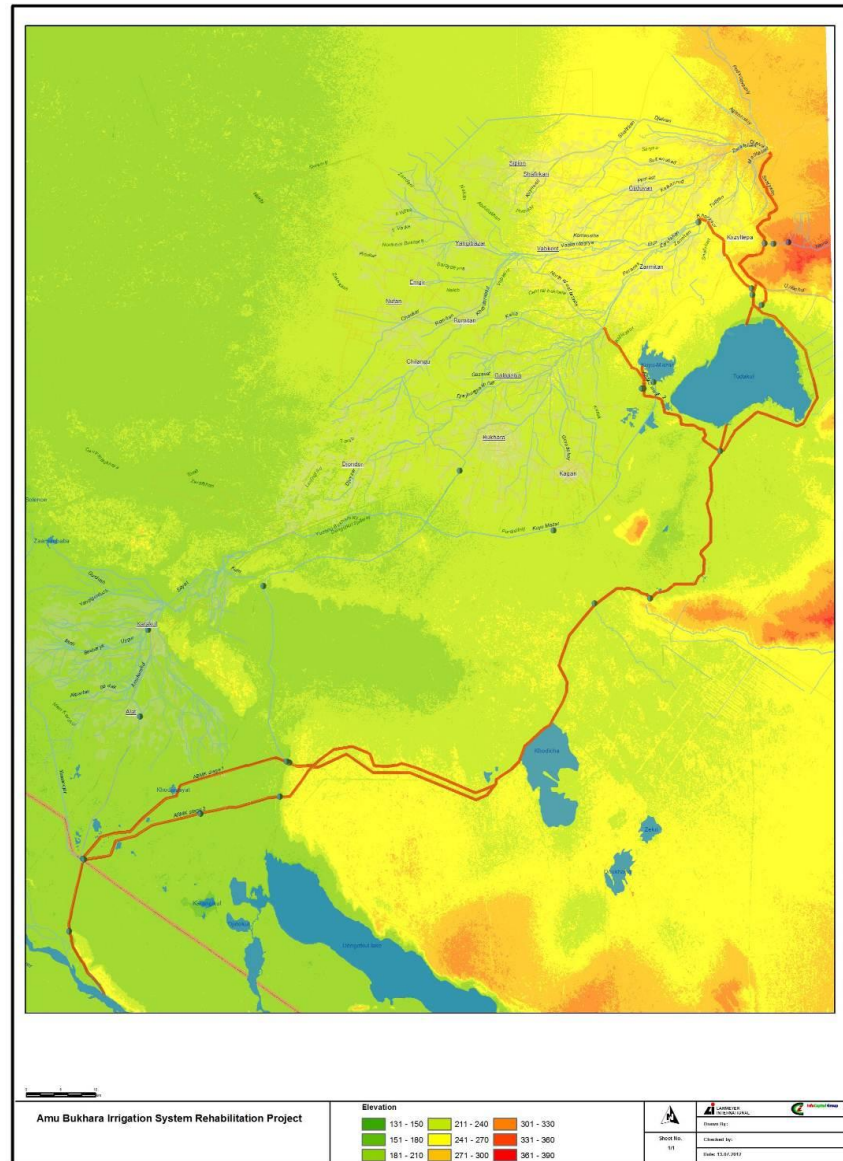
40. Winds from the north and north northwest (23.6% and 19.8% respectively) predominate in the city of Bukhara. Usually there are winds with the speed of 2-3 m/s and 4-5 m/s, their probability of occurrence is 37.6% and 33.1%. The probability that light breezes (0-1 m/s) occur is 11.5% of the time. The low probability of light breezes occurring is beneficial for stronger winds promote the dispersion of air pollutants.

### **(iv) Topography and Soils**

41. The region's territory represents an even desert valley, the Kyzylkum Desert, with highlands. There are mountains in the southern part of the region. These are Tamdytay (922 m), Bukantau (764 m), and Kuldjuktay (785 m).

42. In geomorphological terms the city of Bukhara is located in the south part of the Bukhara oasis within the large Bukhara-Hivinsky depression. In the east part of the depression 20 km to the west of Bukhara is the Zarafshan River. The land forms of a valley are generally Quaternary sedimentation.

**Figure 10: Topographical Map**



Source: Present Study, 2012.

43. Land forms of territory are flat with the general bias of 0.0003 to 0.0004 to the southwest, with a partial bias to the southeast to the periphery of an oasis. The general flatness of land forms is broken by separate hills of a technogenic origin and a weak sinuosity. Occurrence of wavy landforms in the conditions of irrigation farming is connected with erosion-accumulative processes and accumulation of oozy irrigational sediments. The soils in the irrigated areas (1.6% of the total land resources) are alluvial.

44. Table 7 summarizes the monthly average drain water salinities for the years 2009-2011. Drainage water salinity is in the range of 2.37-6.63 g/l with an average of about 3.6 g/l. The quality falls outside FAO 29 Guidelines for Irrigation Water which states that there can be severe problems using water with a salinity of greater than 2.0 g/l. Some of the drain water is



being reused and this is on an emergency basis because of the lack of irrigation water during peak times of the year. Rather than just condemning this practice it is necessary to find ways of avoiding the use of drain water to sustain crops. There is a conscious awareness of improving the efficient use of irrigation water and this should help to resolve the problem.

**Table 7: Average Salinity Levels of Drain Water**

Year	Average Salinity Levels in g/l												
	Jan	Feb	Mar	Apr	Mar	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av
2009	4.0	3.9	4.4	4.0	3.9	3.7	5.0	2.4	3.3	3.2	3.3	3.2	3.6
2010	3.5	3.6	4.3	2.8	3.7	3.8	3.9	3.5	3.8	3.2	2.6	2.8	3.4
2011	3.5	3.1	3.3	3.4	3.5	3.7	3.6	3.6	3.6	3.6	6.6	3.6	3.7

Source: HGME

#### **(v) Surface Water of the Amudarya River Basin**

45. The Amu Darya River flows to the Southwest of Bukhara. It forms the international border with Turkmenistan. The Zarafshan River enters the project activity areas from the Northeast, Navoi Oblast. The water from both rivers is used for irrigation.

46. The Amu Darya River is the glacier/snowmelt fed type of River, and its average annual flow is 68,63km<sup>3</sup>. The main flow volume (85%) is formed by the Vakhsh and Pyandj tributaries. The flow from the Surkhandarya, Kafirnigan, and Kunduz Rivers is only 15%.

47. The Amu Darya River is the largest in terms of regional runoff. The Amu Darya River accounts for 2/3rds of the water resources of the Aral Sea basin. The length of the Amu Darya from its source at the Pyandj River to the Aral Sea is 2,540 km, of which about 1,000 km is within the territory of Uzbekistan. The river basin extends over about 1,327,000 km<sup>2</sup>.

48. The Amu Darya is formed by the confluence of the Pyandj and Vakhsh rivers. The River flows along the border between Afghanistan and Uzbekistan, crosses Turkmenistan, returns again to Uzbekistan and discharges into the Aral Sea, creating at its mouth a delta up to 300 km wide. Two large right bank tributaries (Kafirnigan and Surkhandarya) and one left bank one (Kunduz) flow into the River in its middle reaches. There are no further tributaries of significance along the remainder of the river course.

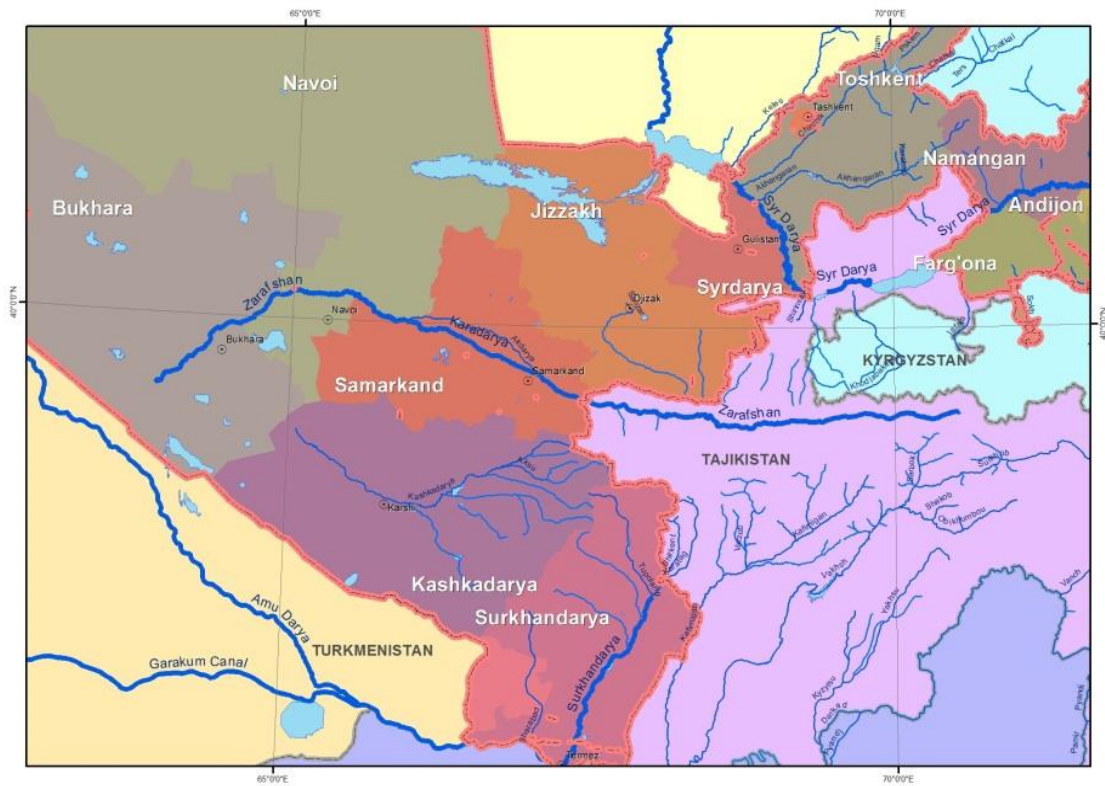
49. Over its course the River crosses deserts and semi-deserts and flows between the Karakum and Kyzylkum deserts. While flowing through the plain from Kerki to Nukus, the River loses most of its runoff through evaporation, infiltration, and irrigation. The waters of the Amu Darya River are the most turbid of any in Central Asia and among the most turbid in the world.

