Initial Environmental Examination

September 2016
Project number: 47181-002

TAJ: Water Resources Management in Pyanj River Basin Project

Prepared by the Agency on Reclamation and Irrigation, Republic of Tajikistan for the Asian Development Bank.

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Agency of Land Reclamation and Irrigation

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CURRENCY EQUIVALENTS

(as of 23 January, 2015)

Currency unit – somoni (TJS)

TJS 1.0 = $0.19

$1.00 = TJS 5.37

ABBREVIATIONS

ADB	Asian Development Bank
ALRI	Agency for Land Reclamation and Irrigation
AP	Affected Person
CEP	Committee for Environmental Protection
CIS	Chubek Irrigation System
CL	Cultivated Land
DDEP	District Department of Environmental Protection
EA	Executing Agency
EHS Guidelines	A ШdlH BKЧk GrШф's *Environment, Health and Safety Guidelines*
EIA	Environmental Impact Assessment
EMoP	Environment Monitoring Plan
EMP	Environment Management Plan
EU	European Union
FA	Farmers Association
FY	Fiscal Year
GAP	Gender Action Plan
GBAP	Gorno-Badakhshan
GIP	Good International Practice
GoT	Government of Tajikistan
GRM	Grievance Redress Mechanism
I&D	Irrigation and Drainage
IA	Implementing Agency
IEE	Initial Environmental Examination
IWRM	Integrated Water Resources Management
JFPR	Japan Fund for Poverty Reduction
JICA	Japan International Cooperation Agency
LARAP	Land Acquisition and Resettlement Action Plan
LIC	Loan Implementation Consultant
MEWR	Ministry of Energy and Water Resources
MLRWR	Ministry of Land Reclamation and Water Resources
MoH	Ministry of Health
NGO	Nongovernment organization
O&M	Operation and Maintenance
OSH	Occupational Safety and Health
PCR	Physical Cultural Resource
PEE	Public Ecological Expertise
PMO	Project Management Office
PPCU	Project Public Complaints Unit
PPE	Personal Protective Equipment
PPTA	Project Preparatory Technical Assistance
PRB	Pyanj River Basin
PRBC	Pyanj River Basin Council

PRBMP	Pyanj River Basin Management Plan
PRBO	Pyanj River Basin Organization
REA	Rapid Environmental Assessment
RURA	Region Under Republic Administration
SEE	State Ecological Expertise
SPS	Safeguard Policy Statement
TJS	Tajikistan Somoni
WRM	Water Resources Management
WUAs	A KtOr UsOrs' AssLIMKTTLHs

WEIGHTS AND MEASURES

Ha	hectare
Km	kilometer
km²	square kilometer
m^3	cubic meter
m^3	cubic meter
m^3/s	cubic meter per second
mg/l	milligrams per liter
Ppm	parts per million

NOTES

(i) The fiscal year (FY) of the Government of Tajikistan and its agencies ends on 31 December.

(ii) In this report, "$" refers to US dollars.

TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

A. Introduction

1. This is the Initial Environmental Examination (IEE) report for the proposed Water Resources Management in the Pyanj River Basin (PRB) Project. The proposed Project will improve institutional and physical water resources management (WRM) capacities in the PRB of the Republic of Tajikistan (hereafter referred to as Tajikistan) by: (i) establishing a PRB organization, council, and Joint PRB committee, and developing a PRB management plan; (ii) modernizing and climate-proofing the Chubek Irrigation System (CIS); and (iii) improving farm and water use management capacities. The CIS is located within Khatlon Viloyat (province) in southwestern Tajikistan. The impact of the proposed Project will be increased farm incomes in the CIS, and the outcome will be increased agricultural water productivity.

B. Policy, Legal and Administrative Framework

2. Environmental legislation in Tajikistan has been revised and updated extensively in recent years. Key legislation includes the *Law on Environment Protection* (2011), the *Law on Ecological Expertise* (2012), the *Law on Specially Protected Natural Areas* (2011), and the *Law on Production and Consumption Wastes* (2011). The *Law on Environment Protection* along with the *Law on Ecological Expertise* provide the basis for State Ecological Expertise (SEE) (environmental impact assessment) in Tajikistan. With respect to occupational safety and health (OSH), the *Labour Code*, the *Occupational Safety Law* and *Norms and Rules on Occupational Safety* describe the duties of the owner and the employer concerning OSH, the duties of the OSH officer, procedures for financing OSH measures, and guarantees of the right to labour protection.

3. The State Environmental Program for the period 2009-2019 is the primary environmental program in Tajikistan. It obligates ministries and offices, heads of administrations and city mayors to improve environmental conditions and promote sustainable development during the period of economic transition.

4. Organizations with primary responsibility for environmental management and monitoring in Tajikistan include the State Committee for Environmental Protection (CEP) under the GoT, the Sanitary Inspectorate of the Ministry of Health (MoH), and the Inspectorate for Industrial Safety and the Mining.

5. The GoT is currently reforming the WRM sector. The Ministry of Land Reclamation and Water Resources (MLRWR) was abolished in November 2013 and its responsibilities were reassigned to the newly formed Ministry of Energy and Water Resources (MEWR), responsible for the policy and regulations on WRM; and the Agency for Land Reclamation and Irrigation (ALRI), responsible for development and management of WRM infrastructure.

6. An environmental licensing system regulates the handling of hazardous waste and mineral extraction, and an environmental permitting system regulates the use of natural resources, especially the hunting or harvesting of certain species. However, implementation of the regulations and policing are problematic. Several ministries have developed environmental quality standards, each in its field of responsibility. For example, admissible levels of noise, vibration, magnetic fields and other physical factors have been set by the Ministry of Health.

C. Project Description

Existing CIS Status

7. The CIS is located within Khatlon Viloyat in southwestern Tajikistan, and provides irrigation to four districts: Hamadoni, Farkhor, Vose, and Kulob. It draws water from the Pyanj River near the village of Chubek. About two-tCiTHs LIITtCOCIS's TrrPKtOHKrOKTs PrKYTtв fed and remaining third is supplied with pumped water

8. The CIS was designed and built in the 1950s and became operational in 1964. The main purpose of the CIS was to supply water to the cotton fields established under the Soviet Union's centrally planned economy. The Pyanj River has an extremely high sediment load, particularly during the irrigation season, and most canals are 50% to 80% filled with sediments (mostly fine sands with silt), which dramatically reduces capacity. Sedimentation and poor operation and maintenance (O&M) capacity has resulted in CIS water delivery capacity declining to less than 80 m^3/s in 2013 compared to 150 m^3/s in 1950.

Project Scope, Impact and Outcomes

9. The Project scope includes three components:

- **I** **Institutional Strengthening and River Basin Management** (establishing a PRB organization, council, and Joint PRB committee, and developing a PRB management plan).
- **II** **Irrigation System Modernization and Climate-Proofing** (modernizing and climate-proofing the CIS, including construction of sediment excluding basin and rehabilitation of existing canals and pump stations).
- **III** **Improvement of Farm Level Agricultural Water Productivity in the CIS** (improving farm and water use management capacities).

10. The impact of the proposed Project will be increased farm incomes in the CIS, and the outcome will be increased agricultural water productivity. The key outputs will be (i) WRM capacity improved in the PRB; (ii) WRM infrastructure in the PRB modernized and climate-proofed; (iii) farm management and water use capacities increased; and (iv) efficient and effective project management. The construction of a sediment excluding basin, the replacement of pumps and motors in the pump stations with energy efficient ones, and more profitable farm management to enable farmers to pay water use levies, will result in more sustainable O&M of the CIS.

D. Implementation Arrangements

11. The MEWR will be the EA for Component I, the ALRI will be the EA for Components II and III. The existing Project Management Office (PMO) of the Building Climate Resilience in the Pyanj River Basin will be strengthened to manage administration of the Project as well and will include an environment management unit (EMU).

E. Budget and Time Schedule

12. The Project cost is tentatively estimated at $35.76 million. The Asian Development Bank (ADB) will provide an ADF loan of 18.4 $million and ADF Grant of $6.6 million, the Japan Fund for Poverty Reduction (JFPR) will provide $2.0 million in Technical Assistance (TA) and a grant of $3.0 million; and the GoT will finance $5.76 million.

13. The Project will schedule to commence in July 2016 and will have a five year implementation period. With most of the first year focusing on detailed design and contracting, it is expected that implementation of the first contract will start in mid-2017.

F. Description of the Environment

Topography and Soils

14. Tajikistan is a landlocked mountainous country with more than 50% of its area above 3,000 masl. The country is dominated by the Trans-Alay Mountain range in the north and the Pamirs in the southeast. The topography of the command area of the CIS is relatively flat alluvial plains with higher elevations to the north and east, draining to the Pyanj in the southwest. The command area is surrounded by low loess foothills to the north and west, and steep rocky Pamir mountains to the east. The Pyanj River forms the southern border of both the CIS and Tajikistan.

15. Soils in Tajikistan are classified into 4 zones based largely on altitude. Soils in the Project area belong to lowland belt, and are primarily sierozemic.

Meteorology and Climate

16. Average monthly temperatures in the Project area range between 33^0C and -6^0C, and average annual rainfall at Kulob is 564 mm. There is a single long winter wet season lasting from October to May, and 88% of rainfall occurs during this period.

17. The Project area has a moderately long growing season for crops. Daytime temperatures in mid-summer are hot, and with most rainfall occurring in the winter very little rain falls in the growing season, resulting in a heavy reliance on irrigation water.

Water Resources

18. Surface water resources in the project area are relatively plentiful, primarily due to the Pyanj River which drains most of the mountainous Pamir region in Tajikistan and part of the Hindu Kush in Afghanistan. The Pyanj River is the primary source of drinking and irrigation water in the area as it has reliable flows all year round.

19. The Pyanj River forms a gorge in the Pamir Mountains upstream of the CIS intake. At this point it divides and extends over a large alluvial fan to form a system of highly mobile braided river channels running between gravel spits, islands and low vegetation.

20. There are significant reserves of groundwater within the Pyanj alluvial fan and in the flood plains of the Kizilsu and Yakhsu Rivers. The water table is naturally high and therefore the groundwater resources are vulnerable to contamination.

Ecological and Sensitive Resources

21. Tajikistan is broadly divided into 12 ecosystem types. Within the Project area there are six main habitats: the steep rocky mountain system of the Pamirs at the eastern end of the Project area; rounded loess hills at the western and northwestern end of the Project area; agricultural lands including wheat and cotton fields, vegetables and orchards throughout the command area, north of the Pyanj River; flood damaged land consisting of gravels slowly colonizing with small annuals and mosses; the habitats of the Hamadoni alluvial fan consisting of the network of river channels, gravel banks and open water and Tugai vegetation on the drier parts of the fan; and, the riverine habitats of the Kizilsu and Pyanj valleys.

22. Most Project physical works will be undertaken within what is an existing well established irrigation system in a highly modified agricultural landscape, and there are no known rare or endangered flora and fauna or parks or protected areas in the vicinity of Project activities.

Socioeconomic Conditions

23. Tajikistan had a 2013 population of 8.16 million, and Khatlon Viloyat had a 2013 population of 2.9 million. The four Project area districts have a combined population of 666,000, with Kulob having the highest population (194,000) and Hamadoni the lowest (132,000). Approximately 75% of the population is rural.

24. Tajikistan is a highly agrarian country. More than 70% of the population is rural, and agriculture accounts for approximately 30% of GDP. The agricultural sector employs the largest share of the work force both nationally (37%) and in Khatlon Viloyat (54%). During the Soviet era the dominant crop was cotton. Currently cereal crops occupy the most land area in the CIS command area, mainly wheat, maize and rice.

25. Health indicators in Tajikistan such as infant and maternal mortality rates are among the highest of the former Soviet republics. Poverty rates in Khatlon Viloyat are slightly higher (39.2%) than the national average (35.6%).

26. Tajiks who speak the Tajik language are the main ethnic group within the country, though there are sizeable minorities of Russians and Uzbeks. Within the Project area Tajiks make up from 87 to 90% of the population.

Physical Cultural Resources

27. There are no known PCRs within the areas were works will be undertaken.

G. Anticipated Impacts and Mitigation Measures

28. Anticipated positive and negative environmental impacts of the proposed Project were assessed based on the ADB SPS, Tajikistan EIA regulations and the joint experience of the PPTA international and national environmental consultants from existing irrigation projects in Tajikistan and elsewhere.

29. Pre-construction phase issues are very limited, and are mostly associated with silting and ensuring appropriate incorporation of mitigation measures into the project design. There will be no involuntary land acquisition or resettlement required.

30. Most physical works are small scale occurring within an existing well established irrigation system in a highly modified agricultural landscape, away from settlements and sensitive receptors. Potential negative construction phase environmental impacts are typical for irrigation rehabilitation and include: (i) soil and water contamination from petroleum products and hazardous materials; (ii) sediment disposal during canal rehabilitation activities, including disposal of excavated sediments and other materials from irrigation canals, drainage collectors and the settling basin; (iii) construction and domestic waste and spoil disposal; (iv) air pollution from fugitive dust; (v) noise and vibration; (vi) hydrology impacts; (vii) impacts on protected areas, flora and fauna; (viii) community disturbance and safety; and (ix) health and safety risks to workers and residents; and (x) impacts on PCRs. These potential impacts are typically localized, short-term and small scale, and can be successfully minimised through typical good construction practices.

31. Project operation is expected to result in minimal potential negative environmental impacts, the most significant being the risk of inappropriate disposal of sediment excavated from the sediment excluding basin and the canals. Some sites for sediment disposal have been identified while detailed procedures for sediment disposal will be developed during the project implementation stage in consultation with local stakeholders. Sediment from the sediment excluding basin and the main canal will be partly used to strengthen flood protection works along the Pyanj River but mostly disposed of back into the Pyanj River. Sediment excavated from the canal, which are away from the river will be used partly to strengthen the canal banks and partly disposed of at disposal sites to be identified during the implementation stage. No sediment disposal will be allowed on active farmland, streams, or wetlands.

32. Potential positive operation phase impacts are significant, widespread and long-term, and include increased CIS water supply capacity; increased agriculture production; modernization and climate-proofing of CIS infrastructure; improved energy efficiency of selected pump stations; decreased O&M requirements and costs; and, improved farm management and water use capacities. Overall the Project will have a significant positive long-term wide-spread socio-economic impact through increased farm incomes in the CIS area.

H. Alternative Analysis

33. An analysis of Project alternatives was undertaken during the feasibility stage to determine the most financially and technically feasible way of achieving the Project objectives. Based on the analysis and given the available financing, the Project has selected the most appropriate approach to modernization of the CIS.

I. Information Disclosure and Public Consultations

34. Public consultation and information disclosure was undertaken in March 2015 covering all four districts. The consultation meetings were organized with support from local authorities as well as ALRI regional and district departments, and were attended by a total of 117 persons including Water Users Associations (WUAs), Farmer Associations (FAs), village leaders and farmers from communities benefiting from the CIS, local authorities and ALRI local branches. Overall there is very strong support for the Project, and most questions focused on how to maximize Project benefits for end-users.

J. Grievance Redress Mechanism

35. A project-level grievance redress mechanism (GRM) has been established to receive and facilitate resolution of complaints about the PrLLjOMs environmental performance during construction and operation phase. The GRM includes procedures for receiving grievances, recording/ documenting key information, and evaluating and responding to the complainants in a reasonable period of time. Any concerns raised through the GRM will need to be addressed quickly and transparently, and without retribution to the affected person.

K. Environmental Management Plan

36. A comprehensive EMP was developed to ensure: (i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; (ii) implementation of monitoring and reporting; and (iii) PrLLjOMtMLLmjKHMOa TC tCOTKjTsKHs relevant environmental laws, standards and rOPulKtTLLs KHH ADB's SPS. TCOEMP THMuHOs KH OHFTLLHmOH mLLHtLuTHP plKH (EMLLP) tLL monitor the environmental impacts of the Project and assess the effectiveness of mitigation measures, and a capacity building and training program focused on health, safety and

environment. Organizational responsibilities and budgets are clearly identified for execution, monitoring and reporting. The EMP is presented in Appendix II.

L. Conclusion

37. Based on the analysis conducted it is concluded that the Project will result in significant positive socioeconomic and environmental benefits, and negative impacts are minor and can be mitigated with good practices. It is therefore recommended that:

i) tCOPrLjjOMs MKCPLUrTKttTLIKs ADB OЧЯrLUЧnOЧI category B is confirmed;

ii) tCS IEE Ts MLLsHHOOHsuTTMOЧI tLUmOO ADB's OЧЯrLUЧnOЧIKI sKTCPuKrH requirements for the Project, and no additional studies are required; and

iii) the Project be supported by ADB, subject to the implementation of the commitments contained in the EMP and allocation of appropriate technical, financial and human resources by the EA and IA to ensure these commitments are effectively and expediently implemented.

II. NTRODUCTION

A. The Project

1. The proposed Water Resources Management in the Pyanj River Basin (PRB) Project will improve institutional and physical water resources management (WRM) capacities in the PRB of the Republic of Tajikistan (hereafter referred to as Tajikistan) by: (i) establishing a PRB organization, council, and Joint PRB committee, and developing a PRB management plan; (ii) modernizing and climate-proofing the Chubek Irrigation System (CIS), including installation of a settling basin and rehabilitation of existing canals and pump stations; and (iii) improving farm and water use management capacities. The CIS is located within Khatlon Viloyat (province) in southwestern Tajikistan (Figure 1)ЧКЧН НrКas aKtOr ПШmtCOPвКЧj RTFOr. The CIS irrigates 50,163 ha of land in four districts: Hamadoni, Farkhor, Vose, and Kulob.

2. The impact of the proposed Project will be increased farm incomes in the CIS, and the outcome will be increased agricultural water productivity. The key outputs will be (i) WRM capacity improved in the PRB; (ii) WRM infrastructure in the PRB modernized and climate-proofed; (iii) farm management and water use capacities increased; and (iv) an efficient and effective project management system. The construction of a sediment excluding basin, the replacement of pumps and motors in selected pump stations with energy efficient ones, and more profitable farm management to enable farmers to pay water use levies will result in more sustainable operation and maintenance (O&M) of the CIS.

3. The Ministry of Energy and Water Resources (MEWR), and the Agency for Land Reclamation and Irrigation (ALRI) will be the executing agencies (EAs) to manage project implementation. MEWR will be the EA for Component I, the ALRI will be the EA for Components II and III. The existing Project Management Office (PMO) of the Building Climate Resilience in the Pyanj River Basin will be strengthened to manage administration of the Project as well. An environment management unit (EMU) will be established within the PMO.

4. The Project is tentatively estimated at $35.76 million. The Asian Development Bank (ADB) will provide an ADF loan of $18.4 million and ADF Grant of $6.6 million, the Japan Fund for Poverty Reduction (JFPR) will provide $2.0 million in Technical Assistance (TA) and a grant of $3.0 million; and the GoT will finance $5.76 million.

B. Report Purpose

5. ADB's OЧЯTrШЧnOЧIKl sKTCPuKrH rOquTOmOЧls KrO specified in the Safeguard Policy Statement (SPS 2009). The Project has been screened by ADB based on a Rapid Environmental Assessment (REA) Checklist (see Appendix I) and classified as Environment Category B, requiring the preparation of an Initial Environmental Examination (IEE).

Figure 1: Project Location, Khatlon Viloyat, Tajikistan.

Source: Ezilon Maps, 2015.

C. Approach to EIA Preparation

6. This IEE has been prepared to MIIIIIplв a TtC tCOADB's SPS requirements. It has also been prepared to comply with the Tajikistan *Law on Environment Protection* (2011) and the *Law on State Ecological Expertise* (2011), and will be submitted for review and approval by the Committee for Environmental Protection (CEP).

7. This IEE report has been prepared as part of the preparatory assistance technical assistance (PPTA) for the proposed Project.[1] The methodology is based on the ADB SPS and the joint experience of the PPTA international and national environmental consultants from existing irrigation projects in Tajikistan and elsewhere. Background data was obtained from published and unpublished sources, (e.g., on climate, topography, geology and soils, natural resources, flora and fauna, agriculture, and socio-economic status). A number of CIS area inspections were conducted by the environmental consultants from October 2014 to March 2015, including all areas where physical works will be implemented. Extensive discussions were held with a key stakeholders and public consultation was undertaken to explain the proposed Project to affected persons (APs) and solicit their input (see **Section VII**). Data and expert input was also obtained from other PPTA specialists. Data and information obtained have been included where appropriate in the IEE report.

D. Report Structure

8. This IEE report consists of an executive summary, nine chapters and appendixes. The report is structured as follows:

Executive Summary
Summarizes critical facts, significant findings, and recommended actions.

I Introduction
Introduces the proposed Project, report purpose, approach to IEE preparation and IEE structure.

II Policy, Legal, and Administrative Framework
Discusses TKjTkTstKЧs and ADB's environmental assessment legal and institutional frameworks, and applicable environmental guidelines and standards.

III Description of the Project
Describes the Project rationale, scope, components, location, implementation arrangements, budget and time schedule.

IV Description of the Environment
Describes relevant physical, biological, and socioeconomic conditions within the Project area.

V Anticipated Environmental Impacts and Mitigation Measures
Describes impacts predicted to occur as a result of the Project, and identifies the mitigation measures which will be implemented. .

VI Analysis of Alternatives
Presents an analysis of Project alternatives undertaken to determine the best way of achieving the Project objectives.

[1] *TA – 8647 TAJ: Water Resources Management in Pyanj River Basin – PPTA Consultants*ЧTmplOmOHtOH Лв EPTISA SOrЯTMDLs HOIЧPOHTOTK S.L. ПШt tCOGLШT KЧHtCOADB.

VII Information Disclosure, Consultation, and Participation
Describes the process undertaken for engaging stakeholders and carrying out IEE disclosure and public consultation.

VIII Grievance Redress Mechanism
Describes the Project grievance redress mechanism (GRM) for resolving complaints.

IX Conclusion and Recommendation
Presents conclusions drawn from the assessment and recommendations.

Appendix
Appendix I presents the REA Checklist. Appendix II presents the environmental management plan (EMP), including required construction and operation phase environmental mitigation measures, the environmental monitoring plan (EMoP), reporting requirements, and capacity building. Other appendices present the bibliography, documents from the public consultation meetings, and information on the sediment sampling program.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Tajikistan Environmental Legal Framework

9. Environmental legislation in Tajikistan has been revised and updated extensively in recent years. Table 1 **s**ummarizes relevant legislation, with key laws explained in the text below.

Table 1: Tajikistan Environmental Laws and Codes.

Subject	Law	Year Issued/Updated
Air Quality	– Law on Air Protection	2012
Protected areas, Flora and Fauna	– Law On Specially Protected Natural Areas – Law on the Protection and Use of Flora – Law on Fish Breeding, Fisheries and Protection of Fish Resources	2011 2008 2013
Environmental Management	– Law on Environmental Protection – Law on State Ecological Expertise – Law on Environmental Monitoring – Law on Hydro-meteorological Activities	2011 2012 2011 2002
Forests	– Forestry Code	2011
Health and Safety	– Law on Securing Sanitary and Epidemiological Safety of the Population – Law on Industrial Safety of Hazardous Installations	2003 2004
Land Management	– Land Code – Law on Land Administration – Law on Land Valuation – Law on Soil Protection	2006 2010 2001 2009
Mineral Resources	– Law on Mineral Waters – Law on Subsoil	2006 (1994) 2008
Waste and Chemicals Management	– Law on Production and Consumption Waste – Law on Production and Safe Handling of Pesticides and Agrochemicals	2011 2003
Water Resources	– Water Code – Law on Hydro-meteorological activity	(2000) 2006 2011

Source: Tajikistan Ministry of Transport, 2013 and PPTA consultants.

10. The ***Tajikistan Constitution*** (amended 2003):

- proclaims the exclusive state ownership of land, mineral resources, water, air, flora and fauna and other natural resources and their effective use in the interest of all people (clause 13);
- ensures health care for all citizens and measures to improve the environment (clause 38); and
- entrusts each person with the responsibility to protect environment, historical and cultural monuments (clause 44).

11. The ***Law on Environment Protection*** (2011) replaces the previous *Law on Nature Protection* (adopted in 1993, expired in 2011). The new *Law on Environment Protection* is a "ΠΚmOaШk" lKa which:

- defines the legal basis for state policy in the field of environmental protection, and is aimed at ensuring sustainable socio-economic development, human rights guarantees for a safe and favorable environment, strengthening law and order, prevention of the negative impacts of economic and other activities on the environment, organization of rational use of natural resources, and environmental safety;
- stipulates that Tajikistan's environmental policy should give priority to environmental actions based on scientifically proven principles to combine economic and other activities that may have an impact on the environment, with nature preservation and the sustainable use of resources;
- defines applicable legal principles, protected objects, and the competencies and roles of the Government, the CEP, local authorities, public organizations and individuals;
- establishes several types of controls over compliance with environmental legislation: State control, ministerial control, enterprise control and public control. State control is implemented by the Sanitary Inspectorate of the Ministry of Health, the Inspectorate for Industrial Safety and the Mining Inspectorate; public control is carried out by public organizations or trade unions and can be exercised with respect to any governmental body, enterprise, entity or individual;
- defines the obligations of officials and enterprises to prevent and eliminate the consequences and liabilities of persons or organizations that cause damage to the environment or otherwise violate the Law;
- requires an environmental impact assessment of any activity that could have a negative impact on the environment (the *Law on Environment Protection* along with the *Law on Ecological Expertise* provide the basis for environmental impact assessment in Tajikistan, discussed below in Section II.D); and,
- defines environmental emergencies and ecological disasters and response procedures.

12. The ***Law on Ecological Expertise*** (2012) defines public participation requirements, referred to as Public Ecological Expertise (PEE). According to the Law PEE of economic activities and projects which can negatively impact the environment can be carried out by any public organization or citizen. They have right to receive information on results of the State Ecological Expertise (SEE), and the PEE findings should be taken into consideration during the SEE decision making process. Public organizations which undertake PEE should inform the affected population as to the PEE process, results and findings.

13. The ***Law on Specially Protected Natural Areas*** (2011) defines the legal, organizational and economic basis for specially protected natural areas, and establishes their zoning.

14. The ***Law on Production and Consumption Wastes*** (2011) regulates the generation, collection, storage, use, disposal, neutralization and burial of wastes, as well as public administration, supervision and control in the field of waste management. It is designed to help prevent adverse impacts of production and consumption wastes on the environment and human health.

15. The ***Law on Environmental Monitoring*** (2011) defines the organizational, legal, economic and social basis for environmental monitoring, and regulates relations between state authorities, self-governing authorities of towns and villages, public organizations and citizens in this area.

16. The ***Law on Air Protection*** (2012) regulates organizational, legal relations with respect to air quality control, establishes state control over the use of city air sheds and industrial centers and other settlements, and controls sources of air pollution.

17. The ***Law on the Protection and Use of Flora*** (2008) is aimed at the preservation and reproduction of flora resources. It establishes state policy for the protection and rational use of flora, and defines related legal, economic and social aspects.

18. The ***Law on Fauna*** (2008) is aimed at the protection and restoration of fauna resources, and regulates protection, restoration and reasonable use of fauna.

19. The ***Water Code*** (2006) stipulates policies on water management, permitting, dispute resolution, usage planning and cadastre. It promotes rational use and protection of water resources by all beneficiaries and defines the types of water use rights, authority and roles of regional and local governments for water allocations among various users, collection of fees, water use planning, water use rights and dispute resolution. The Code delegates Water User Associations (WUAs) to operate and maintain on-farm irrigation and drainage infrastructure.

20. The ***Law Hydro-Meteorological Activity*** (2011) establishes the legal basis for meeting the needs of the State, individuals and legal entities for hydro-meteorological and environmental data.

21. The ***Land Code*** (2006) defines the types of land use rights, the authority and role of regional and local governments for land allocation, collection of land taxes, land use planning, land use right mortgaging and settlement of land disputes. It also defines the rights of land users and lease holders, and the use of a special land fund for the purpose of land privatization and farm restructuring. The Code regulates land relations and it is directed at the rational use and protection of land and fertility of the soil. Land may only be used in a rational manner, КЧН tСОСШЮ КІІШа s ІШМІККutСШtТТОs tШНОМЯТОa СКt МШstTtuТs “rKtTШК” use. It also includes mechanisms for removal of land-use permits from farmers, including in situations where land use causes land degradation.

22. The ***Forest Code*** (2011) regulates forestry aiming at the rational use of forest resources, the protection and conservation of the natural environment and the promotion of the production of timber and agricultural products. Forests are declared to be common property of the people of Tajikistan and as such are owned by the state. All forests together form the "unified state forest reserve".

23. The ***Law on Environmental Information*** (2011) defines legal, organizational, economic and social aspects for ensuring environmental information, and promotes rights of individuals and legal entities to receive complete, accurate and timely environmental information.

24. The ***Subsoil Law*** (2008) establishes the legal basis for the study, protection and use of subsoil.

25. The ***Land Administration Law*** (2010) obliges authorities to map and monitor the quality of land, including soil contamination, erosion and water logging.

26. With respect to occupational safety and health (OSH), the ***Labour Code***, the ***Occupational Safety Law*** and ***Norms and Rules On Occupational Safety*** describe the duties of the owner and the employer concerning OSH, the duties of the OSH officer, procedures for financing OSH measures, and guarantees of the right to labour protection. The owner of the enterprise and the employer are directly responsible for the compliance of employees with the OSH requirements in their work places. The employer, pursuant to Article 8 of the ***Occupational Safety Law***:

- ensures safe and healthy labor conditions, supervises hazardous and toxic production factors, and informs the employees on changes in this field in a regular and timely manner;
- develops and implements annual plans of measures to improve occupational safety and health;
- encourages and contributes to effective cooperation between the employer and the employees in ensuring safe and healthy labor conditions;
- in harmful and hazardous production facilities as well as in facilities with special temperature and pollution environments issue to the employees for free work clothes and footgear and other individual protection, washing and disinfectant materials;
- annually allocates funds and material resources for OSH measures depending on the labor conditions and the rate of occupational accidents and diseases. Such funds and materials may not be used for any other purposes;
- establishes sanitary points (first-aid kits) in every production unit;
- organizes at his own cost medical and preventative services for employees, etc.; and,
- provides compensation for hazardous work (in the shape of extra wages, additional leave, a shorter working day) and incurs other costs to guarantee safety and health.

B. Tajikistan Environmental Programs

27. The **State Environmental Program,** adopted in 2009 for the period 2009-2019, is the primary environmental program in Tajikistan. It obligates ministries and offices, heads of administrations and city mayors to improve environmental conditions and promote sustainable development during the period of economic transition. It calls for adoption of modern environmental standards for water, air, soil, solid waste, toxic wastes, and noise, based on maximum permissible amounts. Standards are to be supplemented by discharge permits. The Program also divides the country into 12 broad ecological zones (see Chapter IV).

28. The principal objectives of the Program are improvement of (i) the environmental status of agricultural lands; (ii) the state of water resources; (iii) vegetation including forest resources; (iv) fauna and flora; (v) recreational possibilities; (vi) air quality; (vii) utilization of mineral resources; (viii) public health; and (ix) environmental performance of industry and construction. The Program calls for economic and other analyses of environmental problems and the use of economic mechanisms for environmental management including: (i) limits on the use of resources; (ii) payment for use of natural resources; and (iii) pollution charges. Any use of a natural resource – including the assimilative capacity of air, water, and soil – is to be paid for in an amount as determined by the Government. The Program calls also for better monitoring, improved environmental impact assessment, and improved financing of environmental activities. There are also sections dealing with environmental education, information, environmental centers and environmental legislation. State nature sanctuaries and reserves for the protection of rare and threatened species are to receive special attention.