#### **(vi) Surface Water of the Zarafshan River**

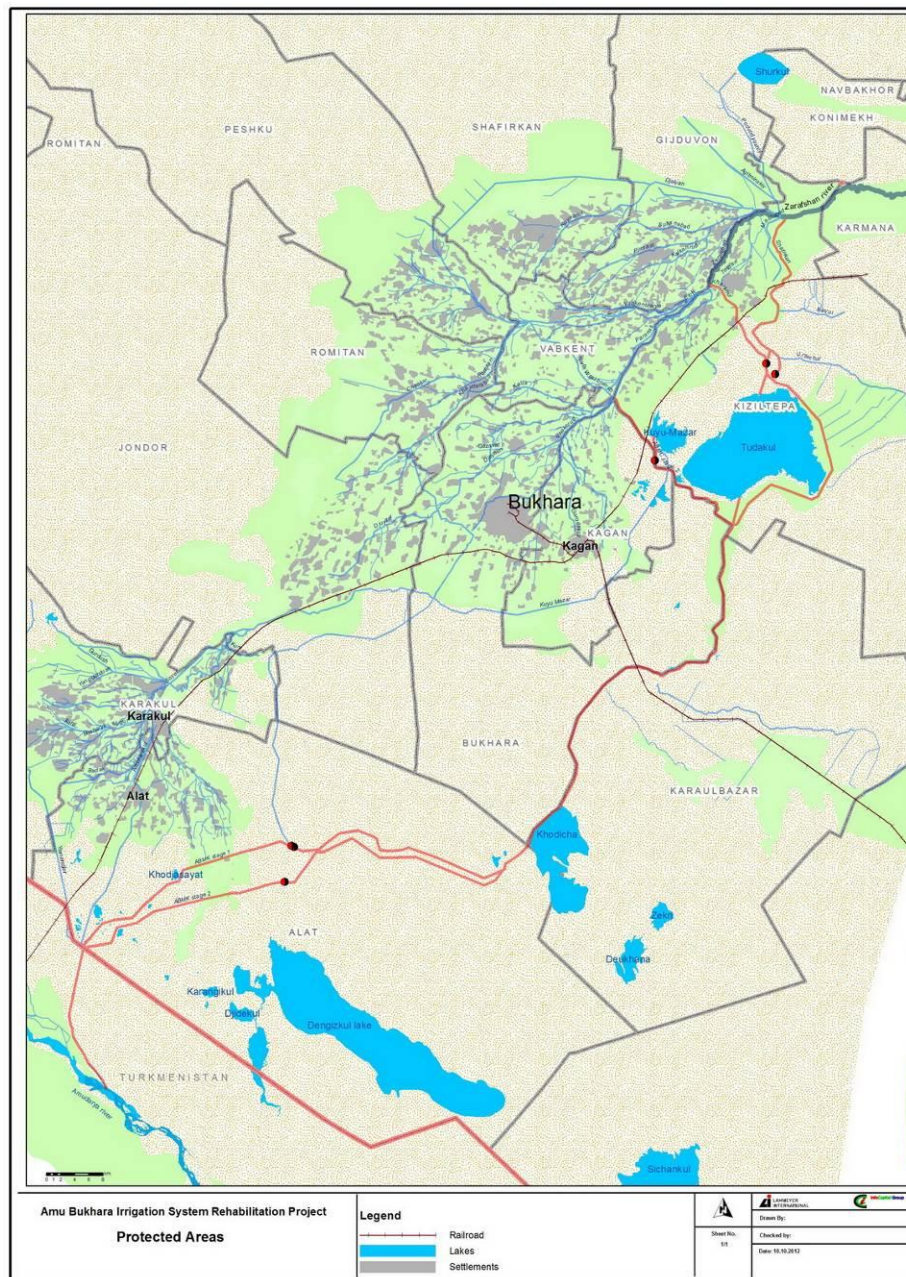
50. The Zarafshan River originates in Tajikistan and flows westward through Uzbekistan, passing near Samarkand and entering Bukhara Oblast from Navoi. By the time the River reaches Bukhara, the river ceases to convey usable water.

51. From this point, the BIS endeavours to maintain an environmental flow in the intake canal section that is estimated to be 50 to 150 million m<sup>3</sup>/year. The water then collects in the sands to form salt lakes.

**Figure 11: Central Asian River Systems**



### Figure 12: Water bodies in the Project Territory



Source: Present Study, 2012

**(vii) Lake Dengizkul**

52. Lake Dengizkul extends over 31,300 ha. It is the largest saline wastewater closed water body in the Southwest part of the Kysylkum desert, with typical ecological conditions of natural lakes situated in the deserts of Central Asia. The lake, dried up by the mid-1950s because of overuse for irrigation, has been refilled since 1966 and is very important for maintaining a biodiversity of wetland-dependent species in a largely arid region. It is of crucial importance for migrating and wintering waterfowl, as it is situated on the route of bird migrations from Western



Siberia and Kazakhstan to Indo-Pakistani wintering grounds. It is RAMSAR Site No. 1108 (RAMSAR, 2003).

53. Lake Dengizkul is also the habitat of many vulnerable and endangered species, especially as it supports more than 1% population of the endangered White-headed Duck (*Oxyuraleucocephala* Scop.). Commercial mining of gas in the vicinity of and on Lake Dengizkul is the main human activity, and this enabled the provision of the population with fuel and thus preserved trees and shrubs, which are important components of the desert ecosystem. However, excessive inflow of drainage water significantly influenced the water level in the lake and the floods have destroyed some habitats recently.

#### (viii) Reservoirs

54. The Kuyu Mazar and the Tudakul reservoirs are within the project area. They are both Important Bird Areas (IBAs). The Kuyu Mazar Reservoir with a total volume of 320 mm<sup>3</sup> with a usable storage of 275 mm<sup>3</sup>; and the Tudakul Reservoir with a total volume of 1,200 mm<sup>3</sup> with a usable storage of 700 mm<sup>3</sup>. Both reservoirs are fed by the ABMK system and are used for storage and supply for irrigation. The Kuyu Mazar is also the principal fresh drinking water supply reservoir for Bukhara and therefore has public access restrictions and is isolated from drainage return flow which is diverted to the Tudakul Reservoir. However, the project areas where works will be concentrated are not involving the environmental sensitive areas.

#### (ix) Groundwater

55. Groundwater forms a significant part of the country's water resources and plays an important role in supplying water for drinking, as well as for agriculture, including pasture irrigation. Underground water of the Aral Sea basin, which lies within the ROU, is formed by precipitation and filtration from water bodies and irrigated areas. The total volume of natural underground water in Uzbekistan is 24.35 km<sup>3</sup>. Out of this amount 20.79 km<sup>3</sup>, 2.92 km<sup>3</sup>, and 0.46 km<sup>3</sup> lie in the Quaternary, Upper Pliocene-Quaternary, and Upper Cretaceous deposits respectively.

**Table 8: Groundwater Resources and Use**

River Basin	Available Groundwater (km <sup>3</sup> )	Groundwater Consumed (km <sup>3</sup> )	
		Total Consumed	Amount consumed with mineralization < 1 g/l
Amu Darya	10.73	9.93	3.11
Syrdarya	13.62	14.09	5.84
Total	24.35	24.02	8.95

Source: ABIS

#### (x) Geology/Seismology

56. The city of Bukhara is located in the southern part of the Bukhara oasis within the large Bukhara-Hivinsky depression. The land is a valley formed from Quaternary sedimentation.

57. The land forms are flat with the slope of about 0.0003 to 0.0004 to the southwest. The general flatness of land forms is broken by separate hills of a technogenic origin. Wavy

landforms in the irrigated areas are related to natural erosion-accumulative processes and by the deposition of canal sediments.

**(xi) Fisheries**

58. There are commercial fisheries, aquaculture, in the Alat area. These are not near the project activity areas.

**(xii) Aquatic Biology**

59. About 30 species of fishes, predominantly carp, dwell in the Amu Darya and Zarafshan rivers. Of these species, the Aral Barbell and both the Large and the Small Amu Darya Shovel Nosed Sturgeon, are listed in the Red Book of Uzbekistan.

**(xiii) Forests**

60. The Republic is rich in flora. There are 68 species of trees, 320 of shrubs, and 953 grass species:

**Table 9: Forested Area by Tree Species**

Species	Ha	% of Total Forested
Total area under forest	2278700	100
Saxaul	1385500	60.8
Juniper	225600	9.9
Tamarisk	207300	9.1
Cerkez	152700	6.7
Asiatic poplar	61500	2.7
Nut trees	52400	2.3
Kandym	41000	1.8
Other shrubs	123100	5.7
Other trees	296000	1.3

61. Natural forest covers about 20% of the total area of state forest. The largest areas of natural forest are in the sandy zones of the Republic of Karakalpakstan and in Navoi and Bukhara oblasts. In the natural forest, the predominant species are: juniper in the mountain and saxaul and Asiatic poplar riparian forest. In Bukhara Oblast there are 10 commercial forest farms with a total area 572,010,000 ha.

62. There are 93 forestry enterprises in the Republic. Out of this number 67 are forestries, 8 special-purpose forestries, 8 independent forest sites, 6 protected areas, 3 hunting farms, 1 national park Forestries of the Republic annually afforest 42 hectares, including seeds sowing on 27 ha, and tree planting in 15 thousand ha.

63. In the Republic of Uzbekistan, the area under forest is 23,748,000 ha or 5.3 % of the total area of the Republic. The Forest Fund is for special-purpose forest land located mainly in desert-sandy zone (7,000,100 ha), the rest is in the mountain zone (831,000 hectares), in the river valleys (113,700 hectares) and in the valleys (164,300 hectares).

64. Forest plays a very important nature and land protection role. In Uzbekistan, even with forest-covered and bush-covered desert pastures, the percentage of forest land is not more than 5 or 6%. Most part of forest is in the sandy zone where the main trees are saxaul, kandym, and cherkez. In the mountain zone there are about 300,000 hectares of forest and afforested land. The most valuable are juniper mountain forest (about 200,000 hectares).