29. The **Specially Protected Natural Areas Development State Program** for 2005-2015 aims to improve the management of protected natural areas. The program defines the time frames for the planned activities implementation, state institutions responsible for implementation, required financial resources and sources of funding.

30. Other relevant programs include:

- The **Forestry Development Program** for 2006-2015, adopted in 2005, aims to protect, restore, and efficiently utilize forest resources. The program provides planning for cultivation of forests, restoration and protection of forests, and productive use of forest natural resources.

- The **Program for Rehabilitation of Hydro-Meteorological Stations and Gauging Stations** for 2007-2016, adopted in 2006, aims to rehabilitate and optimize the National Hydro-Meteorological Service.
- The **Program for Study and Preservation of Glaciers** for 2010-2030, adopted in 2010, studies the state of glaciers and means to preserve them.
- The **National Strategy for Disaster Risk Management** for 2010-2015 addresses the most frequent disasters faced by the population:
  - earthquakes pose the most serious risk to Tajikistan in the longer term;
  - epidemics, avalanches, mudflows and floods pose significant risk in the short term (i.e. annually); and
  - droughts occur infrequently, but cause significant damage.

C. Tajikistan Environmental and WRM Institutional Framework

31. The organizations with primary responsibility for environmental management and monitoring in Tajikistan include the State Committee for Environmental Protection (CEP) under the GoT, the Sanitary Inspectorate of the Ministry of Health (MoH), and the Inspectorate for Industrial Safety and the Mining.

32. The CEP was established by Presidential decree in 2008. The CEP includes members from state agencies, scientific-research centers, an analytical control center with laboratory facilities, and a center for standardization and environmental regulation responsible for the development of relevant environmental regulations and norms on the basis of national environmental standards. The CEP absorbed the former State Forest Enterprise, and has a staff of over 2000. It has a comprehensive mandate that includes policy formulation and inspection duties. The CEP has divisions at Viloyat/Region, city and rayon (district) level, in the form of District Departments of Environmental Protection (DDEPs).

33. The GoT is currently reforming the WRM sector. The Ministry of Land Reclamation and Water Resources (MLRWR) was abolished in November 2013 and its responsibilities were reassigned to (i) the newly formed Ministry of Energy and Water Resources (MEWR), responsible for the policy and regulations on WRM; and (ii) the Agency for Land Reclamation and Irrigation (ALRI), responsible for development and management of WRM infrastructure. In addition:

- the General Department of Geology (Tadjikgeologia) conducts monitoring of aquifers and groundwater quality and drills new wells;
- the State Control Committee over Industrial Safety and Mining Industry manages thermal and mineral waters and ensures safe operation of industrial mines and monitors mine water;
- the Ministry of Public Health is responsible for monitoring of the drinking water quality, and especially for water-transmitted infectious diseases, and manages a network of 73 sanitary-epidemiological stations;
- Vodokanals (in regions and districts) and the State Unitary Enterprise "Hochagiimanziliukommunali" manage the operation of water supply and sewerage systems in the country, as well as GUP HMK, a state authorized body in the field of rural water supply.

D. Tajikistan Environmental Impact Assessment and Licensing Framework

34. The *Law on Environment Protection* along with the *Law on Ecological Expertise* provide the basis for State Ecological Expertise (SEE) (environmental impact assessment) in Tajikistan. An environmental licensing system regulates the handling of hazardous waste

and mineral extraction, and an environmental permitting system regulates the use of natural resources, especially the hunting or harvesting of certain species. However, implementation of the regulations and policing are problematic.

1. Environmental Impact Assessment

35. Chapter V of the *Law on Environment Protection* introduces the concept of SEE which assesses the compliance of proposed activities and projects with the requirements of environmental legislation and standards. The responsibility for SEE resides with the CEP and its regional offices.

36. According to the *Law on the State Ecological Expertise*, all civil works, including rehabilitation, should be assessed for their environmental impacts and the proposed mitigation measures reviewed and monitored by the CEP. SEE is to be cross-sectoral in nature, scientifically justified, comprehensive, and objective. Financing of programs and projects is allowed only after a positive SEE finding or conclusion has been issued. Currently there is no EIA categorization system in place and environmental impacts of most construction activities are reviewed on a case by case basis.

37. The project proponent is responsible for the preparation of the environmental assessment. The CEP is authorized to invite leading scientists and qualified outside specialists to participate in the review of the assessment. The review decision should be issued within 30 days, unless the project developer agrees to an extension, and remains valid for two years if the decision is positive. For very complicated projects the term of consideration and approval can be extended till 60 days.

38. The *Law on Ecological Expertise* also defines public participation requirements, referred to as Public Ecological Expertise (PEE). According to the Law PEE of economic activities and projects which can negatively impact the environment can be carried out by any public organization or citizen. They have right to receive information on results of the SEE, and the PEE findings should be taken into consideration during the SEE decision making process. Public organizations which undertake PEE should inform the affected population as to the PEE process, results and findings.

2. Licensing and Permitting

39. Licenses are legal instruments to regulate certain potentially hazardous activities where minimal qualifications and adherence to rules are required to ensure that they are carried out efficiently, safely and do not result in potentially significant and irreparable damage to the environment and human health. Activities requiring licenses include handling hazardous waste, industrial safety, sources of ionizing radiation, and production and handling of pesticides and other agrochemicals. They are issued by the relevant industry regulator (ministry or committee) or an entity to which it has delegated this responsibility. Licensing is also used to ensure efficient and sustainable use of natural resources. For example, licenses are required for prospecting, collecting or extracting mineral resources, or for constructing underground facilities not related to mining.

40. Permits are meant to ensure the sustainable use of natural resources. There are two types of permits: (i) permits to use natural resources; and, (ii) permits for emissions or discharges. Natural resource use permits allow their holders to take a certain number or amount of a natural resource within a defined territory and time period. They are issued to both individuals (e.g. to hunt a particular species of animal or harvest particular factories) and to organizations (e.g. permits to extract ground or surface water for a particular use). By law, permits are needed for any commercial use of any resource. The authority that issues the permit and the legislation (government resolution) that applies depend on the resource.

41. Permits to discharge polluted matter are issued by the relevant inspectorate (e.g. previous State Water Inspectorate or State Air Inspectorate – now departments) of the local state environmental protection committees to industrial or agricultural enterprises and municipal utilities. The permits allow release of a defined amount of pollutants (gases, liquids, solid waste) into the environment. The permits are normally granted for one year and indicate the maximum allowed concentration of the pollutants, the maximum volume of the polluted matter and the pollutants allowed.

3. Environmental Standards

42. Several ministries have developed environmental quality standards, each in its field of responsibility. For example, admissible levels of noise, vibration, magnetic fields and other physical factors have been set by the Ministry of Health. Table 2, Table 3, and Table 4 provide the Tajikistan standards for surface water, air quality and noise, respectively.

Table 2: Surface Water Quality Standards

Parameter	Value (mg/l)
Dissolved Oxygen	Winter – 4.0 Summer – 6.0
BOD	3.0
Oil	0.05
Iron	0.05
Copper	0.001
Zink	0.01
Phenols	0.001
Chlorides	300
Sulphates	100
Calcium	180
Potassium	50
Suspended Matter	1000

Source: State Committee for Statistics. Environmental Protection in Tajikistan: Statistical Summary 1990-2000, in Ministry of Transport 2013.

Table 3: Air Quality Standards

Parameter	Standard[2] mg / m3
Particulate Matter (PM)	0.150
Nitrogen Oxide (NO)	0.060
Nitrogen Dioxide (NO_2)	0.040
Sulphur Dioxide (SO_2)	0.050
Carbon Dioxide (CO_2)	3.000
Ammonium	0.200

Source: Asian Development Bank. Environmental Profile of Tajikistan. 2000.

[2] Based on the Russian standard GN 2.1.5.1338-03 on maximum allowable concentrations for pollutants in the outdoor air of populated areas.

Table 4: Noise Standards

Parameter	Standard[3]
Allowable noise level for working place of drivers and service staff of trucks and construction equipment	70-80 dBA
Allowable noise level created by cars for areas adjoining to residential houses, buildings and other receptors at a distance of 2 m	70 +10 dBA from 07h to 23h 60 + 10 dBA from 23h to 07h
Allowable noise level for areas adjoining to hotels and hostels	75 +10 dBA from 07h to 23h 65 + 10 dBA from 23h to 07h

Source: Ministry of Transport, 2013.

4. Implementation and Compliance

43. A number of legal acts establish liability for violations of environmental laws, which can be enforced by several State bodies. In particular, the 2010 *Code of Administrative Violations* establishes administrative liability for organizations, their officers and individuals for a range of violations, ranging from the careless treatment of land to violation of the rules for water use or water protection to failure to comply with SEE. The administrative sanctions for environment related violations can be imposed by the administrative commissions of CukumKtsЧ MШtsЧ tCO CEP's inspectors, the Veterinary Inspectors of the Ministry of Agriculture, and the State Committee for Land Administration, Mapping and Geodezy. The most common administrative sanction is a fine of up to 10 minimal monthly salaries for individuals and up to 15 minimal month salaries to officers of organizations.

44. The 1998 *Criminal Code* covers crimes against ecological safety and the environment, such as violations of ecological safety at work, poaching, and land degradation. The maximum fine is up to 2,000 minimal monthly salaries and the maximum sentence is up to eight years in prison.

E. Relevant International Agreements

45. The GoT has signed a number of international agreements regarding environmental and biological protection, including:

- Aarhus Convention on Access to Information and Public Participation in Decision-Making and Access to Justice in Environmental Matters (2001);
- Stockholm Convention on Persistent Organic Pollutants (2006);
- Espoo Convention on Environmental Impact Assessment in a Trans-boundary Context (2006);
- Bonn Convention on Migratory Species of Wild Animals (2001);
- Ramsar Convention on Wetlands of International Importance (2001);
- UN Framework Convention on Climate Change (2008);
- The Kyoto Protocol – UN Framework Convention on Climate Change (2008);
- UN Convention on Biological Diversity and Cartagena Protocol on Bio-safety (1997);
- UN Convention to Combat Desertification;
- Vienna Convention for the Protection of the Ozone Layer.

(Source: PPTA consultants and Ministry of Transportation, 2013)

[3] Standard as per Sanitary Norms CH 2.2.4/2.1.8.562-96, (provided by Sanitary Epidemiology Service of the Ministry of Health.

F. Other Relevant Guidelines

46. During the design, construction, and operation of a project the ADB requires the borrower to follow environmental standards consistent with good international practice (GIP), as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines* (hereafter referred to as the *EHS Guidelines*).[4] The *EHS Guidelines* contain discharge effluent, air emissions, and other numerical guidelines and performance indicators as well as prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technology. When host country regulations differ from these levels and measures, the borrower/client is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client is required to provide justification for any proposed alternatives.

G. Applicable ADB Policies and Requirements

47. The applicable ADB policies and requirements for EIA include the *Safeguard Policy Statement* (SPS 2009) and *Environmental Safeguards – A Good Practice Sourcebook* (2012). The SPS is underpinned by the ADB Operations Manual for the SPS (OM Section F1, 2010).

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

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

i) reflect the significance of the project's potential environmental impacts;

ii) identify the type and level of environmental assessment and institutional resources required for the safeguard measures proportionate to the nature, scale, and significance of the project's potential impacts; and,

iii) determine consultation and disclosure requirements.

50. ADB assigns a proposed project to one of the following categories:

i) **Category A.** Proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented; impacts may affect an area larger than the sites or facilities subject to physical works. A full-scale environmental impact assessment (EIA) including an environmental management plan (EMP), is required.

4 *World Bank Group, Environmental, Health, and Safety Guidelines*, April 30, 2007, Washington, USA. http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

ii) **Category B**. PrLLipLLsOl prLLkOMs pLLlOYlTKl OYrTLLYnOYlKl TmpKMs KrO lOss adverse and fewer in number than those of category A projects; impacts are site-specific, few if any of them are irreversible, and impacts can be readily addressed through mitigation measures. An initial environmental examination (IEE), including an EMP, is required.

iii) **Category C**. Proposed project is likely to have minimal or no adverse environmental impacts. No EIA or IEE is required although environmental implications need to be reviewed.

iv) **Category FI**. Proposed project involves the investment of ADB funds to, or through, a financial intermediary.

51. The Project has been classified by ADB as environment category B, requiring the preparation of an IEE (this report).

52. The SPS 2009 requires a number of additional considerations, including: (i) project risk and respective mitigation measures and project assurances; (ii) project-level grievance redress mechanism; (iii) definition of the project area of influence; (iv) physical cultural resources damage prevention analysis; (v) climate change mitigation and adaptation; (vi) occupational and community health and safety requirements (including emergency preparedness and response); (vii) economic displacement that is not part of land acquisition; (viii) biodiversity conservation and natural resources management requirements; (ix) provision of sufficient justification if local standards are used; (x) assurance of adequate consultation and participation; and (xi) assurance that the EMP includes an implementation schedule and measurable performance indicators. All applicable environmental requirements in the SPS 2009 are covered in this IEE.

IV. PROJECT DESCRIPTION

A. The Project

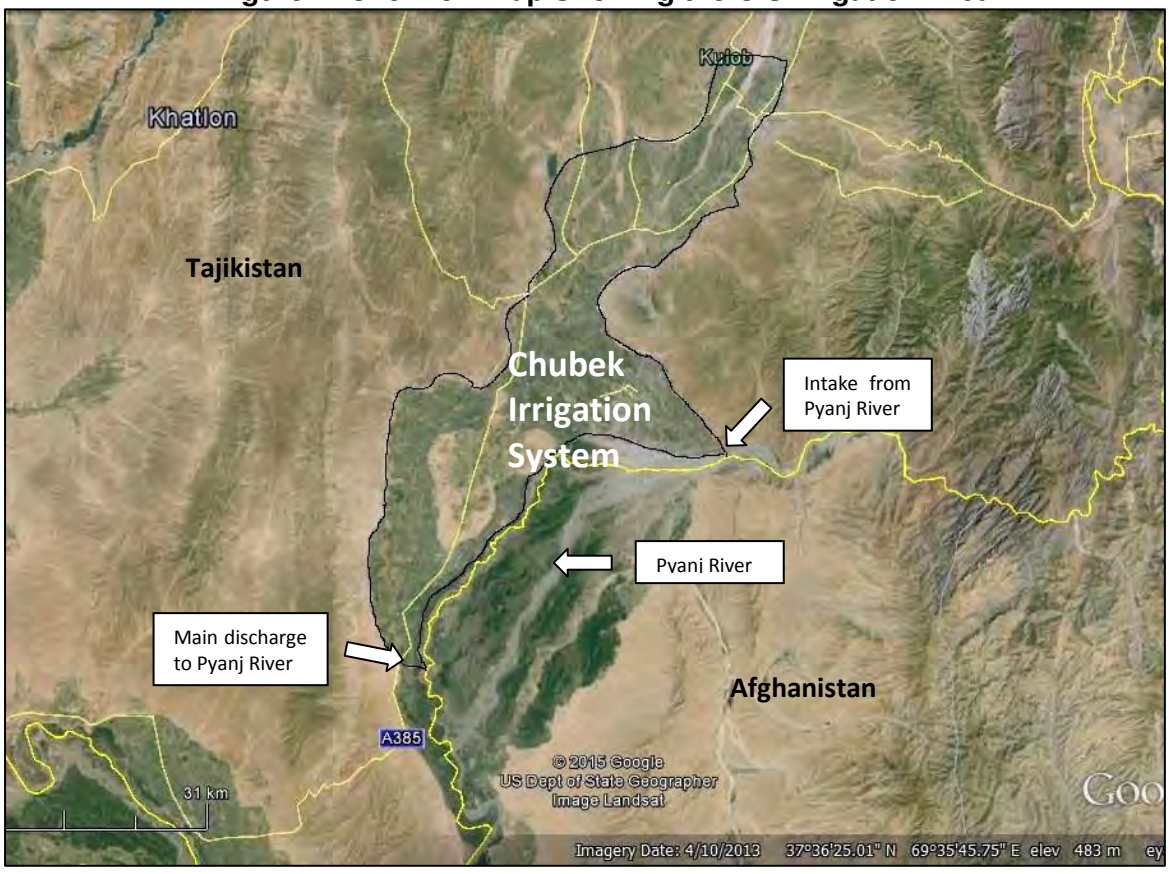
53. The PRB Project will improve institutional and physical WRM capacities in the PRB. The Project will: (i) establish a PRB organization, council, and Joint PRB committee, and develop a PRB management plan; (ii) modernize and climate-proof the Chubek Irrigation System (CIS), including construction of sediment excluding basin, excavation of sediment from canals and drains, and rehabilitation of control structures and selected pump stations; and (iii) improve farm and water use management capacities.