65. The main mountain species is juniper that grows on about 204,000 hectares. River valley forests were in the past thick forests composed of local species of poplar. Various shrubs are heavily affected by man's activity. Plantations of alien trees are growing in valleys and mountain areas of the Republic. Saxaul and other desert shrubs grow mainly on sandy soil and play an important role in protecting sand from wind erosion and improving the continental climate. Most of the land of the forest fund is located in the Republic of Karakalpakstan, Bukhara, Navoi oblasts; In Samarkand, Syrdarya, and Fergana valley is where there is the least he area under forest.

66. The location where construction works for the proposed project will be executed is mostly nearby agricultural land, and not involving any forest land or forest areas.

#### **(xiv) Rare or Endangered Species**

67. In 1979, GOU began gathering data for the Uzbekistan Red Book. It provides information on the species that are rare and under threat. In 1983, the first edition of the Red Book, which dealt with fauna, was published. It listed 63 kinds of vertebrates. The second edition, 2003, included 23 kinds of mammalian, 48 kinds of birds, 16 kinds of reptiles, 17 kinds of fishes, 3 kinds of annelids, 14 kinds of molluscs, and 61 kinds of arthropods. The third edition was prepared and is issued in 2006. This edition includes 184 species and subspecies, which includes 77 species of invertebrates, mainly insects, and 107 vertebrates.

68. In the fourth edition, 2011, the number of species remains the same. But there are some changes. Newly included is the Sayga, a unique gazelle, and removed is the Shizoper's planktonic canser Aral, as it is now more widely distributed in saline reservoirs of the country.

**Table 10: Number of Rare and Vanishing Fauna Species in Uzbekistan**

<b>Class</b>	<b>Number of species</b>	<b>Rare and vanishing species and subspecies</b>	<b>in %</b>
Invertebrates	21,337	78	0.4
Fish(Pisces)	83	18	21.7
Amphibian (Amphibia)	3	-	-
Reptiles (Reptilia)	59	16	27.1
Birds (Aves)	424	48	11.3
Mammals (Mammalia)	97	24	24.7
<b>Total</b>	<b>22,003</b>	<b>184</b>	<b>0.8</b>

Source: Academy of Sciences and State Committee for Nature Protection, Republic of Uzbekistan, 2009

69. Outside the irrigated areas, the land is sparsely covered with low desert shrubs like camel thorn. Thickets and riverine vegetation with species, such as Tamarix, reeds and poplar, occur in wetlands, lakes, and along rivers. In the last 50 years, the population has steadily increased, causing deforestation of the now denuded land. Timber and fuel wood shortages are evident throughout the area. In the irrigation scheme, the desert has been modified into irrigated arable lands with monoculture crops (cotton, wheat and rice) and home gardens (dekhan) with a

large variety of horticultural crops. Along canals and roads, several tree species have been planted, such as pine, poplar, maple and mulberry.

70. Most of the natural fauna has disappeared with the gradual habitation and population increase over time. Typical wildlife species, which can be encountered within the Project area, include Goitered Gazelle, mouse, fox, hare, jackal, badger, monitor lizard and snakes.

71. Aquatic biodiversity has been much reduced since the start of agricultural and industrial development in the 1940s. In particular, the original migratory fish assemblages of the Amu Darya have been destroyed by loss of habitat (dams and diversions) and reduced water quality (salts and other pollutants). Common fish species are carp and catfish. Fish also occur in the irrigation canals and reservoirs. There is no fishing on a commercial basis, while local people fish in an artisan manner. Of particular mention is an endemic fish species, which only occurs in the Amu Darya River.

72. Bukhara Oblast is rich in endemic species and out of the 184 species mentioned in the Red Book for Uzbekistan, fourth edition, 2011, 23 species occur in the Bukhara Oblast and 33 species in Navoi oblast, outside the irrigation scheme. No evidence was found that the irrigated areas provide habitat for any endangered species.

73. Two protected areas are located near the project area. The Eco Center Djeyran abuts the project area. It is a center for breeding the Goitered Gazelle and Bukhara deer, a rare species. The other protected area is Lake Dengizjul, which is a RAMSAR site. Composed of ornithology fauna have 257 bird species, in this number 63 nesters.

74. None of the project areas where the civil works will take place involve areas habitat of endangered and rare species.

## **E. Anticipated Environmental Impacts and Mitigation Measures**

75. Preliminary screening was done by ADB using the Rapid Environmental Assessment (REA) form. Based on this assessment, this project is categorized as a “B” project. Scoping checklists were used to identify the potential environmental stressors and the receptors that may be subject to an impact.

76. In addition to the use of checklists, the ABIS PPTA Environmental Team added potential impacts based on site investigations and assessments. The level significance (small, moderate, or major) of the potential impacts was assessed on the basis of the checklists and of the on-site assessment.

### **(i) Environmental Benefits Associated with the Project**

77. The Project has the potential for considerable positive environmental impacts in the Amu Bukhara area. The new sediment control facility will reduce sediment entering the system. The cleaning and shaping of canals will result in restoration of canal capacity and a reduction in water losses improving water availability. Improvements to the drainage system will reduce water logging and soil salinity.

78. The Project will support the strengthening of the water resources management through installation of a modern control and communication system, capacity building and improved Operation and Maintenance procedures, the strengthening of Water Consumer's Association's (WCA) and development of an integrated Water Resources Management Model. The improved water resources management component would optimize the use of the available water resources in the Amu Darya Basin and will result in more water available while adhering to the abstractions from the Amu Darya River that are required by international agreement.

79. The rehabilitation of on-farm infrastructure in the pilot areas will improve the water management at farm level and this will reduce wastage of water and drainage requirements. The farm demonstrations will improve the soil management and introduce sustainable cropping practices. Training sessions emphasizing new crop technologies and improved water management methods would raise the awareness of sustainable environmental development among government staff and water users.

80. The existing diesel powered dredgers will be replaced by electric powered dredgers. This will reduce the emission of Greenhouse Gases (GHG).

81. Community water supply and irrigation water quality will be improved by the reduction of silt and salts in the ABIS.

#### **(ii) Potential Environmental Impacts Related to Project Location**

82. The Project will rehabilitate existing systems for irrigation water supply and drainage. As the overall system capacity will be kept unchanged, this will not require new land acquisition or resettlement. Project activities will take place on State owned land where settlement is not allowed. Therefore, no significant potential socio-economic impacts are expected because of project location.

83. A new sediment control facility will be constructed with the aim to reduce the amount of sediments entering the main canal. The new facility will consist of a deepening of a section of the intake canal in Turkmenistan.

84. Project activities will not take place within protected areas. The Eco Center are located near the Project area: Aktepe Zapovjednik and Aral Payghambar. The latter is an island in the middle of the Amu Darya River at about 25 km downstream of the Amu Zang intake. The island is not accessible due to security regulations, which contributes to the conservation of biodiversity values. Aktepe Aktepinsk reservoir is part of the irrigation scheme and serves as a back-up storage reservoir receiving any overflow of the Amu Zang canal resulting from discrepancies between the operation of pumping stations Amu Zang I and being replenished from the Amu Zang canal downstream of Amu Zang II pump station. The recently created Aktepe Zapovjednik protected area is located along the shores of the reservoir. No impacts on the Zapovjednik are expected from the Amu Zang Canal rehabilitation, since there are no rehabilitation works associated with the reservoir envisaged under the Project.

#### **(iii) Potential Environmental Impact Related to Planning and Design and the Proposed Mitigation Measures**

85. The proposed measures to mitigate the potential impacts to acceptable levels include:

- (i) Mitigation measures that conform to Best International Practices and that are recommended by the Provincial *Gosproridodaas* per GOU requirements;
- (ii) The monitoring measures to evaluate the effectiveness of the mitigation measures
- (iii) Responsibilities for undertaking (a) the mitigation measure and (b) for monitoring the implementation of the mitigation measure
- (iv) The cost of (a) the mitigation measure and (b) the cost of monitoring the measure

114. Activities and responsibilities are identified for the project phases of pre-construction, construction and operation. A matrix of the EMP is attached as Appendix 1. They conform to Best Management Practices. All mitigation and monitoring measures proposed are those commonly proposed for the range of potential impacts assessed. No arcane or esoteric measures are proposed. Thus it is expected that experienced Project Managers and competent contractors will readily understand the EMP.

#### **(iv) Mitigation Measures during Pre-Construction**

115. The pre-construction phase provides the only opportunity to re-evaluate the original EMP and plan its implementation. This includes checking the design requirements that have been allocated to the Design Engineers and ensuring that the EMP conditions are incorporated into the bid and contract documents. This will be done by the Safeguards Officer (SO) of the Project Management Unit (PMU) with the guidance of the Environmental Specialists. It will be the Project Manager's responsibility to ensure that the required costs are included into the overall subproject budget.

116. It is also necessary to ensure incorporation of Health and Safety Requirements into the bidding and contract documents. Basic staff facilities need to be provided at the pump stations, including; a staff changing area, a place to take meals and relax, washrooms and proper toilets that are connected to an acceptable effluent disposal system. Portable chemical toilets, shall be available at desilting, canal, and drain field work sites.

117. Mitigation to eliminate risk of electrocution at the pump houses should include raised walkways to lift the workers above wet floors, incorporation of efficient drainage pumps and provision of electrical equipment that is designed to operate in damp environments. It is further required that the Design Engineer ensures that the following be in the tender documents:

- (i) Pump house drainage systems and raised walkways are designed to International Best Criteria or GOU standard, whichever is more stringent. Walkways must have safety railings. Effective safety measures must be taken to protect workers from dangerous moving parts. Also, satisfactory ventilation and lighting inside the pump-houses must be provided;
- (ii) All electrical systems are designed to International Best Criteria or GOU standards, whichever is more stringent, for high voltage pump stations, which would include the provision of electrical grounding and fused circuit breakers. Protection relays will be required, including earth (grounding) protection to shut off the power supply in case of short circuit or earth fault. All of these measures

will contribute to eliminating danger of electrocution. Procurement specifications will include these requirements and the cost of supplying these measures will be incorporated within the cost of the supplied equipment;

- (iii) The Safety Officer (SO) develops a Worker Safety Plan (WSP) that considers the risks associated with working in pump houses and that is compliant with the GOU Labour Code;
- (iv) Oil and water separators are specified in pump designs if water in the primary canal is likely to carry more than 0.5 mg/l;
- (v) The equipment and procedures used to conduct and report on the topographic and hypsometric survey meet International Best Criteria or GOU standards, whichever are more stringent; and
- (vi) The bid documents contain the CVs of the Contractor's Environmental Representative(s).

118. During bid evaluation above requirement will be evaluated in the selection of the contractor. Should the contractor not provide these details, the bid is judged to be non-compliant with the bid requirements.

**(v) Impacts to Physical and Ecological Environments**

119. The following paragraphs describe potential impacts into the ecological environment.

**a) Water Flow**

120. The Project will rehabilitate the pumping stations without changing the installed capacity. The amount of water that will be drawn from the Amu Darya river after the project completion will remain the same.

**b) Water Quality**

121. With respect to mineralization, no negative changes are expected once the Project is rehabilitated. The average level of mineralization of the Amu Darya at Termez is 0.4- to 0.7 g/L. Mineralization levels of the various collectors directly draining into Amu Darya are much higher and range from 3.0 to 5.0 g/L. The Project will include improvements of the existing drainage system, which will result in environmental benefits such as reduced water tables and reduced salinization. The introduction of measures for adoption of sustainable agriculture systems will, on in the long term, improve the quality of the return flows. Improved water management in the project area would result in a reduction of water abstractions, and corresponding drainage flows from the Amu Darya, which reduces the salt load concentration in the river.

**c) Sedimentation**

122. The Project envisages improvements to the existing sediment basin in the intake channel, which is in Turkmenistan. The diesel dredgers will be replaced by electric dredgers. The sediment interception facility is designed to trap about 50% of the total sediment load. The remaining sediments (mostly coarse and fine silt and clay fractions) will partly settle in the

smaller canals and field ditches or will be transported to the farmers' fields. In general, farmers appreciate these finer sediments, since they contribute to soil fertility.

123. After the construction of the sediment control facility, the amount of sediments entering the irrigation system will be reduced and most of the intercepted sediments will be returned back to the Amu Darya River through dredging pipes. These sediments were obtained from the river, and therefore do not constitute an introduction of exotic materials into the river. Nevertheless, the sediment regime of the Amu Darya River should be monitored to detect any potential changes on in the downstream parts reaches of the river. This monitoring program will be supported by the Project.

#### **d) Wildlife**

124. The nearby presence of Eco Centers and IBA's requires that the project conduct careful and detailed studies of wildlife, particularly birds, life cycles and habits in order that designs and plans do not have potentially negative impacts on wildlife.

### **(vi) Potential Environmental Impact Related to Construction and the Proposed Mitigation Measures**

#### **a) Mitigation Measures during Construction**

125. The contractor may only commence work after (i) the Gosecoexpertisa has approved the IEA24 and issued the consent to commence work and (ii) the ADB is provided with a copy of the above consent, and the ADB has approved the IEE.

126. Several contractors and sub-contractors may be involved in the work of all subprojects. The CEMP will apply equally to all subcontractors, and it will be the main (General) contractor's responsibility to ensure that all subcontractors abide by the EMP. The CE/SO will ensure that all contractors are issued with a copy of the EMP.

127. The following construction related activities/ issues have to be dealt with during the construction phase:

- (i) Removal of trees as per GOU authorization
- (ii) Wind and water erosion prevention measures appropriate to the situation must be taken for any soil placed in a spoil designated for construction soil, desilting soil, and canal cleaning soil
- (iii) Removal and disposal of debris
- (iv) Storage and handling of materials including fuel, lubricants and equipment
- (v) Traffic safety during the transport of machinery, equipment and material;
- (vi) Noise from construction activities
- (vii) Dust and vibration
- (viii) Worker health and safety
- (ix) Solid and liquid waste management



(x) Rehabilitation and closing of construction sites

128. Construction is estimated to take 5 years. The contractor will have initial responsibility for the supervision and monitoring of construction activities and will use the EMP as the reference for establishing these conditions.

129. The overall responsibility for the completion of the work and direction of the contractor to meet the EMP requirements will be the responsibility of the Construction Engineer (of the Project Management Consultants) supported by the Monitoring Engineer (of the PMO). They will be supported by the SO. The contractor will have his own representative on site – the Site Engineer (SE) who will be responsible for implementing the contract and complying with the EMP.

130. Following the selection of the contractor and approvals from Gosprompriroda and ADB, the contractor the contractor's Site Engineer and person responsible for supervising the CEMP are to attend a meeting at the site. At this meeting the EMP conditions will be outlined to the contractor so that there would be no confusion as to the requirements of complying with the EMP. After the contractor is clear about complying with the EMP requirements, the Safeguard Officer will advise the CE that the contractor can now commence work.

131. If trees need to be removed, Gosprompriroda will need to approve the removal of the trees. The contractor will be responsible for advising the CE where the trees to be removed are. The Environmental Management Officer will arrange for the Gosprompriroda to visit the site and approve or disapprove the removal of the trees. Following any removal of trees, the contractor will arrange for trees of identical species to be planted elsewhere in the construction site area.

132. Where the rising main is to be excavated all excavated materials are to be stockpiled alongside the excavated trench and replaced after the new pipelines have been laid. While stockpiled, effective wind and water erosion prevention measures must be taken. The contractor will be required to rehabilitate and landscape the area, and ensure that the area drains correctly. The contractor and the CE will be responsible for meeting these requirements. Quarrying of fine and coarse material is only to be done through licensed quarry operators. The Contractor will ensure that approvals are obtained for opening any borrow-pits, if required.

133. To the extent possible all waste material is to be re-used or recycled. Anything that cannot be recycled will need to be taken to the existing district landfill sites operated by the epidemiological services centre and the Hokimiyat, depending on whether the waste is hazardous or not. If any new landfill sites are to be used, the Contractor will be responsible for obtaining approvals from the Hokimiyat.

134. Construction material and POL storage areas and equipment maintenance areas must be identified and developed. Fuel and oil will need to be stored in dedicated areas at least 20 m away from a water course or other sensitive area. Where more than 5,000 liters of fuel is stored, the fuel must be stored in sealed tanks that are provided with a concrete base that is certified to hold 110% of the tank capacity. Vehicles and machinery are not to be re-fuelled near water courses. The contractor must have trained his personnel in correct fuel handling procedures to prevent spills and techniques for cleaning up accidental spills. All waste oil, oil and fuel filters are to be collected and disposed of in accordance with best industry practices. Upon closure of the site, all contaminated soil is to be excavated, removed and replaced with fresh topsoil.

Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard office.

135. Movement of trucks to carry material along access roads to the project areas will be via a low-traffic density paved roads. However, precautions are recommended for transport of material/equipment to eliminate any potential adverse impacts. If contractor's vehicles are likely to cause any congestion to local traffic flow and block to public roads, Contractors shall select alternative routes for their trucks based on the truck load, dividing the load if necessary to prevent damages to local roads and bridges. The Contractor shall be responsible for damages to local roads and bridges. All the vehicles shall observe the speed limits, be maintained in good operating condition and always transport material under cover. Contractor shall avoid peak hours on roads with moderate to high traffic.

136. Project sites are at least 150 m away from the nearest settlement and therefore equipment that generates noise will not be an inconvenience to people. However, noise will be a particular issue for workers who may be operating this equipment. Workers and operators of noisy equipment will be provided with ear protection while noise suppressors on construction equipment are to be maintained to the manufacturer's specifications. These activities will be the contractor's responsibility. Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard officer.

137. When near protected areas, it is necessary to time activities, both on a daily and a seasonal basis, in order to avoid disrupting animal or bird migrations, breeding, or nesting.

138. Excavation and construction work may create dust in the workplace from construction operations and from vehicles carrying material. However, the overall impact will be minor on paved roads, but the application of dust control best construction practices (BCP) by the contractor will control any problem. When the contractor's work aggravates dusty working conditions, the contractor will need to control dust by spraying water on the susceptible areas. The contractor will also be required to maintain a record of dust control spraying. Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard officer.

139. The contractor will be required to provide a safe working environment, personal protective equipment, a person trained in first-aid and a fully supplied first-aid kit at all construction activity sites. The contractor will be required to induct all workers to the construction area with a briefing session on workplace hazards and worker safety. A contingency plan must be developed by the contractor for handling major emergencies. The contractor is to keep a record of accidents and time lost from accidents.

140. Various quantities of solid and liquid waste will be generated from the construction sites. Solid waste can be disposed of at approved dump sites. Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard officer. If worker facilities are constructed the contractor will need to provide facilities to collect liquid wastes. These must be disposed in an acceptable place that will be approved by the safeguard officer and CE in agreement with Gospriroda requirements. No waste is to be dumped in any water body. Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard officer. However, it is important that all waste is disposed according to the recommendations of the District Sanitary Epidemic Station.

141. The contractor will be responsible for cleaning up and disposing of all waste materials and rehabilitating (landscaping) all construction sites and work areas so that these can be returned as close as possible to their previous state. This includes the stabilization and landscaping of all of the construction sites. Any borrow pits that were operated by the contractor are to be reshaped and closed. Any contaminated soil must be removed from fuel and oil storage areas.

142. Payment will be withheld from the contractor until all of the sites are satisfactorily cleaned, and the sites satisfactorily rehabilitated. Supervision and monitoring of these issues will be overseen by the CE and assisted by the safeguard officer.

#### **b) Excavation Materials**

143. Canal cleaning requires excavation of important amounts of sediment from the ABMK canals, which is about 10.5 to 11.5 mm<sup>3</sup>. Where there is not enough space along the canal to deposit the excavated materials, the material will be transported and deposited further away on unproductive lands. There are extensive areas of unproductive lands in the desert areas adjacent to the pumping station, where the materials should be deposited. The specific location will be determined during the detailed design. The impacts of the construction activities are considered not significant, provided the excavated soil is properly disposed of on the unproductive wastelands.

144. Most of the spoil will be coarse grained (mostly medium to very fine sand and coarse silt) and is not suitable for deposition on farmers' fields. Spoil disposal will be regulated through specific clauses in standard contract documents. Most areas adjacent to the irrigation scheme, which are not irrigated, are unproductive desert lands, where the spoil can be disposed of without negative environmental impacts. Where large quantities are excavated, and the space near the canal is limited, it is recommended to dispose of the spoil further away from the canals. The specific locations will be determined during the detailed design. All construction sites should be properly cleaned up, levelled and re-planted if required. All corresponding costs are included in the Project estimates.