B. Existing CIS Status

1. Overview

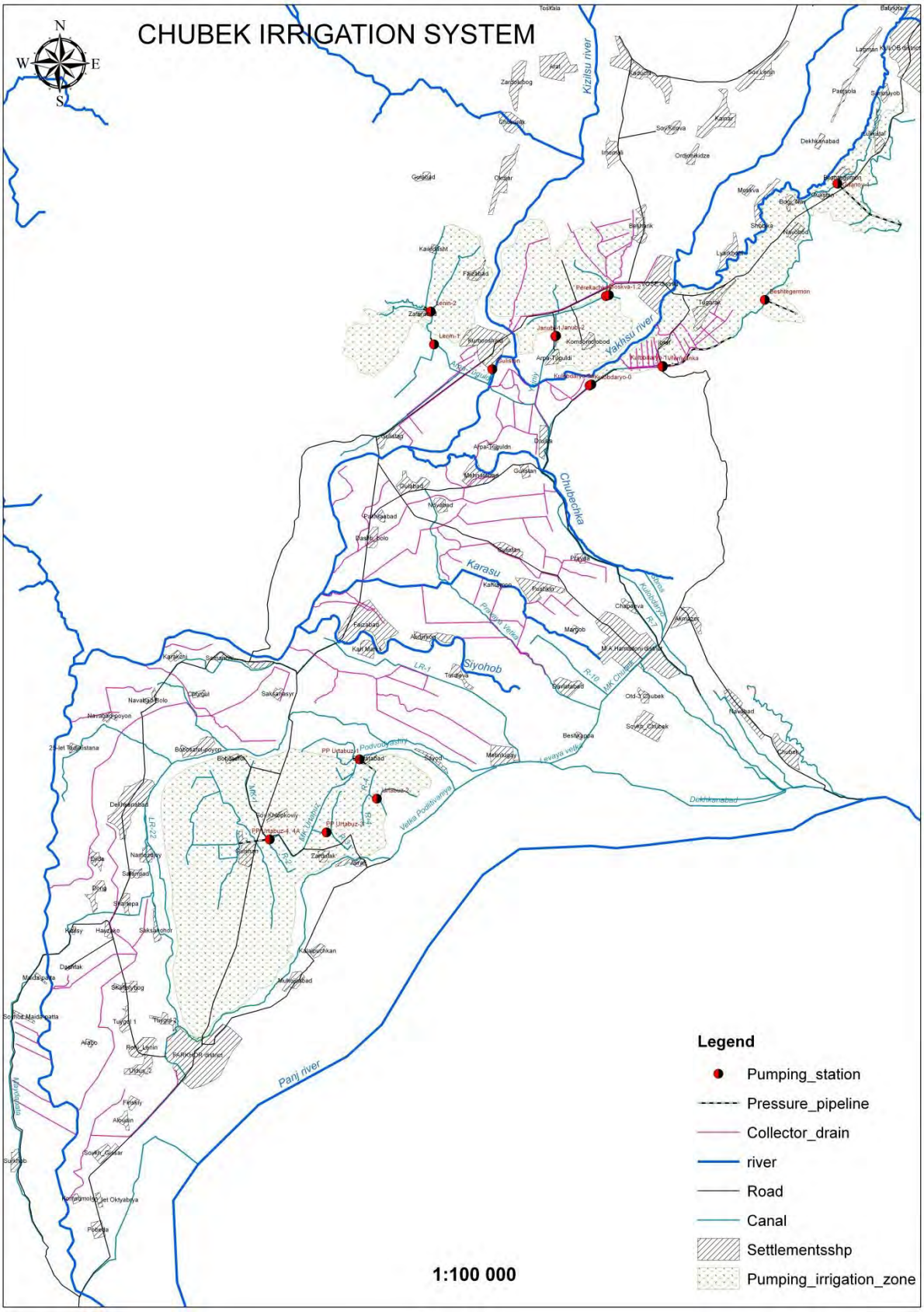
54. The CIS is located within Khatlon Viloyat in southwestern Tajikistan (Figure 1) КЧН prLШЯНОз TrTPKtTLШЧtLШfour districts: Hamadoni, Farkhor, Vose, and Kulob. It draws water from the Pyanj River near the village of Chubek (Figure 2). Figure 3 shows the main CIS components (intake, irrigation canals, pumping stations and drainage canals), while Figure 4 shows some of the main features near the intake.

Figure 2: Overview Map Showing the CIS Irrigation Area



SLШrMO GLШLPIOEKrtC 2015. ImKPOHKtOOMLШOr 4Ч2013.

Figure 3: Map of CIS Showing Major Components



Source: PPTA GIS.

Figure 4: CIS intake Area

SLUurMQ. GLLLLPIOEKrtC 2015.

55. Chubek Irrigation System (CIS) is located on the right bank of Pyanj River. Water from the Pyanj River is diverted by gravity without any regulator across the river. The Chubek Main Canal with original capacity of about 150 cubic meter per second (cumec) was constructed in 1950 while the distribution system was constructed during 1950-1987. The water is supplied by a combination of gravity system and 20 sets of 102 pumping units. Some areas require multistage pumping. The total pumping required for various irrigation areas varies from 8.5 to 177.5 meters (m).

56. CIS has a total design command area of 50,163 hectare (ha); 35,819 ha (71%) is fed by gravity and 14,344 ha (29%) by pumps. Vose District has the highest proportion (57%) while Kulob has only 2% of the command area. Data on district-wise irrigated area is given in Table 5.

Table 5: Area Served by Pump and Gravity Irrigation – Design Conditions

District	Land Irrigated by Chubek Canal – Design Conditions			
	Irrigated Land Total, ha	Irrigated by Pumps, ha	Irrigated by Gravity, ha	Irrigated by Pumps, %
Hamadoni	16,508	0	16,508	0%
Farkhor	24,548	5,837	18,711	24%
Vose	8,740	8,140	600	93%
Kulob	367	367	0	100%
Total	**50,163**	**14,344**	**35,819**	**29%**

57. The gravity irrigation distribution system consists of 1 kilometer (km) lead channel with a capacity of about 400 cumec, a complex of head regulator and sediment escape structure at the end of lead channel, about 17.2 km long Chubek Main Canal, about 496 km of interfarm canals including main canal, and about 499 structure.

58. The CIS was designed to serve primarily the areas by gravity. Pumps were installed wherever required to irrigate the adjoining high areas. This is evident from the profile of the

existing canal which is very close to the natural ground level to minimize cost by keeping the cut and fill at minimum. The canals have a number of falls to keep the profile close to natural ground level instead of keeping the head to minimize pumping for high lands.

59. Because of inadequate maintenance of the system since its commissioning, the existing irrigated area is estimated at 43,210 ha, about 86% of the design conditions. The district-wise existing irrigated area is: Hamadoni 13,984 ha (85%), Farkhor 22,500 ha (92%), Vose 6,397 (73%), and Kulob 376 ha (100%). Details are in **Error! Reference source not found.**

Table 6: Area Served by Pump and Gravity Irrigation – Existing Situation

District	Total Irrigated Land of the District, ha	Land Irrigated by Chubek Canal – Existing Situation			
		Irrigated Land Total, ha	Irrigated by Pumps, ha	Irrigated by Gravity, ha	Irrigated by pumps %
Hamadoni	16,508	13,984	0	13,984	0%
Farkhor	24,548	22,500	5,837	16,663	26%
Vose	19,337	6,397	5,797	600	91%
Kulob	8,350	329	329	0	100%
Total	**68,743**	43,210	**11,963**	**31,247**	**28%**

Source: Remote Sensing data given in RESTEC Study

2. Sedimentation

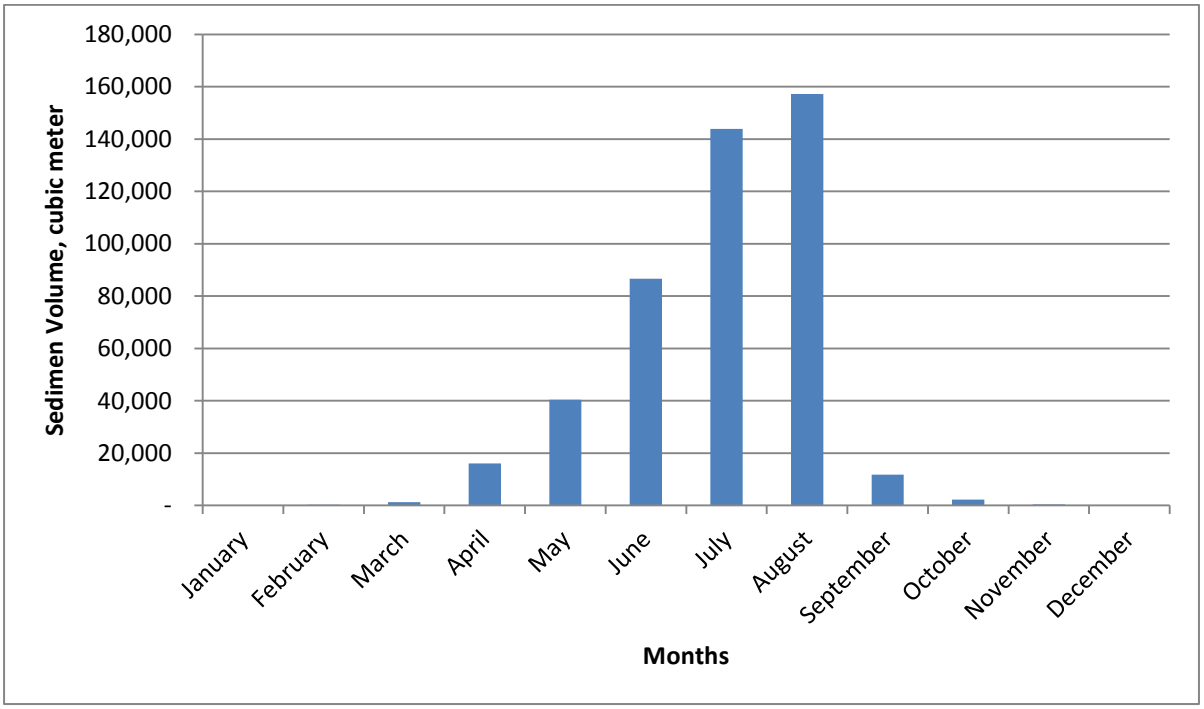
60. The Pyanj River has high sediment load, particularly during the irrigation season (Table 7 and **Figure 5Error! Reference source not found.**). Sediment load has been estimated using historical diversions adjusted for over-registering identified during the feasibility studies.

Table 7: Calculation of Sediments Entering the Chubek Main Canal

Month	Average monthly diversions, cumec		Average sediment concentration, parts per million by weight	Monthly sediments volume, cubic meter	
	Current, as registered	Current, Adjusted for Over-registering		Current, as registered	Current, Adjusted for Over-registering
January	9.00	5.69	12.39	149	94
February	9.00	5.69	36.72	398	278
March	10.00	6.32	153.47	2,046	1,293
April	27.16	17.17	703.13	24,635	16,088
May	56.52	35.72	848.13	63,899	40,384
June	67.32	42.55	1,527.63	132,664	86,638
July	82.82	52.34	2,061.25	227,560	143,818
August	79.68	50.36	2,342.00	248,752	157,211
September	53.83	34.02	259.93	18,050	11,788
October	31.42	19.86	85.36	3,575	2,259
November	13.50	8.53	32.24	561	367
December	9.00	5.69	20.39	245	155
Average / Total	**37.44**	**23.66**	**673.55**	**722,533**	**460,374**

Source: Based on data from No 27 Khirmanjo Monitoring Station, Pyanj River (about 120 km upstream the CIS intake point).

Figure 5: Monthly Sediment Volume Entering Chubek Irrigation System



Source: Based on data from No 27 Khirmanjo Monitoring Station, Pyanj River (about 120 km upstream the CIS intake point).

61. Water delivery capacity of the CIS has declined to less than 80 m^3/s in 2013 compared to 150 m^3/s in 1950. Most canals are 50% to 80% filled with sediments (mostly fine sands with silt) which dramatically reduce capacity. According to ALRI, to prevent sediments build-up in CIS canals up to 1.3 million m^3 of sediments The water first flows into a canal approximately 1 km long and 50 m wide, separated from the main river channel by an embankment made of excavated river bed material. The water then flows through a head regulator (concrete dam with segmental steel gates) and enters the main concrete lined in-take canal. The head regulator utilizes bottom opening sluice gates which do not allow for sediment control.

62. The main in-take canal is about 1.2 km long and branches out near its end into several smaller main canals delivering the river water to the agricultural lands of the four districts. Water is distributed through 73 main and inter-farm canals with a total length of 396 km, 102 km of which are concrete lined (Table 8).

63. At present CIS has only 9 excavators and 5 bulldozers in working order, and these machines are often called upon by the District authorities to do other jobs.

Figure 6: CIS Canals Showing Sediment Loads

Source: PPTA consultants.

3. Intake and Canals

64. TCOCIS takes water from the single side intake built on the northern bank of the Pyanj River near the village of Chubek, KpprШбmKtOь 2 km ЛОьШЧН tCO border MШЧНШl stKtTЫl (Figure 7). The water first flows into a canal approximately 1 km long and 50 m wide, separated from the main river channel by an embankment made of excavated river bed material. The water then flows through a head regulator (concrete dam with segmental steel gates) and enters the main concrete lined in-take canal. The head regulator utilizes bottom opening sluice gates which do not allow for sediment control.

65. The main in-take canal is about 1.2 km long and branches out near its end into several smaller main canals delivering the river water to the agricultural lands of the four districts. Water is distributed through 73 main and inter-farm canals with a total length of 396 km, 102 km of which are concrete lined (Table 8).

Table 8: Inventory of Inter-farm Canals

S. №	Name of ALRI District Dept	Number of Canals	Date of Start of Operation	Command Area (ha)	Canals length (km)	Number of structures
1	Chubek Canal Dept (main canal)	1	1950	0	17.2	7
2	Hamadoni District Dept	27	1956-1971	16,508	113.0	97
3	Farkhor District Dept	39	1950-1987	24,548	226.8	461
4	Vose District Dept	3	1963-1975	8,740	27.3	52

5	Kulob District Dept	1	1973	367	5.4	4
	Total	73		**50,163**	**389.7**	**621**

SLJurMO: ALRIЧ2015.

Figure 7: CIS intake. Note Flood Protection Works

SLJurMO: PPTA CLJYsultKЧt.

Figure 8: CIS Head Regulator

SLJurMO: PPTA CLJYsultKЧt.

Figure 9: CIS Main Channel, with Aqueduct

Source: PPTA Consultant.

4. Control Structures

66. There are a total of 621 various control structures in the CIS, including gates, weirs, dividers and hydrometric structures for measuring water levels or flows in open channel systems. All canals and structures were built during the Soviet era during the 1950s to 1980s. Structures have been poorly maintained and most are in very poor condition. At present about 70% of gates and weirs are either broken or missing, and none of the hydrometric structures have water meters (Figure 10).

Figure 10: Heavily Damaged Control Gate Structure

Source: PPTA Consultant.

5. Pump Stations

67. About 14,344 ha area of CIS was designed to be irrigated by water pumped by 102 pumping units arranged in 20 groups in Farkhor, Vose, and Kulob districts. The pumping

head varies from 8.5 m to 177.5 m. Some areas need 2-3 stages of pumping. The combined design pumping capacity of the 102 pumps was 84.7 cubic meter per second (cumec). Currently, about 65 pumps are totally out of operation and the remaining 37 are in working condition but in poor shape. The total pumping capacity of currently operating pumps is about 29 cumec (about 34 % of the design capacity). The pumps, presently in working condition, suffer from accelerated deterioration because high concentration of sediments in water and lack of repair facilities. The overall efficiency of the current pumping units is not more than 50% where as the new pumping unit with efficiency exceeding 75% are available.

68. The design areas served by various pumping stations and their pumping heads are given in Table 9.

Table 9: Pumping Stations in the Project Area

Pumping Station	Pump Units	Area Served (ha)	Other Pumps in Multistage Pumping	Total Pumping Head, (m)
FARKHOR DISTRICT				
Urtaboz 1	9,10.12	1,130		51.5
Urtaboz 2	1-4	215	Urtaboz 1	104.0
Urtaboz 3	1-4	424	Urtaboz 1	20.0
Urtaboz 4		3,900	Urtaboz 1	84.5
Urtaboz 4A		30	Urtaboz 1	64.5
Ordzhonikidze		138	Urtaboz 1	78.5
District subtotal		**5,837**		
VOSE DISTRICT				
Kulobdarya 0	1	100		8.5
Kulobdarya 0A	1	70		8.5
Kulobdarya 1	1-3	2,945	Kulobdarya 0,0A	103.5
Janubi 1	1-2	1,120		10.0
Janubi 2	All (1-5)	400		15.0
Perikachka	All (1-2)	725	Janubi 1, 2	23.0
Moskva 1	All (1-3)	180	Janubi 1, 2	27.0
Moskva 2	All (1-3)	178	Janubi 1, 2	65.0
Gulistan	All (1-2)	40		20.0
Lenin 1	1-3	1,210		70.0
Lenin 2	1-4	967	Lenin 1 (4,5)	140.0
Lenin 8 A	5-8	205	Lenin 1 (6)	150.0
District subtotal		**8,140**		
KULOB DISTRICT				
Beshtegirmon		100	Kulobdarya 0,1	177.5
Jdanov 1		267	Kulobdarya 0,1	170.5
District subtotal		367		
Total Pumps-Served Area		**14,344**		

69. All pumping stations were built between 1964 and 1990. The quality of pump station operation and maintenance has sharply declined since the collapse of the Soviet Union in December 1991. All major pump stKtTLШЧOquTpmOЧI TOms CKЯO ЧLa OбMOEЭOH tCOF “ITO OбpOMKЧMъ Лв sOЯDrKl tTmOs-ЦKЧH CTPC sOHTmO-t lLШKHs Kre extremely abrasive on pump impellers and other equipment (Figure 11). Over the last 20 years pumps, electric motors,

electric control boards have been repaired many times and modified by poorly qualified technicians using outdated tools and low quality locally sourced materials, and many pumps now require constant maintenance or are either poorly or non-functioning.

Figure 11: Heavily Damaged Pump Impeller

SUurMO: PPTA CUHsultK-t.

6. Chubek Irrigation System Management

70. The Ministry of Energy and Water Resources (MEWR), responsible for national-level water resources management, controls the operation of Chubek Main Canal diversion structure on Pyanj River. Beyond the diversion structure, management of the canals, various structures on the canals, and the pumps is the responsibility of Agency for Land Reclamation and Irrigation (ALRI). The role of ALRI in operation and maintenance (O&M) is discussed in Appendix 15. The organization structures of MEWR and ALRI are given in Figure 12 and Figure 13 respectively.

Figure 12: Organizational Structure of Ministry of Energy and Water Resources

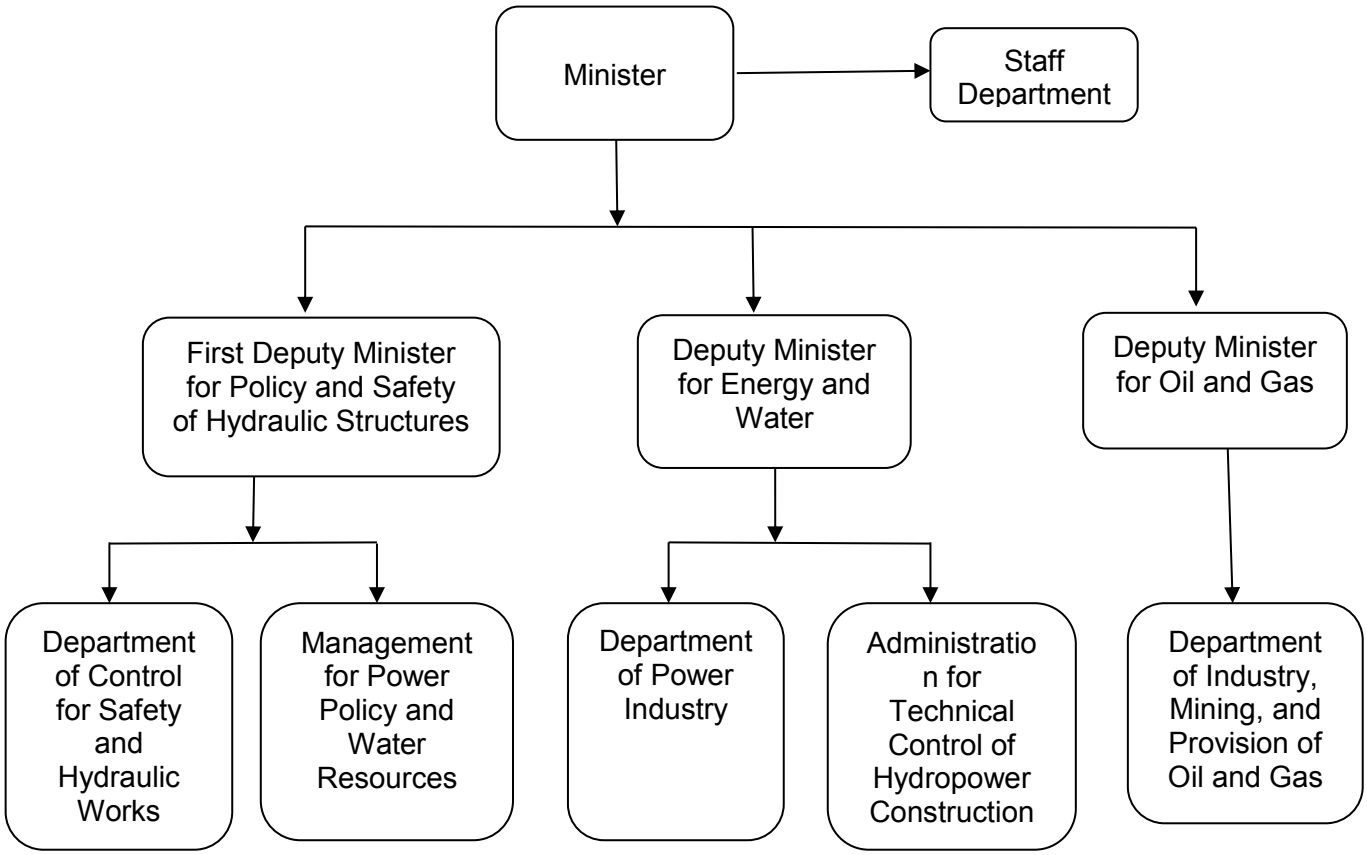
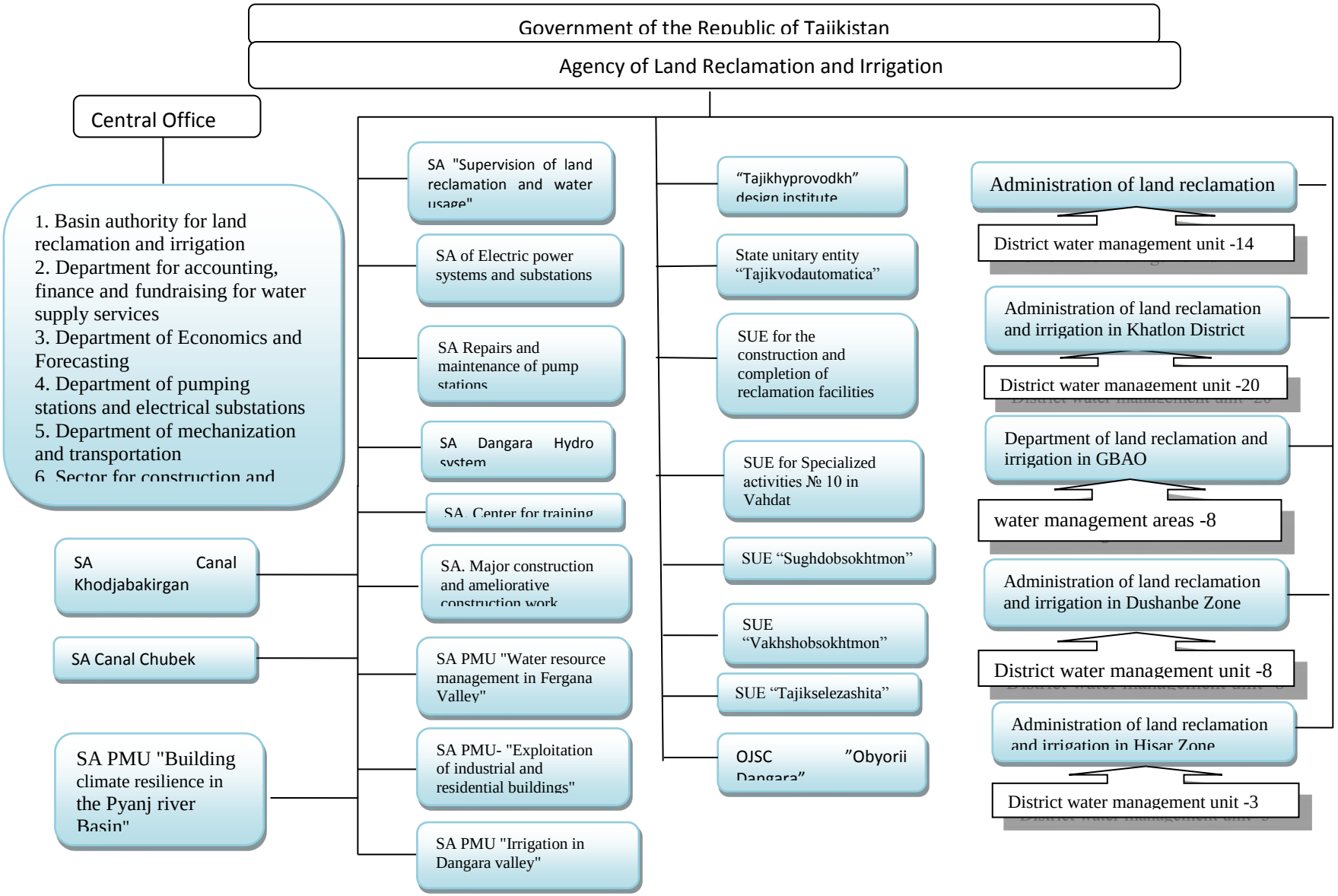


Figure 13: Organizational Structure of Agency for Land Reclamation and Irrigation



C. Project Rational[5]

71. Tajikistan is the most vulnerable of Central Asia and Caucasus countries to food insecurity due to its limited irrigated land, which account for 95% of crop production, and the underdeveloped agricultural sector. FШtв ГЯО pОrМОЧt (45%) ШПtСОМШЧtrв's ОmplШвmОЧt and 57% of all rural employment is still in agriculture. AlmШst 80% ШПtСОМШЧtrв's aШrkТЧР poor live in rural areas and half of the working poor are in agriculture mainly due to low labor incomes.

72. Between 1990 and 2004 TКjТkТstКЧ's КЧЧuКl НЯОrsТШЧs ПrШm surПКМО КЧН groundwater declined from 13.7 km^3 to 12.3 km^3 and its water delivery declined from 12 km^3 to 9 km^3. This resulted in a decrease of water delivery efficiency from 88% to 75%. These declines are attributed to the deteriorating WRM infrastructure, in particular irrigation and НrКТЧКРО (I&D) Кs 91% ШПМШЧtrв's НЯОrtОН aКtОr is used for irrigation; and the weak capacity of WRM institutions including government agencies and water user associations (WUAs), on the operation and maintenance (O&M) of WRM infrastructure.

73. The GoT has prioritized efforts to increase the effectiveness and efficiency of WRM and agriculture production. It has targeted improvement of irrigated agriculture covering 320,000 ha and the creation of 1,500 ha of irrigated land, with the objective of increasing the value of agricultural products 7% by 2015 to meet national food demand. To achieve these targets it has called for $262 million to improve WRM and $24 million for improved agriculture investment.

74. As noted previously, the GoT is reforming WRM by abolishing the MLRWR and assigning its responsibilities to the newly formed MEWR, responsible for the policy and regulations on WRM; and the ALRI, responsible for development and management of WRM infrastructure. Further reforms include: (i) the change in WRM areas from territorial administrative to hydrological areas; and (ii) the establishment of (a) river basin management plans (RBMPs) to clarify and monitor water allocations, and (b) water governance institutes such as river basin organizations to develop RBMPs, and river basin councils which will provide a participation mechanism for different water users and approve RBMPs in line with principles of integrated WRM. The World Bank has commenced support for these reforms at a national level and in the Kafernigan River basin, and ADB has been requested by the GoT to help reform and modernize deteriorated WRM infrastructure in the PRB, the largest river basin in the country.

75. Given that more than 40% of the PRB comprises the territory of Afghanistan and serious flood disasters occur frequently, in 2010 both governments signed a bilateral agreement for joint hydrological monitoring of the Pyanj River, with the help of developing partners including ADB. A road map to establish a joint PRB commission was developed in 2013 with ADB assistance. The governments are seeking technical and financial assistance to implement the road map.

76. Improvements to the PRB's A RM aТl positively affect economy and food security as the PRB includes the majority of Khatlon Viloyat, the province which has the largest pШpulКtТШЧ (2.7 mТlТШЧ) КЧН КРrТМulturО prШНuМТШЧ, КЧН Тs МШЧtrв's pШШrОst ЯОr ЛКsТЧ. To improve WRM in the PRB, the following need particular attention: (i) PRB's aКtОr НОmКЧН Тs 12% higher than diversion; and (ii) PRB is vulnerable to climate change.[6]

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5 BКsОН ШЧ ADB. 2014. CШЧМОpt PКpОr. PrШjОМt NumЛОr: 47181. *Proposed Grant Republic of Tajikistan: Water Resources Management in Pyanj River Basin*. КЧН PPTA rОpШrts.

6 TСО ПШllШaТЧР ТmpКМts tШ A RM КrО prОНТМtОН: (К) PrКНuКl sСТПt ТЧ tСО rТЯОr ПlШa sОКsШЧКl НТstrТЛutТШЧ; КЧН (Л) ТЧМrОКsОН ШПa КtОr НОmКЧНs rОquТrОmОЧts ТЧ ТrrТРКtТШЧ sвstОms (ADB. 2011).

77. Irrigation systems in the PRB cover about 120,000 ha; of these, the largest is the CIS at 45,000 ha. The CIS's a KtOr supplв MKpKMtв CKs HOVTHO-H from 150 m^3/s in 1950 to around 80 m^3/s in 2013 as a result of: (i) a deterioration of I&D infrastructure; (ii) high sediment loads; and (iii) weak O&M capacity. In 2004 ADB financed $3.7 million for partial rehabilitation of the CIS, but it was not sufficient to restore full functioning.

78. Wheat, cotton, and vegetables account for 31%, 51%, and 18% of the cultivated area, respectively. Crop yields are low (e.g., the PRB wheat yield of 2.36 t/ha is significantly lower than in Uzbekistan at 4.50 t/ha) and water productivity in the PRB is also low (e.g., estimated productivity for wheat of 0.6 kg/m^3 could be between 0.8-1.0 kg/m^3 with appropriate irrigation and sufficient other inputs).