#### **c) Canal Protection**

145. According to the existing government instructions, irrigation canals should be flanked with by buffer strips alongside where intensive agriculture, using fertilizers and pesticides, is not allowed. These strips would serve to provide space for inspection roads (the inner buffer zone), to protect the canal against infiltration of polluted water from nearby agricultural fields, and contribute to the general amenity of the environment through the establishment of vegetative strips (the outer buffer zone), which do not require intensive irrigation and/or application of agro-chemicals. The width of these strips depends on the capacity of the canals and has been determined by Government regulation as tabulated below.

**Table 14: Government Mandated Buffer Zones**

Capacity of the Irrigation canal (m <sup>3</sup> /sec)	Width of the Inner Buffer Zone for Inspection Roads and Deposit of Sediment from Canal (m)	Width of the Inner Buffer Zone for Inspection Roads and Deposit of Sediment from Canal (m)
1	6	n.a.
5	10	n.a.
25	20	50
50	75	100
100 or more	100	200

m<sup>3</sup>/sec = cubic meter per second, m = meter, n.a. = not available.  
Source: MWAR.

146. The buffer strip zones (right of way of canals) are state owned lands. In some places along the canals, farmers have illegally encroached the buffer strips to cultivate crops. Through consultations with farmers, the PMO will ensure that buffer zones are restored, where required, and maintained according to the regulations.

**d) Waste Material**

147. Replacement and repair of the pumps at the various pumping stations requires properly disposing of disposal and disassembling the old pumps and materials. Any waste materials containing oil products or other polluting substances will be treated in such a way that the polluting substance is collected and disposed properly.

**e) Domestic Waste water and Solid Wastes Generated from Construction Workers**

148. Civil work contracts will ensure that the technical operations (replacement of pumps, construction activities and cleaning of canals) are carried out according to the standard instructions for the appropriate disposal of waste, minimization of nuisances during construction, and proper after-care of the construction sites. The Project will ensure that contractors for civil works also comply with national safety and hygiene requirements for domestic wastewater and solid waste, which will be included in the contract documents for civil works.

**f) Dust and Noise**

149. During construction of the sediment control facility and rehabilitation of canals dust and noise may be created. Dust may be caused especially during the periods of strong winds. To minimize impacts to workers water spraying will be utilized. For the health and safety of workers, dust creation from construction and the noise impact from machinery will be mitigated by personal protection equipment.

**(vii) Potential Environmental Impact Related to Operation and Mitigating Measures**

**a) Mitigation Measures during Operation**

150. During operation, including the defects liability period, the main issues will be: (i) maintenance of the pumps and associated facilities, (ii) desilting of water, (iii) maintaining canals, (iv) maintaining drains, and (v) ensuring worker and resident health and safety.

151. The implementation of the O&M procedures of the pumps will be the responsibility of the BISA Chief Engineer responsible for pump stations. Included in the pre-construction EMP activities, as a procurement requirement, the pumps and electrical equipment are to be supplied with their own maintenance training programs. A record of training programs is to be kept by the Pump Station Manager which shows the type of training carried out, the number of people trained, their position and the length of training. The Pump Station Manager is to send a summary of the training records to the Chief Operations Manager of BISA every year.

152. The pump operators will also be required to maintain the oil and water separators to ensure that all waste oil that may have entered the pump house drainage system is removed before it is pumped back to the Primary Canal. If the oil cannot be recycled then it is to be disposed of in an approved earth fill. The Pump Station Manager is to ensure that the oil separator is adequately maintained and that staff are familiar with its cleaning and operation. BISA will verify that the oil separators are being properly maintained and that staff are familiar with these requirements and procedures developed for their maintenance will be the Design Engineer's responsibility. In such a case, it is required to ensure that the oil and water separators are included in the redesign of pump stations.

153. BISA responsibilities include: (i) to arrange with the suppliers of the mechanical and electrical equipment the implementation of the training programs that are included in the procurement package; (ii) to evaluate the impact that the maintenance training programs are having on maintaining the reliability of the mechanical and electrical equipment; (iii) to arrange a regular maintenance program; and (iv) provide sufficient budget to meet regular maintenance requirements for the pump station.

154. Worker safety practices/ conditions need to be improved so as to meet basic Uzbekistan labour standards. A Worker Safety Plan has been included as an EMP activity in the pre-construction phase. This will need to be implemented and monitored during operation. A record of accidents is to be maintained by the Pump Station Manager. The BISA pump house management will be responsible for implementing the program. Every month the Pump Station Manager is to send a copy of the Accident Record Report to the Chief Operations manager of the BISA.

155. During the operation period, sanitary conditions of the pump house and cleanliness must be properly maintained. The cesspits must be periodically emptied as required. A dedicated warehouse must be maintained for storage of waste such as mercury pollutants (luminescent lamps) for recycling (de-mercurization) at the special enterprises. Waste must be disposed according to the recommendations of the District Sanitary Epidemic Station either to the regional dump yards, for recycling or reuse.

**b) Water Flows**

156. No major changes of the water abstractions are expected once the rehabilitated project is in operation. Similar amounts of water will be extracted from the Amu Darya River. The ABIS operation staff will monitor the water abstractions throughout Project implementation.

**c) Sediment Reduction**

157. The desilting facility will result in an important reduction of sedimentation and siltation of irrigation canals and drains. It is estimated that about 50% of the suspended solids currently entering the irrigation system, will be intercepted at the Amu Zang intake. The other 50% consists mostly of fine-grained sediments, and will be settled in the field canals and on farmers' fields. These finer sediments are generally appreciated by farmers.

158. The impacts of the return flow from the sediment control facility on the river are considered not significant and can be absorbed by the Amu Darya flow, as discussed previously.

**d) Water Losses**

159. Operational procedures following implementation of the Project are likely to be improved by management strengthening programs and introduction of a decision support system. Improvements in operation efficiencies are further expected from the rehabilitation of canals, collectors and the installation of hydro-posts, which allow better monitoring and control of water delivery.

160. Once the main canals are cleaned and lined, infiltration losses during operation will be reduced substantially. Canal deformation and erosion, now occurring in various places, will be reduced considerably once the rehabilitated system is in operation. A monitoring program for water flows is included under the Project.

161. At the pilot areas, water losses will be reduced due to introduction of water savings techniques. Techniques that could be adopted by the farmers include: (i) land leveling so that water is better spread over the land and less water is needed; (ii) better application rates, which are adjusted to the growing periods of the crops, and (iii) mulching of soils to reduce evaporation from the soil and enhance water holding capacity of soils. Water losses will be further reduced due to construction and repair of canal linings.

162. About \$1,784,000 will be invested for the five year period during which project planning, design, and construction activities will take place. \$1,784,000 is about less than one percent the estimated project cost.

**F. Analysis of Alternatives**

163. There are no alternatives to the proposed project as water releases from the Amu Darya River are beyond the control of the GOU. The "zero alternative" of not carrying out the implementation of the proposed subprojects would be water shortages for the 315,000 ha of designated command area as well as to the city of Bukhara.

164. There are some alternatives to rehabilitation of Amu-Bukhara irrigation system. The Zero alternative considers not conducting rehabilitation works, in expectation of progressive destruction of the equipment and structures so long as the system already be unable to provide the farmers with water. If the Amu-Bukhara system will not be reconstructed within several years, it can completely leave out of operation. You see many objects on system work about 50 years. Such situation would have destructive social consequences, including lowering of earnings of the farmers and stop agricultural production on the area in 315,000 ha. Besides it would be resulted in deterioration of water supply of Bukhara and Kagan cities. Not conducting of rehabilitation works would result in large social shocks, and taking into account that fact, that in the future the expansion of irrigated lands in the country is not planned, the resettlement of these farmers within the limits of existing irrigated lands would not be represented probable. The closing of pump stations now would mean that for the areas located below stations cease water delivery. The losses irrigated system would grow in some times, that would result to even more not rational use of water resources.

165. At realization of the project the reconstruction of ABIS pump stations, improvement of interfarm canals and structures on demonstration sites, and introduction of the appropriate water resources management technologies on interfarm level will be carried out. As a result of project realization to increase water efficiency and water use efficiency, to be improved water resources management on command territory of ABIS on interfarm system. Due to the project to increase efficiency of irrigation system. In result the opportunity will appear to lower impact of irrigation on an environment: to reduce quantity of returnable waters and by that to reduce a level of pollution surface flows, to lower a salinity and flooding level lands, to increase land efficiency and productivity of crops. At the farmers the opportunity to grow secondary crops will appear, that will bring additional profit.

166. Contracts with sub-contractors for civil works will include clauses to ensure minimum environmental impacts. The staff of PMO will prepare the contract documents and supervise the activities. The Provincial Committee on Nature Protection would be responsible for environmental clearance. Procedures will have to be followed as established in the national regulations (i.e. the "National Guidelines on Conducting Environmental Studies", 1993).

167. The Project supports that, wherever possible, the authorized and specialized national institutes will carry out the environmental monitoring activities in the Project area, which will ensure sustainability and continuation during Project operation after Project completion. During the first six months of Project implementation, the PMO environmental specialists will develop a monitoring program to be undertaken during the Project implementation. Specialized national institutes will take part in the program according to their field of expertise. The following monitoring currently takes place in the Project area.

168. Water quality monitoring of surface water is carried out by the State Hydromet. Water table monitoring in Bukhara Oblast is carried out by the specialized "Land Reclamation and Hydrological Expedition Department" ("Land Reclamation and Hydrological Expedition Department") of Ministry of Agriculture and Water Resources (MAWR) on a monthly basis. Meteorological monitoring is also conducted by Hydromet. Drinking water quality monitoring is undertaken by the Provincial Office of the Ministry of Health. Ecological monitoring is undertaken by the Analytical Inspection under the State Committee of Nature Protection. The Project supports the fish monitoring at the ABIS approach canal to quantify the fish populations living in the ABIS, and to estimate the amount (and type) of fish sucked-up by the pumps. The

Provincial Committee on Nature Protection will undertake this activity. The source of funds is to be determined.

## **G. Information Disclosure, Consultation, and Participation**

### **(i) Public Involvement**

169. Agencies that provided information/consultation for the IEE preparation include the State Committee for Nature Protection in Tashkent, the Ministry of Agriculture and Water Resources, the Environmental Protection Committee in Bukhara Oblast, the Provincial Department of MAWR in Bukhara, "Land Reclamation and Hydrological Expedition Department", farmers' associations, and various individual farmers in the field. Interviews were conducted with the above stakeholders, to obtain and analyze their views and main concerns. In addition, in June, July, October, and November 2012, a detailed socio-economic survey using participatory techniques was carried out. Representatives of the "Department of Ecological Expertise" within the State Committee for Nature Protection participated in the final Project workshop held in Tashkent, where the scope, design and impacts of the Project were presented and discussed in detail. All these consultations concluded that there is an overall support for the rehabilitation project and that no significant negative environmental impacts are associated with the Project.