79. The proposed Project will reflect the following lessons learnt from a previous ADB financed irrigation project: (i) focus should be on full rather than partial rehabilitation for effective system performance; (ii) projects dispersed over a broad geographic area are hard to implement and have high administrative burdens; (iii) improving on-farm agricultural productivity is important for project sustainability and an appropriate implementing partner should be chosen for the improvement; and (iv) sufficient funds should be raised through water use levies or government contributions to ensure the sustainability of WUAs and coverage of O&M costs.

D. Project Impact and Outcomes

80. The impact of the proposed Project will be increased farm incomes in the CIS, and the outcome will be increased agricultural water productivity. The key outputs will be (i) WRM capacity improved in PRB; (ii) WRM infrastructure in PRB modernized and climate-proofed; and (iii) farm management and water use capacities increased. The construction of sediment excluding basin, the replacement of pumps and motors in selected pump stations with energy efficient ones, and more profitable farm management to enable farmers to pay water use levies, will result in more sustainable operation and maintenance (O&M) of the CIS.

E. Project Scope

81. The Project scope includes four components, only one of which, Component II, has physical works:

- **I** **Institutional Strengthening and River Basin Management** (establishing a PRB organization, council, and Joint PRB committee, and developing a PRB management plan).
- **II** **Irrigation System Modernization and Climate-Proofing (Agency for Land Reclamation and Irrigation** (modernizing and climate-proofing the CIS, including construction of a sediment excluding basin and rehabilitation of existing canals and pump stations).
- **III** **Improvement of Farm Level Agricultural Water Productivity in the CIS** (improving farm and water use management capacities).

82. Each component is described below.

I. Institutional Strengthening and River Basin Management

83. This component will establish a Pyanj River Basin Organization (PRBO), Pyanj River Basin Council, and Joint Tajikistan/Afghanistan PRB commission, and develop a PRB

management plan and joint Tajikistan/Afghanistan PRB monitoring program.

Pyanj River Basin Organization (PRBO)

- Establishing the PRBO is aimed at providing effective water resources management in the river basin for the benefit of the population, economic-growth and maintenance of the basin environmental quality following Integrated Water Resources Management (IWRM) principles.

- The PRBO will be responsible for river basin planning and monitoring of water resources management and protection, and preparation of a Pyanj River Basin Management Plan (PRBMP) including annual and seasonal water allocation, and will monitor implementation of the plans. Specific responsibilities include:
    - Long- and medium-term and annual (seasonal) water resources planning for the river basin;
    - Dissemination of information to stakeholders about the water allocations and MEWR decisions on water allocations;
    - Recommendations on allocation of water use limits shall be discussed at the River Basin Council meetings of authorized representatives from all ministries and agencies involved in water resources management, subject to MEA R's KpprLIJRl LIJItCOITmTsX,
    - River basin wide coordination between water users;
    - Monitoring of implementation of the river basin management plan;
    - Coordination with the River Basin Council members regarding equitable allocations of water in the river basins and in resolving issues with water users; and
    - Coordination with the irrigation and drainage sector at river basin level, including flood protection and land reclamation plans.

Pyanj River Basin Council (PRBC)

- The role of the PRBC will be to coordinate activities of governmental and nongovernmental organizations related to water. The PRBC will be a public organization whose decisions are advisory in nature and which plays the role of assisting the PRBO and other stakeholders in preparation and implementation of the PRBMP.

- As per Article 140 of the Water Code, PRBC responsibilities will include:
    - Review and approval of the river basin management plan;
    - Coordination of the activities of enterprises, institutions and other organizations associated with planning, use and protection of water resources in the river basin.

- Some other tasks and responsibilities of the PRBC may include:
    - Development of recommendations for appropriate allocation of water resources to different water users in the basin, consultation with the RBO to implement the recommendations;
    - Making recommendations for improvement of water resources management and for specific developments within the river basin;
    - Requesting information from relevant ministries and agencies on feasibility of the proposals for water resources development;
    - Collecting and expressing stakeholder views on i) water resources management, ii) water distribution, iii) water quality, iv) provision of services;

- Facilitation in resolution of disputes between different water-users or groups of water users and making recommendations for conflict resolution;
- Review of data on water allocations, water supply, water quality; and
- Assistance to stakeholders and their associations.

Pyanj River Basin Management Plan (PRBMP)

- The PRBMP will enable the basin water supply organizations to carry out analysis and evaluation of the current water situation and to plan basin water resources management for the different periods. Economic development, demographic forecasts, effects of climate change and other factors affecting the basin development will be taken into account in the preparation of the PRBMP.

- The PRBMP will include four main parts:

Part 1: River Basin Analysis – description of current situation with water resources

- Physical description of the basin (background information);
- Land use, areas requiring irrigation, dry/rain-fed areas, pastures;
- Current water supply and demand;
- Pollution sources;
- Requirements of aquatic and terrestrial ecosystems.

Part 2: Pressure – Impact Analysis

- Identification of significant pressures on water resources;
- Identification of significant impacts;
- Identification of significant water management issues;
- Identification of priority issues.

Part 3: Definition of objectives to address priority issues

- Objectives for the river basin for the first 2-3 years;
- Medium- and long-term objectives for the river basin;
- Scenarios for the future water demands.

Part 4: Timed and costed program of measures (plan) to achieve the above objectives

- Measures to achieve short-term objectives;
- Measures to achieve medium- and long-term objectives;
- Monitoring of implementation of the program of measures.

II. Irrigation System Modernization and Climate-Proofing

84. This component will modernize and climate-proof the CIS, including sediment extraction from canals and drainage collectors; design and construction of sediment excluding basin; design and rehabilitation of existing canal gates, weirs and water meters and design and rehabilitation of selected pump stations including installation of new pumps, electric motors, electrical control boards and flow meters. It is divided into five subcomponents.

II.a Sediment Excavation from Inter-Farm Canals, Drainage Collectors and On-Farm Drainage Collectors

85. The Project will excavate an estimated 699 million m^3 of sediments from inter-farm canals, 1,097 million m^3 of sediments from inter-farm drainage collectors (Table 10), and

1.02 million m^3 of sediment from 357 km of on-farm drainage collectors (Table 11).7 Works will be done by segments during the non-irrigation season (October to March). Sediments extracted from the main canals and other canals and drains closer to the Pyanj River will be disposed of in the Pyanj River which will be removed by the river flows, mainly during the high flow season. Materials excavated from other canals and drains will be partly deposited and leveled into berms running adjacent to one or both sides of the canals or collectors and partly in disposal locations to be identified during the project implementation stage.

Table 10: Estimated Sediment Excavation From Inter-Farm and Drainage Collectors

Name of ALRI Regional Dept.	Sediment to be removed from inter-farm canals, 1000 m^3	Sediment to be removed from drainage collectors, 1000 m^3
Farkhor	261	360
Hamadoni	289	615
Vose	78	111
Kulob	7	12
Chubek Canal	65	**1,097**
TOTAL	**699**	

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Table 11: Estimated Sediment Excavation from On-Farm Drainage Collectors

Jamoat	No. of drainage collectors	Drainage area, ha	Length, m	Volume of Sediments, m^3	
				m^3 per m of drainage collector	Total, m^3
FARKHOR District					
Vatan	19	2,777	23,600	3,8	90,010
Gulshan	12	2,263	16,000	1,8	28,773
Gairat	21	1,075	13,400	3,0	40,066
Galaba	31	1,184	32,200	3,3	107,423
Zafar	27	1,274	16,150	4,1	66,678
Dehkonarik	35	2,353	20,919	3,3	68,639
Darkad	5	801	7,450	3,9	29,055
Komsomol	9	436	21,800	4,6	100,764
Farkhor	6	1,560	5,200	4,1	21,519
Total	165	13,723	156,719	3,5	552,928
HAMADONI District					
Chubek	7	276	8,800	2,0	13,200
Dashti-Gulo	13	4,169	31,750	4,0	98,410
Makhnatobod	34	1,281	29,650	3,0	68,340
Kahramon	15	408	9,980	3,2	24,405
Kalinin	7	282	5,650	1,4	6,300
Turdiev	7	926	9,230	1,7	11,930
Total	83	7,342	95,060	2,3	222,585
VOSE District					
Tugarak	27	980	28,160	1,1	22,968
Guliston	22	617	22,350	3,6	62,050
A. Avazov	38	1,379	47,350	3,6	130,675
Total f	87	2,976	97,860	2,2	215,693
KULOB District					
Total	7	350	7,000	3,9	27,300
TOTAL	**342**	**24,391**	**356,639**	**2,9**	**1,018,506**

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86. Exact quantities to be excavated will be further refined during the detailed design stage, which will include field surveys, during the first year of the Project (2016).

II.b Sediment Excluding Basin

[7] The Project has coordinated with the World Bank funded PAPM2 project which is also undertaking excavation of on farm drainage collectors.

87. Currently, he annual sediment load entering the CIS from the Pyanj River is estimated at 0.46 million $m^3$and it is expected to increase to about 0.75 million m^3. The objective of the proposed sediment excluding basin is to minimize sediment entry into the CIS, thereby reducing the impacts of excessive sediment loads on canal efficiency and pump life.

88. The proposed sediment excluding basin will start approximately 250 m downstream of the head regulator. Main components of the sediment excluding basin are:

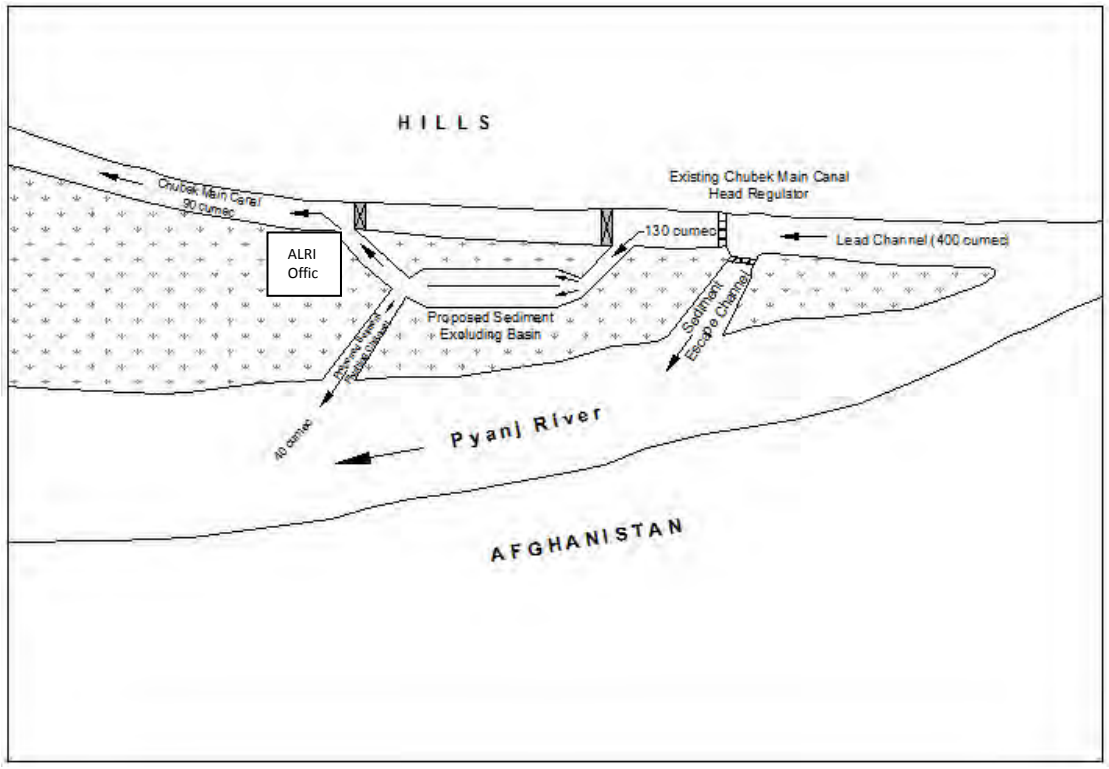
- 100 m long feeder channel from existing Chubek Main Canal to the sediment excluding basin;
- Intake of sediment excluding basin with gates;
- Sediment excluding basin (500 m x100 m) in two compartments which can be operated independently;
- Gated flushing sluice with 160 m long channel leading to Pyanj River;
- 650 m channel from sediment excluding basin to the existing main canal;
- Fall structure at the junction of channel from the sediment excluding basin and the main canal; and
- Strengthening of the flood embankment between the sediment excluding basin and Pyanj River

89. The schematic diagram of the proposed sediment excluding basin is given in Fig 14. It has been designed to remove about 85% of the sediments entering the canal; about 70% by hydraulic flushing and 15% by physical removal using the equipment.

90. Construction of the settling basin will require excavation of an estimated 222,000 m^3 of alluvial sand and gravel. In addition earthwork of about 175,000 m^3 will be required for the flood protection embankment.

91. The sediment excluding basin has been designed based on analysis of CIS and Pyanj River flow rates and sediment load and composition. Sediment particles sized over 63 microns will be removed partly through hydraulic flushing and partly though deposition in the bed of the basin. The smaller sediment particles (very fine sand, silt and clay particles) will be carried as a wash load along the canal. These fine sediments will not damage pumps, and will beneficial for cultivated land. Details on the design and performance of sediment excluding basin are given on Appendix 12.

Figure 14: Schematic Diagram of the Proposed Sediment Excluding Basin



SUurMO: PPTA CUHsultKHt

Figure 15: North-West Area of the Proposed Sediment Excluding Basin

SUurMO: PPTA CUHsultKHt.

Figure 16: Abandoned Fish Ponds, Southeast Area of Proposed Settling Basin Site

SUurMO: PPTA CUHsultKt

92. Under the with-project conditions, the CIS will draw more water and hence the annual sediment intake is estimated at 731,000 m^3 under the without-climate proofing and about 750,000 m^3 under the with-climate proofing scenarios against the current estimated 460,000 m^3. The proposed sediment excluding basin will flush hydraulically to the Pyanj River about 70% of the sediment intake while about 15% will be deposited in the basin. Of the remaining 15%, half will be deposited in the canals mostly in the main canal and the remaining half, consisting mainly of very fine sediments, will find their way to the fields.

93. The sediments deposited in the sediment excluding basin and the canals will need to be excavated with mechanical equipment. A part of sediments excavated from the sediment excluding basin and initial reached of the canals adjacent to the Pyanj River will be used to strengthen the adjacent flood protection embankment and the remaining will be dumped into the bed of Pyanj River which will be subsequently slowly removed by the river during high flows. A part of the sediments excavated from other canals will be spread on canal berms to strengthen their embankments while the remaining will be disposed at suitable sites to be identified during the project implementation period.

II.c Modernization of Canal Structures

94. The works for Component II.a are summarized below and in Table 12.

- In Farkhor District the volume of work to renovate the canal structures includes 1,105 m^3 of earth work, 222 m^3 of concrete work, and the replacement of 82 gates. The total volume of work to renovate water measuring devices includes 108 m^3 of earth work, 27 m^3 of concrete work, and the replacement of 16 water level meters and 7 hydro bridges.

- In Hamadoni District the volume of work to renovate the canal structures includes 980 m^3 of earth work, 1102 m^3 of concrete work, and the replacement of 66 gates. The total volume of work to renovate water measuring devices includes 1303 m^3 of earth work, 1122 m^3 of concrete work, and the replacement of 35 water level meters and 33 hydro bridges.

- In Vose District the volume of work to renovate the canal structures includes 230 m^3 of earth work, 173 m^3 of concrete work, and the replacement of 34 gates, 27 water level meters and 25 hydro bridges.

- In Kulob District the volume of work to renovate the canal structures includes 25 m^3 of earth work, 8 m^3 of concrete work, and the replacement of 4 gates, 1 water level meter and 1 hydro bridge.

Table 12: Modernization of CIS Canal Structures

District	Rehabilitation of Canal Structures			Rehabilitation of Water Measuring Devices and Associated Structures			
	No. of replacement gates	Earth works, m^3	Concrete works, m^3	No. of replacement water level meters	No. of replacement hydrobridges	Earth works, m^3	Concrete works, m^3
Farkhor	82	1105	222	16	7	108	27
Hamadoni	66	980	1102	35	33	1303	1122
Vose	34	230	173	27	25	*	*
Kulob	4	25	8	1	1	*	*
TOTAL	186	2340	1505	79	66	1411	1149

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II.d Modernization of Pumping Stations

Criteria for Selecting Pumps for Modernization

A. Criteria for Deciding Priority Order for Modernization

95. About 14,344 ha area of CIS was designed to be irrigated by water pumped by 102 pumping units arranged in 20 groups in Farkhor, Vose, and Kulob districts. The pumping head varies from 8.5 m to 177.5 m. Some areas need 2-3 stages of pumping. The combined design pumping capacity of the 102 pumps was 84.7 cubic meter per second (cumec). Currently, about 65 pumps are totally out of operation and the remaining 37 are in working condition but in poor shape. The total pumping capacity of currently operating pumps is about 29 cumec (about 34 % of the design capacity). The pumps, presently in working condition, suffer from accelerated deterioration because high concentration of sediments in water and lack of repair facilities. The overall efficiency of the current pumping units is not more than 50% where as the new pumping unit with efficiency exceeding 75% are available.

96. In view of limitations of funds available for modernization, it is necessary to establish some criteria based on which priority order can be decided in which the pumping stations are to be taken up for modernization. Various factors pertaining to the pumping stations can influence priority order for the modernization. Some important factors are discussed here.

97. **Strategic Location of the Pumping Station**: Except for one pumping station (Guliston), all pumping stations are linked in 4 cascade pumping systems. Each cascade has one or two base pumping stations which pump water to the higher level. The next first level pumping station pumps water to further higher elevation and so on. Therefore, the base pumping stations in the cascade pumping system has strategic importance in a sense that full benefits of modernization may not reach ultimate beneficiaries unless base pumping station is modernized.

98. **Present Condition of the Pumping Station**: The need for modernization of the pumping station depends on its present condition. However, it is a fact that all pumping stations are in bad condition and need modernization. Therefore, to decide the priority order, the worse the condition of the pumping station, the more the need for modernization and, therefore, higher the priority.

99. **The Irrigation Area and the Total Pumping Head:** The combination of irrigated area covered under the pumping station and total pumping head is also an important factor in deciding the priority order for the modernization. The pumping station covering large area at comparatively lower total pumping head will attract higher priority. The pumping station covering comparatively smaller area but with higher total pump head will attract lower priority.

100. **The Irrigated Area and the Cost of Modernization for the Pumping Station:** The combination of the irrigated area covered and the total cost of modernization for the pumping station is an important factor to decide priority order for modernization. The pumping station covering large area at comparatively lower cost of modernization will attract higher priority. Conversely, the pumping station covering comparatively smaller area but with higher cost of modernization will attract lower priority.

B. Priority Order for the Groups of Pumping Stations (Cascade)

101. Since the pumping stations are effectively operating in groups, it is important to decide priority for the group of pumping stations.

102. Considering the above factors, the priority for the groups of pumping stations is recommended as under (Table 13).

Table 13: Priority Order for the Groups of Pumping Stations

Priority Order	Group of Pumping Stations	Irrigation Area Served (ha)	Factors Deciding the Priority
Priority-1	Janubi	2,603	Low pumping heads, low cost of modernization
Priority-2	Urtoboz	5,837	High irrigation area coverage, moderate cost of modernization
Priority-3	Lenin	2,382	High pumping head but worst present condition, moderate cost of modernization.
Priority-4	Kulobdarya	3,115	High irrigation area coverage, moderate pumping head but very high cost of modernization

C. Guiding Principles for Modernization of Pumps

103. Based on the priority and the need of modernization, the old pumping units to be replaced by new pumps are decided. However, it is not necessary to replace the old pumps with new pumps of exactly the same capacity and pump head of the existing pumps. There is a need to select new pumps with optimum capacity and optimum pump head so as to ensure full utilization of new pumps and optimum cost of modernization. Imparting flexibility of operation and reliability to the modernized pumping system are also important considerations. Following guiding principles and steps are considered useful in design of the pump capacities and heads for the new pumps.

(i) Calculate the peak water requirement afresh based on the irrigation area coverage, peak water requirement per hector and the transmission efficiency and design the pumping capacity based on this requirement.

(ii) Provide at least two pumps in each pumping system to facilitate the pumping system to operate at lower capacity during the non-peak demand period. This will impart flexibility to the pumping system and will also save energy.

(iii) In most of the cases it is observed that total pump capacities provided as per the old design are substantially high. The pump discharge pipes (common headers) are designed for these high design flows. Though the static head of the pumping system and the diameter of the pump discharge pipe (header) cannot be changed, there is a need to analyze the pumping systems with new pumping capacities to determine the optimum pump head. In many cases, there will be possibility of reduction in total pump head. This will reduce the motor rating, cost of new pumps, and will also save energy during operations.

(iv) At many pumping stations the old pumps are in working conditions but may not last long if made to work continuously because of poor maintenance and lack of availability of proper spare parts. While deciding the number of new pumps and their capacities, consider the old working pumps as spare pumps or pumps working occasionally during peak period. It is advisable to consider that the new pumps cover at least 80% of the peak water requirement. This will impart enhance reliability to the modernized pumping system during the long run.

(v) Select the pumps with lower rotational speed (revolution per minute) to ensure longer and trouble free life with less maintenance requirement. This is essential in view of the limited maintenance facilities available with the operators.

104. These guide lines are generally followed for the detail design of pumps to be modernized.

105. **Pumps Finally Selected for Modernization** With due consideration to the pump selection criteria, estimated costs for modernization, and available funds, Urtaboz pumping systems (complete with all pump houses of Urtaboz 1, 2, 3, and 4) and Janubi pumping system (consisting of Janubi 1 and 2, Perikatchka, and Moskva 1 and 2) and the central repair and maintenance facility of CIS located in Vose have been selected for modernization. Details are in Table 14.

Table 14: Information on Pumping Units and Facilities Selected for Modernization

Pumping unit / facility	Irrigated area, ha	Total pumping head, m	Number of pumping units		Estimated cost, $
			Total	Units to be modernized	
Urtaboz 1 (3-8)		20	6	4	982,126
Urtaboz 1 (9-10)	549	35	2	1	88,451
Urtaboz 1 (1-2)	581	69	2	1	168,451
Urtaboz 2	215	30.1	4	1	100,617
Urtaboz 3	424	32	4	2	111,474
Urtaboz 4 (1-3)	830	19.4	3	0	41,667
Urtaboz 4 (4-6 &12)	1,080	69	4	2	842,785
Urtaboz 4 (7-11)	2,020	88	5	2	714,120
TOTAL URTABOZ	**5,699**		**30**	**13**	**3,049,691**
Janubi 1	1,120	10	6	4	550,836
Janubi 2	400	11.5	5	4	250,833
Perekatchka	725	5	2	3	198,957
Moskva 1	180	12	3	2	105,221
Moskva 2	178	54	3	2	146,460
TOTAL JANUBI	**2,603**		**19**	**15**	**1,252,307**
Repair and Maintenance Facility					**216,836**
GRAND TOTAL	**8,302**		**49**	**28**	**4,518,834**
TOTAL SYSTEM	**14344**		**102**		**11,893,837**
PROPOSED AS %	**57.8%**		**48%**	**27.5%**	**38%**

OF SYSTEM					

106. Improving about 58% of the pumped irrigated area with only 38% of the investment, clearly shows economy of investment using the criteria discussed earlier.

II.e Strengthening of Operation and Maintenance System

107. The Project will support ALRI regional departments in the CIS through office renovations, provision of equipment, and improvements to the ALRI Training Center.

108. In addition, support will be provided for reorganization of the existing and establishment of the new WUAs on hydrologic boundaries and covering the entire project area. The capacity of the WUAs will be strengthened and their officials and staff trained in water management, book keeping, accounting, and other required specializations. Capacity will also be developed of the 5 ALRI regional departments. Training will be provided in Tajik, and topics will include Water Management in Irrigation Systems; Irrigation Systems Operation and Maintenance; Irrigation Technologies and Water Saving Techniques; and Water Measurement Techniques. Finally, a study tour is proposed for key ALRI staff to India, Southeast Asia or Spain to learn best practices in irrigation system operation and maintenance.

III. Farm management Capacity and Water Use Skill improved

109. This output includes (i) demonstration to promote profitable farm management and efficient water use; (ii) production of high-quality seeds; and (iii) establishment and possible reorganization of WUAs and capacity development of WUAs and beneficiaries. International nongovernmental organization(s) (NGOs) with rich experiences for required activities will implement.

110. Under the first component, demonstration plots for a total of 500 ha will promote more profitable farm management using improved agronomic techniques conducive for higher productivity and profitability per unit of farmland and more efficient water use techniques.

111. The second component will (i) supply foundation seed to seed growers and facilitate to produce the seeds for themselves as well as for a large number of smaller farmers; (ii) diversify seed production for vegetable, fruit, and other crops in addition of wheat and cotton seeds being produced; (iii) develop capacity of the seed growers in seed production; and (iv) re-establish field seed laboratories at district offices of the department of agriculture and develop their capacity to certify the seeds. The poorer farmers are particularly suffering from poor quality seeds either from the previous crop or bought from the local markets.

112. TCO tCTH MLLmpLLЧЮ aTl (T) strOЧPtCOЧA UAs' THstTttuTLLЧKlЧ mKЧKPOmOЧЧЧ KЧH tOMЧGTMKlMKpKMtTOsX(T) supplLLt A UAs' rOLLPKЧTFKtTTЫLLЧCвHrLLLLPMKlЛLLuHHKrTЮ ПLLrtCOF efficient water management; and (iii) facilitate formation of new WUAs in the remaining project area, also, on hydrological boundaries. At present, there are only 20 WUAs covering about 83% of the CIS area, and they are not adequately equipped and trained to undertake their tasks efficiently, which has resulted in the low collection rate (average 46% in project districts) of the irrigation service fee. NGO activities will be collaborated with WUASU.

F. Implementation Arrangements

The MEWR will be the EA for Component I and ALRI will be the EA for Components II and III.

113. Workers will be housed in local communities, and it is understood that there will be no need for the establishment of worker camps.

G. Budget and Time Schedule

114. The project is estimated to cost $35.76 million (Table 15).

Table 15: Project Investment Plan
($ million)

Item		Amount
A.	**Base Cost**	
	1. Output 1: WRM capacity improved in PRB	2.07
	2. Output 2: Modernized and climate-proofed CIS WRM infrastructure fully operational	27.00
	3. Output 3: Farm management and water use capacities improved	3.10
	Subtotal (A)	**32.18**
B.	**Contingencies**	2.88
C.	**Financing Charges During Implementation**	0.70
	Total (A+B+C)	**35.76**

115. The government has requested a loan in various currencies equivalent to $18.4 from ADB's SpOMRI FuЧHs rOsLLurMOsLLCOp ГHKЧMO the project.[8] The government has requested K PrKЧt ЧLLO6MOEHP $6.6 mTTLЧTLLmtCOADB's SpOMRI FuЧHs rOsLLurMOstLLCOp ГHKЧMO the project.

116. The Japan Fund for Poverty Reduction (JFPR) is expected to finance a TA equivalent to $2 million for Output 1 and a grant equivalent to $3 million for Output 3, both of which will be administered by ADB. The government will contribute $5.76 million by way of tK6OsKЧH HutTOsTLLrPLLЧD ($4.125 mTTLLЧ,THMrGmOЧIKI stKTTMLLts ($0.935 mTTLLЧTLLrALRI's PMO and PIO staff salaries), and interest during construction ($0.7 million). The financing plan is in Table 16

Table 16: Financing Plan

Source	**Amount** ($ million)	**Share of Total** (%)
ADB ADF (loan)	18.40	51.5
ADB ADF (grant)	6.60	18.5
Japan Fund for Poverty Reduction (TA)[a] (Expected)	2.00	5.6
Japan Fund for Poverty Reduction (grant)[a] (Expected)	3.00	8.4
Government	5.76	16.1
Total	**35.76**	**100.0**

[a] Administered by the Asian Development Bank.
Source: ADB estimates.

[8] A country's eligibility for Asian Development Fund grants under the revised grant framework is determined by its risk of debt distress. The latest debt sustainability analysis determined that Tajikistan had a moderate risk of debt distress and was therefore eligible to receive 50% of its Asian Development Fund allocation as grants.

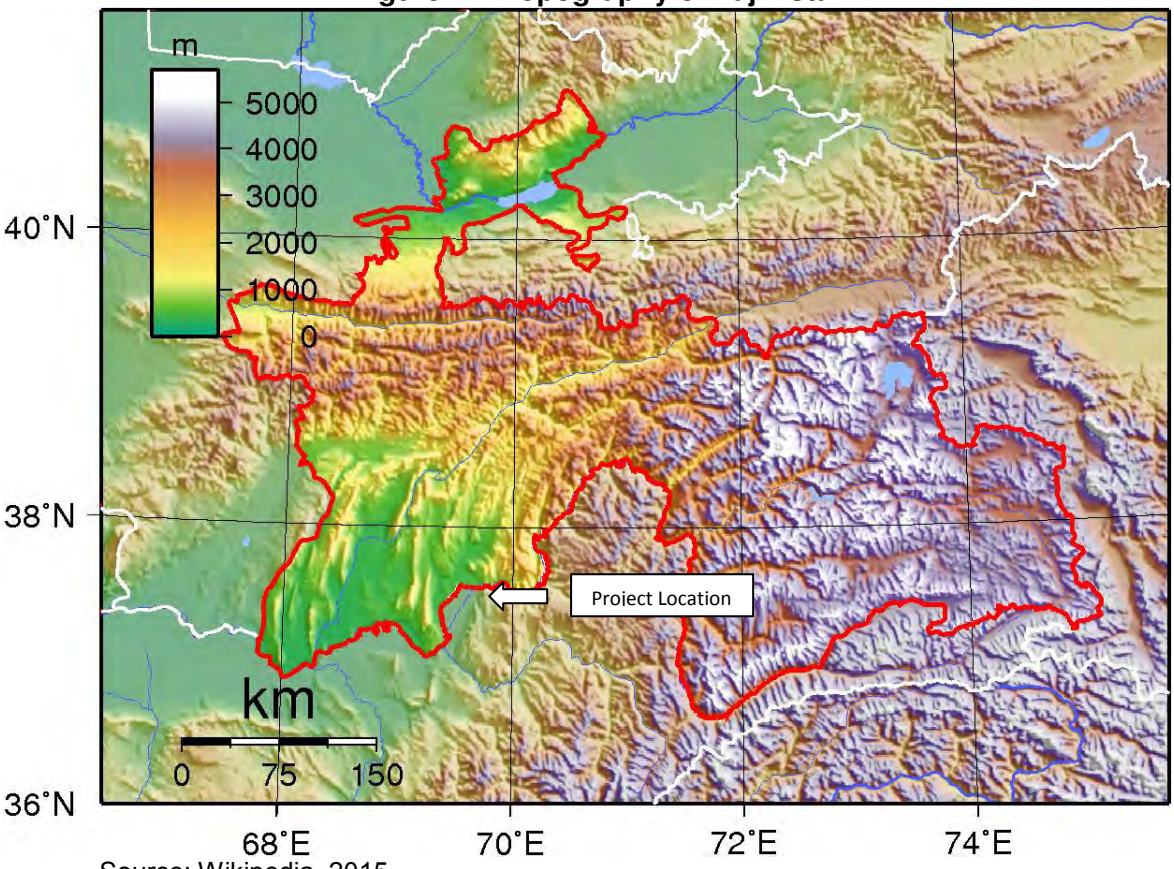
V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Topography

117. Tajikistan is a landlocked mountainous country with more than 50% of its area above 3,000 masl. The country is dominated by the Trans-Alay Mountain range in the north and the Pamirs in the southeast. Khatlon Viloyat in the southwest of Tajikistanis in one of the two lowland areas of the country, the other being the Fergana Valley in the north (Figure 17).