### **(ii) Public Consultation**

170. Initial works on conducting the formal Public Consultation was started in close collaboration with Bukhara Province Hokimiyat, Provincial Committee on Nature Protection (SCNP) and TA Consultants. A brief introduction to the project activities and the intention of the Public Consultation was forwarded to the Bukhara Province Hokimiyat. Various community groups were informed about the Public Consultation by displaying printed notices in public places of Romitan and Bukhara Districts. Moreover, official invitation letters were forwarded to the District Hokimiyats about this activity and to the Provincial Departments of PNPC, and the Makhalla Committees of Romitan and Bukhara Districts.

171. The first formal Public Consultation was conducted on 23 November 2012 in Romitan. Representatives of all above invited groups as well as representatives of the District Pump Station Management participated in the Public Consultation. The key stakeholders participated in the consultation meeting: The details of the public consultation are given in Appendix E.

172. Further consultations will be required during the construction phase to alert farmers to the construction schedule and when changes in water supply may occur. This has been identified within the EMP.

### **(iii) Information Disclosure**

173. To date, the following have been disclosed:

- (i) Subproject description and components
- (ii) Locations
- (iii) summary of potential environmental impacts and proposed mitigation measures



174. The IEE, including the EMP, will be disclosed to stakeholders through the ADB web site, and IEE report in Russian will be made available in the ABIs project office in the field and mahallas.

## **H. Grievance Redress Mechanism**

175. In case of occurrence of complaints from non-staff or the affected population, the project management office (PMO) is the designated a complaint receiver. However, since the population is having more access to, Hokimiyat, local mahallas, the environmental consultant from PMO will routinely check at least 1 times/month with local hokim and mahallas where the project located to gather information whether any complaint has been received by them. In addition, the supervision consultant will also oversee and record to PMO, if there is any communicating caused by the project that could cause a complaint from affected people.

176. The PMO, environmental consultant will coordinate with local authorities, mahalla, and committee on nature protection to resolve any complaint within 5 working days by identifying how the solution will be implemented and communicating with the complainants. If within 5 working days, complaint cannot be resolve, complainants have the right to bring the complaint to high authorities, such as Hokim, or Ministry of Agriculture by following the Government Resolution on Civil Right. All complaint received and handle will be recorded in systematic manner, and both resolve or unresolved have to be directly reported to ADB.

## **I. Environmental Management Plan**

### **(i) Environmental Management and Monitoring Plan**

177. An Environmental Management and Monitoring Plan (EMP), attached as Appendix 1, has been developed and it contains the following recommendations:

178. It will be the PMO's responsibility to ensure that the pump house building designs include provision for basic worker facility requirements, structural stability, safety and health requirements, adequate drainage, oil separation, etc., as outlined in the pre-construction section of the EMP:

- (i) With respect to irrigation infrastructure, designs to deliver adequate irrigation water, facilities for removal of silt before pumping and features important for sustainability of the operations are embodied in the EMP;
- (ii) When the pumps and electrical/mechanical equipment are procured the suppliers are to provide basic maintenance support programs for the pumps and electrical equipment for at least two years. No equipment with PCBs, such as transformers, are allowed;
- (iii) The EMP will form part of the Bid conditions and will also be attached to the contract as a requirement of the contract. Contractors that do not address the EMP at the time of bid will be disqualified;
- (iv) The EMP will need to be reviewed and updated when the detailed design is completed;
- (v) During the implementation of the project, any unforeseen environmental impacts needs to be taken care by formulating appropriate mitigation measures.

## **(ii) Institutional Arrangement**

179. EMP provides realizable mitigation measures that are compatible with Best Construction and Worker Health and Safety Practices. The institutional arrangement to implement the EMP will be as follow: Compliance monitoring of the mitigation measures will be the responsibility of the Construction Engineer who will be supported in this role by the nationally recruited Safeguard Officer. The Safeguard Officer will be supported by a nationally recruited National Environmental Specialist and an internationally recruited Environmental Specialist. The cost of implementing the EMP includes both for the staff of EMU and mitigation measures. The remuneration, transport and other expenses of the staff is included in the project budget. The cost of mitigation measures are expected to be included in the contractors bid values.

180. All project activities prior to construction, during construction and during operation will be monitored and a monitoring mechanism for which is provided in this IEE Report. Moreover, the members of the WUAs, BISA, and Hokimiyats have an important role in project construction and operation so that they can intervene when necessary or when complaints arise.

181. It is recommended that the project proceeds as planned and that the mitigating and monitoring measures that have been identified within the EMP are implemented during the pre-construction, operation and maintenance phases of the project's implementation. Therefore, the bidding document should include the IEE as attachment, and the contractor will be able to include all mitigation costs during the construction period. Bidding evaluation should take into the contractor proposal to cover works and budget to implement mitigation measures as stated in the EMP. The supervision consultant /the engineer, has also to strictly implement the EMP when clear any contractor claim.

## **(iii) Environmental management Costs**

182. Most of the environmental impacts will be occurred during the construction stage, and therefore the environmental mitigation costs will be part of the construction costs. Some of the mitigation measures to avoid the occurrence of unexpected impacts are also should be part of the detail design. Therefore, ensuring that all environmental mitigation measures are incorporated into the design and contractor works are very important steps in implementing the EMP. For environmental management during the operation stage will be incorporated as part of ABIS operation costs.

## **J. Conclusion and Recommendation**

183. The Project involves rehabilitation of the existing infrastructures. No construction of new canals or expansion of the pumping capacity or irrigated area. There are a number of environmental benefits associated with the Project. The Project area is not considered environmentally sensitive, and adverse environmental impacts will be minor. Mitigation measures with careful monitoring plan have been formulated, and costs for implementing the measures have been included in the budget.

184. The activities outlined in the IEE are for the rehabilitation and upgrading of the Amu Bukhara Irrigation System, which will have one or more subprojects. The activities involve the deepening and widening of the intake canal, repair and rehabilitation of pumping stations, removal of existing pumps and installation of new pumps in or away from the existing pump

houses. Work also involves refined management of the system; repair and rehabilitation of the ABMK and associated infrastructure; demonstration farms; and drainage system upgrading. The work will not increase the amount of water presently pumped, but it will reduce and capture leakage and losses water during distributions, and therefore, it will increase the productivity of the water pumped and irrigated. Overall the ABIS will pose small and moderate potential impacts on the environment, mostly during construction, and are acceptable when the mitigating measures outlined in the EMP are applied.

185. Those communities that are dependent on the supply of irrigation water will benefit from the ABIS, which will either provide them with a more secure and reliable source of water or provide water of better quality. The project will also improve the safety and working conditions of the pump house operators.

186. Based on the IEE findings it is concluded that there are no outstanding environmental issues remaining and as all impacts can be effectively mitigated no further environmental assessment is required for the subproject. There is no need to carry out a full scale EIA.

## ENVIRONMENTAL MANAGEMENT PLAN

Table 15: Environmental Management Plan

IMPACT MITIGATION							IMPACT MONITORING	
Project Activity	Potential Environmental Impact(s)	Proposed Mitigation Measures	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of verification	Monitoring responsibility	Monitoring Cost
PRE-CONSTRUCTION PHASE								
[1] Incorporation of Health and Safety working requirements in the pump house and other designs	Health & safety threats to workers in the pump station i. Lack of adequate staff facilities resulting in unsanitary and poor staff facilities. ii. Possible serious accidents and loss of life from (a) working alongside machinery and (b) within high risk of electrocution	<i>Pump Stations</i> i. Provide adequate staff facilities in the pump house redesigns (water-seal toilets, furnished rest rooms, dining rooms, etc.). ii. (a) Provide raised walkways, provide safety guards on exposed machinery, improve floor drainage/lower groundwater level. (b) All electrical installations to meet internationally acceptable safety standards for wet working areas  <i>Desilting, Canal &amp; Drain Cleaning, and Demonstration Farms</i> i. Provide portable toilets; ii. Provide safety guards on exposed machinery; iii. Provide safety awareness training	Design Engineer (DE)	Costs included in procurement specifications	<i>Bid documents &amp; detail designs</i> i. Plans and bid documents show that staff facilities have been included. ii. Bid specifications reflect safety requirements for (a) and (b)	i. Once, verify design. ii. Once verify that safety requirements have been incorporated into Bid specifications	Project Manager (PM) and Safeguards Officer (SO)	Included in project budgets of PMO
[2] Incorporation of wildlife avoidance management plan into project scheduling	Lose of biodiversity due to disruption of bird and wildlife diurnal and seasonal patterns	i. Determine critical diurnal and seasonal times. ii. Prepare and adhere to avoidance plan	DE and SO	Costs included in procurement documents	<i>Bid documents &amp; detailed designs</i> Plans and bid documents show that required	Verify to check on incorporation in design and then throughout the construction period	Project Manager (PM) and Safeguard Officer (SO)	Included in project budgets of PMO

IMPACT MITIGATION							IMPACT MONITORING	
Project Activity	Potential Environmental Impact(s)	Proposed Mitigation Measures	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of verification	Monitoring responsibility	Monitoring Cost
					specifications have been included.			
[3] Development and incorporation of Best Management Practice Topographic and Hypsometric survey standards	Risk that all designs and construction will be sub-standard because of inaccurate survey maps	i. Purchase and use of only new equipment; ii. Contractor to provide Professional Survey Engineer to manage survey works	DE and PM	Costs included in procurement specifications	<i>Bid documents &amp; detailed technical specifications</i> i. Plans and bid documents show that required specifications have been included. ii. Work monitored	Once, verify design Periodically during project	Project Manager (PM) and Safeguard Officer (SO)	Included in project budgets of PMO
[4] Incorporation of structural stability for safety purposes and sustainability of facilities (pump house facilities)	Risk of accidents after completion causing damage to facilities and workers due to inadequate designs; Impacts on project sustainability and benefits in the long-term Adverse impacts on groundwater	<i>All new structures/constructions</i> Building design with a second category of fire resistance where all elements are made of fireproof or not-easy-to-burn materials; Ensure free access to the facilities and availability of roads to them for O&M; Placement of building and facilities considering fire breaks Design according to CNR 2.01.03-96 and 3.04.02-97 “Corrosion Protection of buildings” to prevent effects	Design Engineer	Costs included in procurement specifications	<i>Bid documents &amp; detailed designs</i> Plans and bid documents show that required specifications have been included.	Once, verify design	Project Manager (PM) and Safeguard Officer (SO)	

IMPACT MITIGATION							IMPACT MONITORING	
Project Activity	Potential Environmental Impact(s)	Proposed Mitigation Measures	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of verification	Monitoring responsibility	Monitoring Cost
		on the quality of ground water						
[5] Reduction of sand at the pump intakes	i. Reduce cleaning of canals, reduced pump wear and pumping costs; ii. Increases sustainability of pumps and reduced canal de-silting.	<i>Inlet canal</i> i. Inlet canal design/silt basins to be checked for adequacy of silt removal. ii. Criteria to be developed for cleaning inlet sand trap/ other alternate devices.	DE and Safeguard Officer (SO)	Costs included in procurement specifications	<i>Bid documents &amp; detailed designs</i> Verify inclusion of silt removing measures in design.	Once, verify that the inlet has been evaluated and redesigned as necessary.	PM and SO	Included in project budgets of PMO
[6] Provision of oil and water separators if surface drainage from pump house enter irrigation canals	Avoidable loss of water quality downstream of pump stations	<i>Pump house- drainage inlet</i> Oil and water separators to be provided on internal drainage systems in the pump station if canal water carries >0.3 mg/l oil below drainage outlets.	DE and SO	Costs included in procurement specifications	<i>Bid documents &amp; detailed designs</i> Verify inclusion in re-design.	Once, verify that the oil and water separators have been included.	PM and SO	Included in project budgets of PMO
[7] Development of Worker Safety Plan (WSP)	Possible serious accidents to those working in the pump station.	<i>Pump station</i> Develop Worker Safety Plan that is compliant with Uzbekistan Labour Code	SO	Included as part of SO's tasks – As such no cost implication	<i>Part of O&amp;M Manual</i> Completion of Worker Safety Plan.	Once, verify the WSP has been written.	PM and SO	Included in project budgets of PMO
[8] Evaluation of ground condition of rising main	Possible excessive corrosion of steel manifold and rising main laid in saline water tables and soils; and reduced project sustainability	<i>Rising Mans</i> Evaluate relaying new manifold and rising main sections as above ground structures in salinized areas / Use of protective coating	DE and SO	Costs included in procurement specifications (if any such work is required)	<i>Detailed Design</i> Evaluation of new rising main in terms of corrosion affecting on life of structure	Once, verify evaluation has been carried out and a decision made based on the evaluation.	PM and SO	Included in project budgets of PMO
[9] Provision of canal and open drain crossings	Enhanced accessibility to irrigation areas on both sides of canals and drains	<i>Along ABMK and other channels</i> Upgrade existing crossings and provide additional crossings as required to meet user needs	DE and SO	Costs included in procurement specifications	<i>Detailed Designs</i> WUAs consulted regarding location. Crossings included in design	Once, verify WUAs consultation completed. Canal crossings included in design	PM and SO	Included in project budgets of PMO

IMPACT MITIGATION							IMPACT MONITORING	
Project Activity	Potential Environmental Impact(s)	Proposed Mitigation Measures	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of verification	Monitoring responsibility	Monitoring Cost
					design			
[10] Incorporation of landscaping, tree planting, pavements and beatification of buildings/ sites	Minimized potential risk of soil erosion, reduced ambient dust levels, impairment of aesthetics	<i>Pump house surroundings</i> Identification of locations which require landscaping, tree planting, formation of pavements and include them in the design; Provisions for painting and upgrading of existing buildings wherever	DE	Costs included in procurement specifications	<i>Bid documents &amp; detailed designs</i> Plans and bid documents show that required provisions have been included.	Once, verify design.	PM and SO	Included in project budgets of PMO
[11] Procurement: i. supply of training maintenance programs. ii. Exclusion of PCB from goods included in procurement	i. Poor maintenance of mechanical and electrical equipment will lead to early and costly failure of equipment. ii. Supply of POPs is banned under Stockholm Convention and ADB procurement.	<i>Pump house new equipment</i> i. Training to be provided as a supporting item at the time of procuring the mechanical and electrical equipment. ii. No electrical equipment can (transformers) be supplied with PCB insulation.	DE and SO	Costs included in procurement specifications	<i>Bid document</i> i. Procurement bid document includes provision for the maintenance programs. ii. Bid documents must state that supply of equipment with PCBs will not be permitted	Once, verify procurement bid document includes i. maintenance programs, and ii. Prohibition of PCBs.	PM and SO	Included in project budgets of PMO
[12] Incorporation of EMP in bid and contract documents	Lack of application of the EMP will mean that environmental issues not addressed. Lack of subproject sustainability.	<i>Bid &amp; contract documents</i> i. EMP to be included as a Special Conditions in the Bid Document' and (ii) EMP to be attached to contract to form part of the contract requirements.	PM and SO	No cost implication	<i>Bid &amp; contract documents</i> EMP included in (i) the Bid Document' and (ii) the Contract document.	Once, verify EMP has been included in (i) the Bid Document and (ii) the Contract Document.	PM and SO	Included in project budgets of PMO
[13] Design of	Inability to meet full	<i>Pumps, canals, drains, and</i>	DE	Costs	<i>Detailed</i>	Once, verify	PM and SO	Included in

IMPACT MITIGATION							IMPACT MONITORING	
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rehabilitation of canals, drains, structures, and demonstration farms	irrigation demand and operation over the long-term if inadequately designed.	<i>demonstration farms</i> i. Design considering full irrigation water demand and drainage requirements and adhering to the construction regulations of International Best Practices and of GOU.		included in procurement specifications	<i>designs</i> Plans and bid documents show that required provisions have been included	design		project budgets of PMO
[14] Selection of Contractor	Selection of inappropriate contractors may result in lack of/inadequate compliance with the EMP.	<i>Bid evaluation</i> Prepare evaluation checklist to compare contractors. Use this to select the best contractor.	PM and SO	No cost implication	<i>Bid evaluation</i> Review contractor evaluation scores.	a. Once, verify that the procedure has been followed.	PM and SO	Included in project budgets of PMO
CONSTRUCTION PHASE								
[1'] Awareness campaign	Loss of farm income due to changes in supply of irrigation water caused by construction activities	<i>Irrigated farms</i> Undertake a public awareness campaign to create awareness among farmers of the construction work plan and possible impacts on irrigation delivery.	PM and SO	Cost has been included in PMO budget	<i>PMO documents</i> Public consultation records	Once, verify public consultation process has been completed	PM and SO	Included in project budget of PMO and Project Management Consultants
[2] Introduction of contractor to the site.	Avoids contractor ignoring the EMP and losing environmental values due to poor application of the EMP.	<i>On site</i> i. EMP explained to contractor on-site before any work commences. ii. So approves the commencement of work only after the contractor understands the EMP	SO and Construction Engineer (CE)	No cost implication (PMO task)	<i>PMO Documents</i> Induction carried out prior to commencing work by Contractor.	Once, verify induction process has been completed.	SO	Included in project budgets of PMO
[3] Removal of trees in construction sites	Loss of scarce vegetation.	<i>All Construction sites/ canals</i> Any trees that need to be removed can only be removed after the PNPC/ Hokimiyat has approved their removal.	Contractor, PNPC, SO and CE	No cost implication	All work sites Trees removed only after PNPC approval obtained.	Any tree removed has been approved by the PNPC.	SO and CE	Included in project budgets of PMO & Project Management



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								t Consultants
[4] Site preparation	Erosion from site clearing, grading and excavation resulting in sedimentation of water bodies;	<i>All Construction sites</i> Minimize land clearing and excavation areas, preserving existing ground cover wherever possible, and providing approved ground cover where necessary; plant trees, bushes/grass to minimize rainwater runoff; appropriate stabilizing techniques to prevent cave-ins or earth-slips in excavated areas. Constructing buildings and facilities following the land protection activities stipulated in Construction Norms and Regulations (CNR) 3.01.01-97 and CNR 3.05.03-97.	Contractor and CE	Costed by contractor and cost carried into contract	All work sites Verify the adherence to recommendations in sites where clearance is performed	Spot checks and monthly inspections	CE and SO	Included in project budgets of PMO & Project Management Consultants
[5] Excavation of sites and opening of borrow pits	Loss of aesthetics from poor handling of excavated materials and opening of borrow pits. a). Borrow material - needed for canal work. b). Spoil- Excavated material from rising mains	<i>Borrow sites/ excavation areas</i> a). Borrow material i. Use material from sides of canals that has been dumped after excavation/ de-silting. ii. If borrow pits essential. to be approved by PNPC and Ministry of Geology iii. borrow pits to be closed and landscaped. b) Excavated materials i. Stockpile materials alongside open trench for backfilling; use for road formation ii. Replace material and landscape the area. iii. Remove all waste and unused pipes.	a. Contractor to obtain approval for opening borrow pits. b. Contractor and CE.	Costed by contractor and cost carried into contract	<i>Borrow / excavation areas</i> a. i Material removed from sides of canals. ii , iii. Borrow pits closed b. i. Materials properly stockpiled, ii. site landscaped and iii. all old pipes and other used materials removed.	Verify a. i – iii. and b. I -iii.	CE and SO	Included in project budgets of PMO & Project Management Consultants

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[6] Rehabilitation activities during cropping season	Reduced crop yield due to inability to grow or meet crop water requirements due to lack of water during the crop season	<i>Installing new pump, desilting, and canal upgrade</i> i. Undertake pump station construction, rehabilitation during non-cropping periods ii. Provide water by-pass structures along canal wherever feasible, e.g., provide a detour channel connecting the intake canal to the existing intake chamber behind the rehabilitation site during installation of new pumps (proposed site) to continue uninterrupted supply of irrigation	CE and Contractor	Costed by contractor and cost carried into contract, if any cost is involved	<i>Installation of pumps and canal repair during summer</i> i. Pump station work carried out during off-season ii. Water bypass structures provided for canals if feasible iii. Small effect on farm productivity	i. As required Pump station work carried out during off-season. ii. Water by-pass structures provided iii. Small effect on farm productivity	CE and SO	Included in project budgets of PMO and PMC
[7] Removal and disposal of debris	Improper dumping leading to loss of environmental values	<i>Temporary &amp; designated dumping sites</i> i. Debris to be dumped in land fill sites approved by <i>Oblast Gospropridom&amp;Hokimiyat</i> ii. Sell metal based scrap and equipment to scrap dealers in Alat and Bukhara; iii. Land fill sites to be closed and rehabilitated iv. Old rising main pipes to be removed and disposed or recycled v. Any electrical equipment found to contain PCBs is to be disposed of in accordance with <i>Gozecoexpertisa requirements: Uzbekistan maintains 'sanitary norms' and rules' and under that all waste is classified and recommended the procedures</i>	Contractor, SO, and PSEE	Costed by contractors and cost carried into contract	<i>Temporary &amp; designated dumping sites</i> Verify that disposal site meets PSEE standards Scrap and all old pipes and other metal must be taken away	i. Verify location for dump site ii. Scrap metal and pipe removed iii. Ensure site has been closed	CE and SO	Included in project budgets of PMO & PMC

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		<i>for disposal of each category. The contractor must obtain this recommendation and follow them by hiring the companies registered for handling such waste materials; also reuse , recycling must be followed for some waste.</i>						
[8] Storage and Handling of construction materials, fuel and lubricants	Contamination of soil and water resources	<i>Material/ equipment storage sites</i> a. Prepare material/equipment storage areas with facilities not to impair air quality nor contaminate soil or water and placed about 20 m away from water sources at elevated areas without interfering with drainage pattern b. Bund fuel tank storages to 110% of tank capacity. Refuel vehicles and equipment 20 m away from water courses c. Dispose of used oil and oil filters to meet accepted industry procedures d. Accidental spill handling action (contingency) plan	a, b, c and d: Contractor	Costed by contractor and cost carried into contract	<i>Material &amp; equipment storages</i> Adhere to proposed mitigation; Fuel and lubricant storage and handling procedures implemented; Contingency plans are in place	a. Verify suitability of storage facilities b. Verify fuel storage areas c. Bund formation at start then spot checks as required	Contractor, CE and SO	Included in project budgets of PMO & Project Management Consultants
[9] Noise from construction equipment; e.g. jack hammers, air compressors	a. Nuisance to surrounding communities (if any) b. Workplace hazard	<i>All work sites</i> a. Equipment fitted with approved sound suppression equipment and maintained b. Operators provided with ear protection c. Limit activities to daylight hours	a, b and c. Contractor	Costed by contractor and cost carried into contract	<i>All work sites</i> Workers and communities satisfied with conditions	I Spot checks and monthly inspections: for: a. Noise b. hearing protection	CE and SO	Included in project budgets of PMO & Project Management Consultants
[10] Dust	a. workplace hazard b. community hazard from haul	<i>All work sites &amp; haulage routes</i> a. contractor to have access to water tanker in List of Equipment to be brought to	a and b. Contractor	Costed by contractor and cost carried into	<i>Work sites and haulage roads likely to have dust</i>	Spot checks and monthly inspections	Contractor, Site Engine, CE and SO	Included in project budgets of PMO &

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	traffic	site. b. contractor to spray water on work areas and roads as required		contract	<i>problem</i> Water tanker provided. Contractor's Dust Spraying record			Project Management Consultants
[11] Worker Health and Safety	Accidents and loss of worker productivity	<i>All work sites</i> a. Contractor to implement workplace safety awareness program. b. Workers to be provided with safety equipment and instructed in its use. c. Emergency accident - contingency plan	a ,b and c. by Contractor	Costed by contractor and cost carried into contract	<i>All work sites</i> Inspection and verified by Contractor's Labour Accident Report	Spot checks and monthly inspections	Contractor, CE and SO	Included in project budgets of PMO & Project Management Consultants
[12] Solid and liquid waste management	Soil and water pollution	<i>All work sites &amp; labour camps</i> All solid waste collected in containers for safe temporary storage and weekly dispose to safe dumping areas approved by the PE and PNPC;	Contractor	Costed by contractor cost carried into contract	<i>All work sites &amp; labour camps</i> Visual inspection of work sites and labour camps	Spot checks and monthly inspections	Contractor, CE and SO	Included in project budgets of PMO & Project Management Consultants
[13] Transport of equipment and material in existing roads	Possible public nuisance due to dust, traffic congestion, air pollution, etc., and Damages to local roads and other utilities due to hauling in roads which were not identified during design stage;	<i>Roads used for haulage</i> If local roads are used, Select routes based on the truck load; divide the load to prevent damages to local roads and bridges; observe speed limits and maintain in the good condition; transport material under cover; avoid peak hours in roads with moderate to high traffic. Contractor attends to repair all damaged infrastructure/ roads, if needed. with relevant authorities (Hokimiyat);	Contractor	Costed by contractor cost carried into contract	<i>Roads used for haulage</i> Possible public nuisance due to dust, traffic problem, etc. Any damages to roads restored by end of the project	Spot Check and inspection once a month, if any problem prevails; Following completion of work before final payment	Contractor, SE. CE and SO	Included in project budgets of PMO & Project Management Consultants
[14] Rehabilitation	Impairment of environmental	<i>All work sites, labour camps storage areas &amp; temporary</i>	Contractor	Costed by contractor	<i>work sites, labour camps</i>	Following completion of	Contractor, SE, CE and	Included in project

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and closing of construction sites	resources, aesthetics and community safety	<i>dumping yards</i> a. Remove all waste and contaminated soil b. Restore sites by replacing topsoil and re-vegetating area c. Final payment may be withheld until work is completed		cost carried into contract	<i>storage areas &amp; temporary dumping yards</i> Sites closed according to requirements	work. Before final payment	SO	budgets of PMO & Project Management Consultants
[15] Inspection and acceptance of construction works before handing over		<i>All work sites, labour camps storage areas &amp; temporary dumping yards</i> a. Inspection and signed acceptance by Operating Personnel	Contractor, PM, SO	Costed by contractor cost carried into contract	<i>work sites, labour camps storage areas &amp; temporary dumping yards</i> Sites inspected and accepted according to requirements	Following completion of work. Before final payment	Contractor, SE, CE and SO	Included in project budgets of PMO & Project Management Consultants
POST-CONSTRUCTION, OPERATIONS PHASE (INCLUDING DEFECT LIABILITY PERIOD)								
[1] i. Regular maintenance of infrastructure ii. Regular maintenance of oil and water separators.	i. Early failure of facilities leading to more costly rehabilitation/replacement. Lack of sustainability of subproject. ii. Loss of water quality in irrigation canals	<i>Pump house &amp; irrigation canals</i> i. Arrange maintenance training programs. ii. Evaluate training programs iii. Arrange irrigation canal and drainage channel maintenance programs iv. Arrange budgets for maintenance. v. Check that oil and water separators are being properly maintained	i. First two years training by contractor as per procurement for electro-mechanical equipment I - v. BISA	i. First two years training cost included in procurement of electro-mechanical equipment; ii: BISA	<i>Pump house</i> i. Rehabilitated equipment and infrastructure operating as expected. ii. Oil and water separators cleaned. No visual signs of oil drained into the canal	Six monthly. i. Infrastructure meets expected operating requirements. ii. Oil not being discharged to canal.	BISA	Procurement cost & MAWR cost
[2] Maintenance of land productivity	Deterioration of soil quality due to salinization and	<i>Irrigated Lands</i> Prevent re-use of poor quality drainage water (containing	Relevant BISA and Farmers	MAWR operational costs;	<i>Irrigated Lands</i> Regular	Already established norms for	BISA/MAWR	MAWR

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	water-logging which leads to reduction in crop yield and reduced economic returns from land and water	more than 3 g/l mineralization) for irrigation; increase irrigation efficiency by avoiding over-use of irrigation water; enhance drainage in areas with high ground water tables; and regular maintenance of all drainage canals Crop rotation including green manure and introduction of current agricultural practices such as mineral fertilizers applied in a timely fashion, use of improved seed varieties, etc. to enhance fertility and productivity		Farmers input cost	monitoring of irrigation water quality; drainage water quality; groundwater quality; soil quality (all in terms of mineralization ) and depth to groundwater; yield levels	sampling and parameters by the BISA		
[3] Worker Safety Plan for those involved in irrigation system O&M	Workplace accidents. Possible loss of life.	<i>Pump house</i> Implement Worker Safety Plan	Mainly BISA Pump Station Manager	MAWR cost	<i>Pump house</i> Number of accidents	Monthly Accident Record Report	BISA	MAWR cost
[4] Maintenance of pump house cleanliness and sanitation	Deterioration of sanitary conditions in the pump house; Environmental pollution; Impairment of aesthetics	<i>Pump House</i> Maintenance of water-seal toilets with periodic emptying of cesspits; Waste disposed according to the recommendations of the District Sanitary Epidemic Station either to the regional dump yards, for recycling or re-use depending on the category; Maintenance of a dedicated warehouse for waste such as mercury pollutants (luminescent lamps) for recycling (demercurization) through registered companies.	BISA Pump Station Manager	MAWR operational cost;	<i>Pump House</i> Regular monitoring of waste management and sanitary conditions	Regular observation	BISA	MAWR cost
[5] Abstraction of river water	Reduced available of water for	<i>At the Intake and the Pump House</i>	BISA Pump Station	MAWR operational	<i>Intake structure</i>	Records maintained	BISA	MAWR cost

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exceeding the allowable amount	downstream uses; Violation of international water use agreements	Adherence to international agreements	managers	cost	Measured rate	throughout the year		

CE = Construction Engineer (employed by the Project Management Consultants for the supervision of construction work), DE = Design Engineer (both from the PM consultants and detailed design Contractor), EMP = Environmental Management Plan, MAWR = Ministry of Agriculture and Water Resources, O&M = Operation and Maintenance, PCB =Poly Chlorinated biphenyls; PNPC =Provincial level of State Committee for Nature Protection (*Oblkomprroda*), PM =Project Manager, PMO =Project Management Office; POP = Persistent Organic Pollutants; PSEE =Provincial State Ecological Expertise (*Gosecoexpertisa*); SE = Site Engineer (contractor's Engineer), SO = Safeguards Office (attached to the PMO); WUA = Water Users Association.