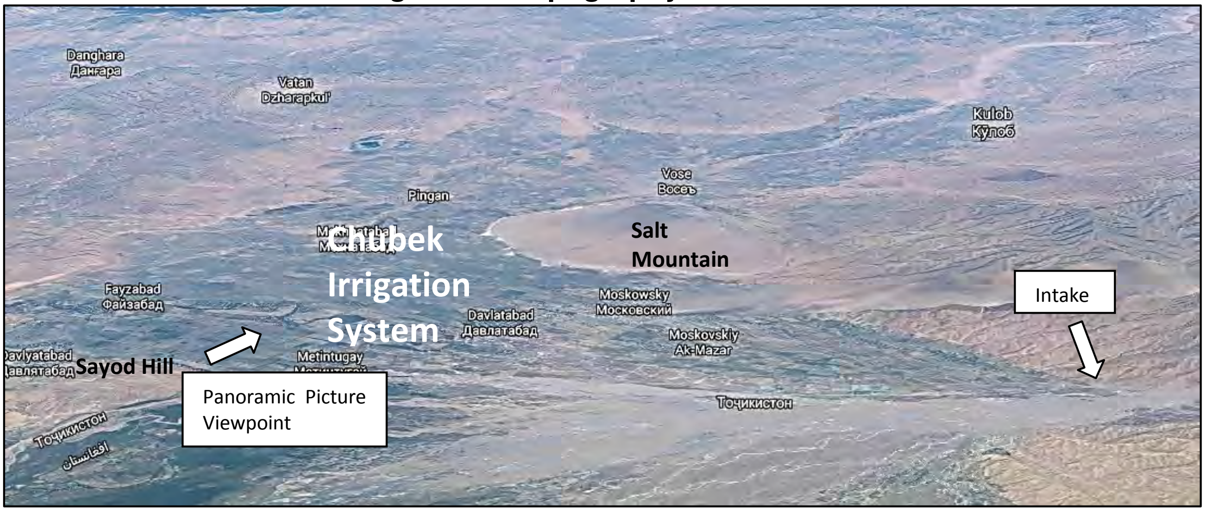
Figure 17: Topography of Tajikistan



Source: Wikipedia, 2015.

118. The CIS includes land in four districts; Farkhor, Vose, Hamadoni and Kulob. The 4 districts comprise 68,743 ha of cultivated land, of which the CIS command area is 50,163 ha. The topography of the command area of the CIS is relatively flat alluvial plains with higher elevations to the north and east, draining to the Pyanj in the southwest. The alluvial flood plains lie in a geological basin called the Tajik Depression, formed in Jurassic and Paleozoic rocks. The command area is surrounded by low loess foothills to the north and west, and steep rocky Pamir mountains to the east. The Pyanj River forms the southern border of both the CIS and Tajikistan (Figure 18). Visually the command area is dominated by Salt Mountain (Khoja Mumin), an 8.5 km long 900 m high oval shaped salt dome (Figure 19). As a result of the command area topography, of the total design command area of 50,163 hectare (ha); 35,819 ha (71%) is fed by gravity and 14,344 ha (29%) by pumps. Vose District has the highest proportion (57%) while Kulob has only 2% of the command area.

Figure 18: Topography of the CIS.



Source: Google Maps, 2015.

Figure 19: Panoramic View of the CIS from the Base of Sayod Hill, Looking to the Northeast

Source: PPTA Consultants, 2015.

Figure 20: Salt Mountain

Source: PPTA Consultants, 2015.

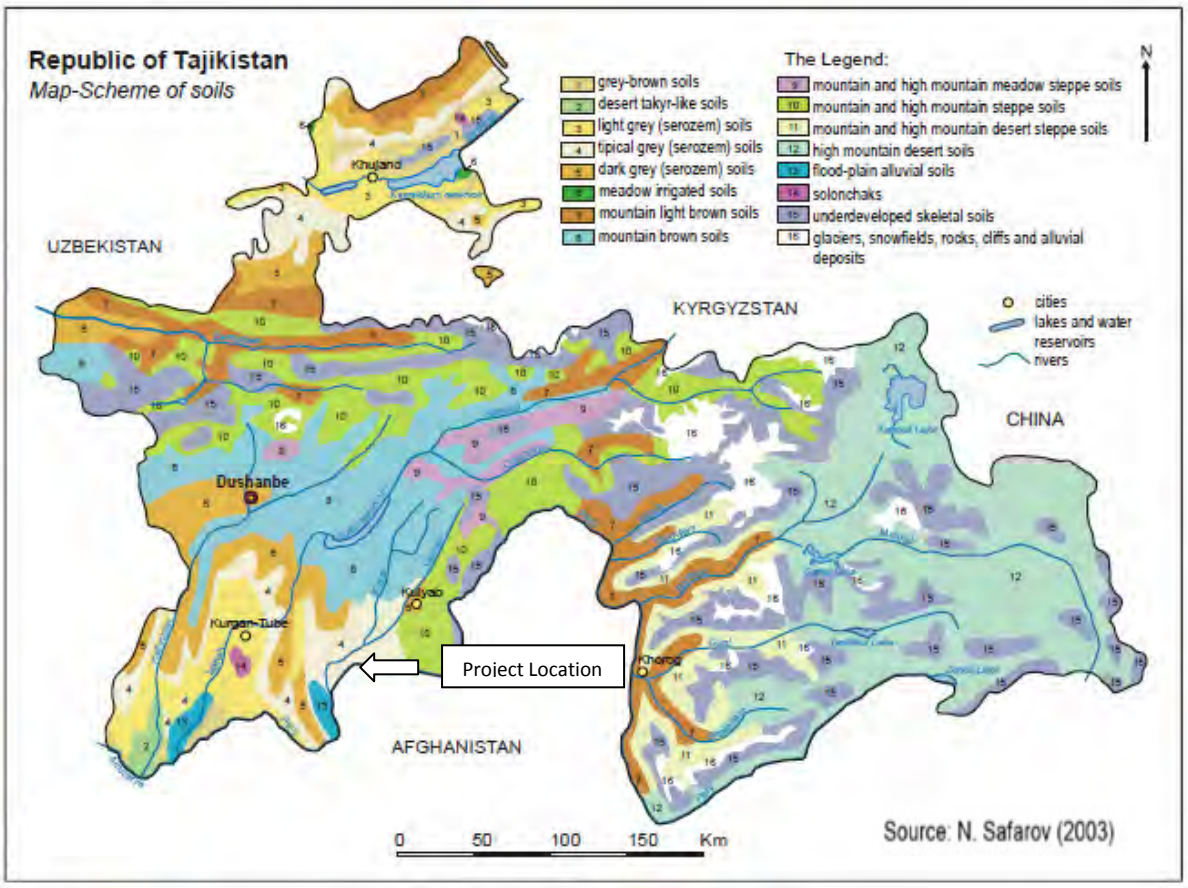
2. Soils

119. Soils in Tajikistan are classified into 4 zones based largely on altitude: (i) lowland belt, mainly with sierozemic soils[9]; (ii) midland belt with mountainous brown soils; (iii) alpine

9 A sШТ PrШщp MШЧsТstТНP ШПsШТs a ТC pКIO PrКвТC A СШrТ ШЧs PrКНТНP ТНtШМКIМКrСШщs mКtОrТКl Кt К НОptС ШП1 ПШШt Шr lОssЧКЧН ПШШnОН ТН tОmpОrКtО tШМШШЧКrТН МТmКtОs uЧНОr К ЯОРОtКtТШЧ ШПНОsОrt plКЧtsЧsСШrt PrКssЧ

belt with high-altitude meadow-steppe, steppe, and desert-steppe soils; and (iv) nival (snow) belt with marlaceous soils amongst glaciers, snowfields and rocks. The Project area is within the lowland belt.

Figure 21: Soil Type Map, Tajikistan



120. Within the CIS arable soils are typically loess, loamy sands and loamy soils, characterized by very little clay, and are of alluvial and colluvial origin. These soils have relatively low fertility; however the humus layer of the loess and loamy sands is fairly fertile and agriculture is possible. For these soils to be converted into agricultural use, they require irrigation and mineral fertilizers. Irrigated lands with steeper slopes tend to contain the most coarsely textured soils.[10]

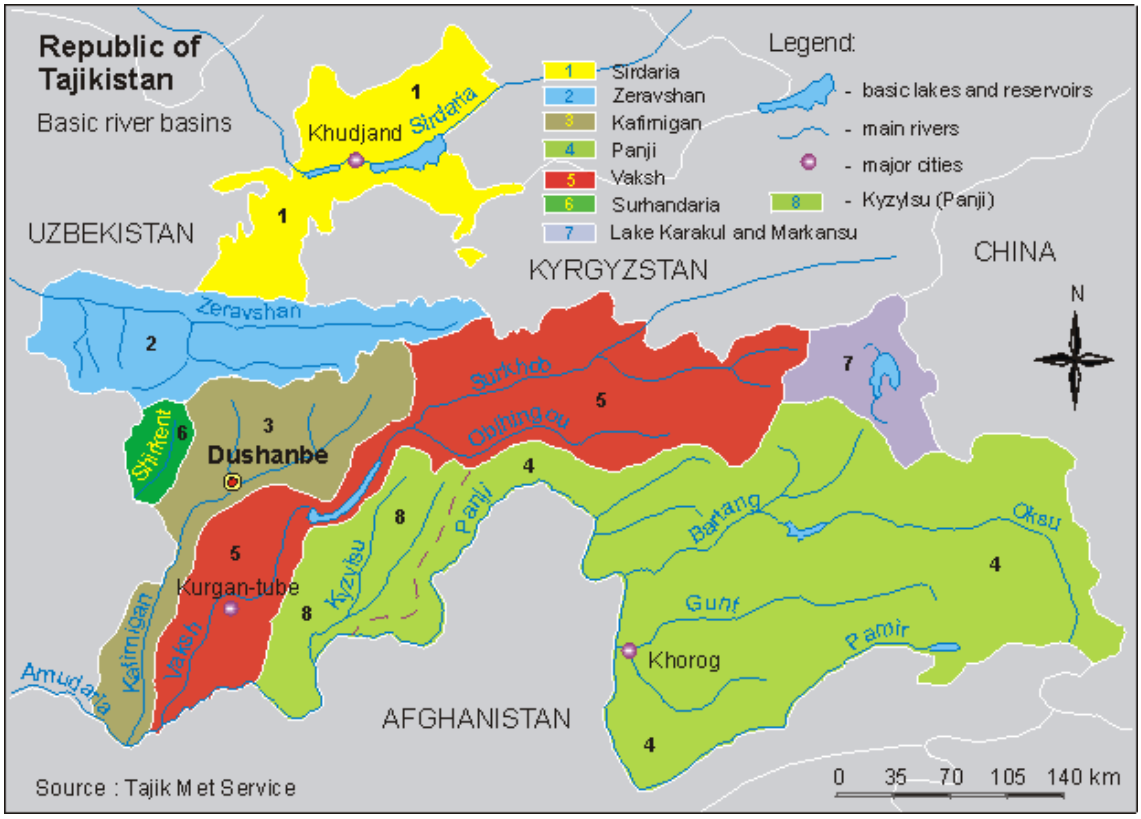
3. Hydrology and Water Resources

a) Surface Water Systems

121. Tajikistan has eight main river basins (Figure 22). Flows are variable; in the larger basins flows are controlled by snow-melt and therefore peak in the summer, while smaller basins respond to rainfall events. Average annual flows are illustrated in Figure 23, and the main factors affecting flooding are shown in Figure 24.

[10] KЧIH sMKttOrOH JIrusC.
ADB, 2004. Tajikistan Irrigation Rehabilitation Project: Final Report Supplementary Appendix A, Identification and Description of the Project Area.

Figure 22: Major River Basins of Tajikistan



122. Surface water resources in the Project area are relatively plentiful, primarily due to the Pyanj River which drains most of the mountainous Pamir region in Tajikistan and also part of the Hindu Kush in Afghanistan. The Pyanj River is a tributary of the Amu Darya, is 1,125 km long, and makes up a considerable part of the Afghanistan - Tajikistan border. It is formed by the confluence of the Pamir River and the Wakhan River in north-eastern Afghanistan. From there, it flows westwards, forming the border of Afghanistan and Tajikistan (Figure 25). The Pyanj River is the primary source of drinking and irrigation water in the Project area as it has reliable flows all year round.

123. The Pyanj River forms a gorge in the Pamir Mountains upstream of the CIS intake. At this point it divides and extends over a large alluvial fan to form a system of highly mobile braided river channels running between gravel spits, islands and low vegetation. Although this system looks like a relatively level riverine swamp from a distance, many vegetated islands stand 3-5 meters high above the adjacent channels.

Figure 23: Average Annual River Flows, 1961-1990

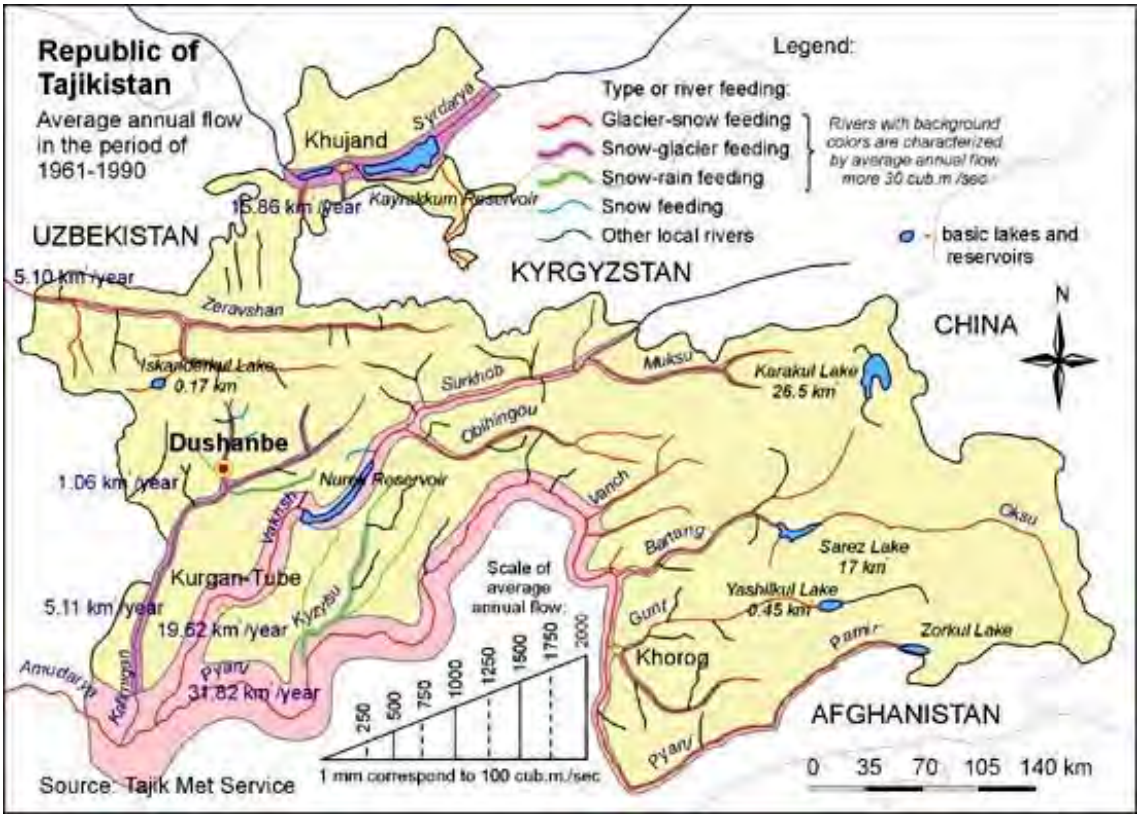


Figure 24: Main Factors Affecting Flooding in Tajikistan

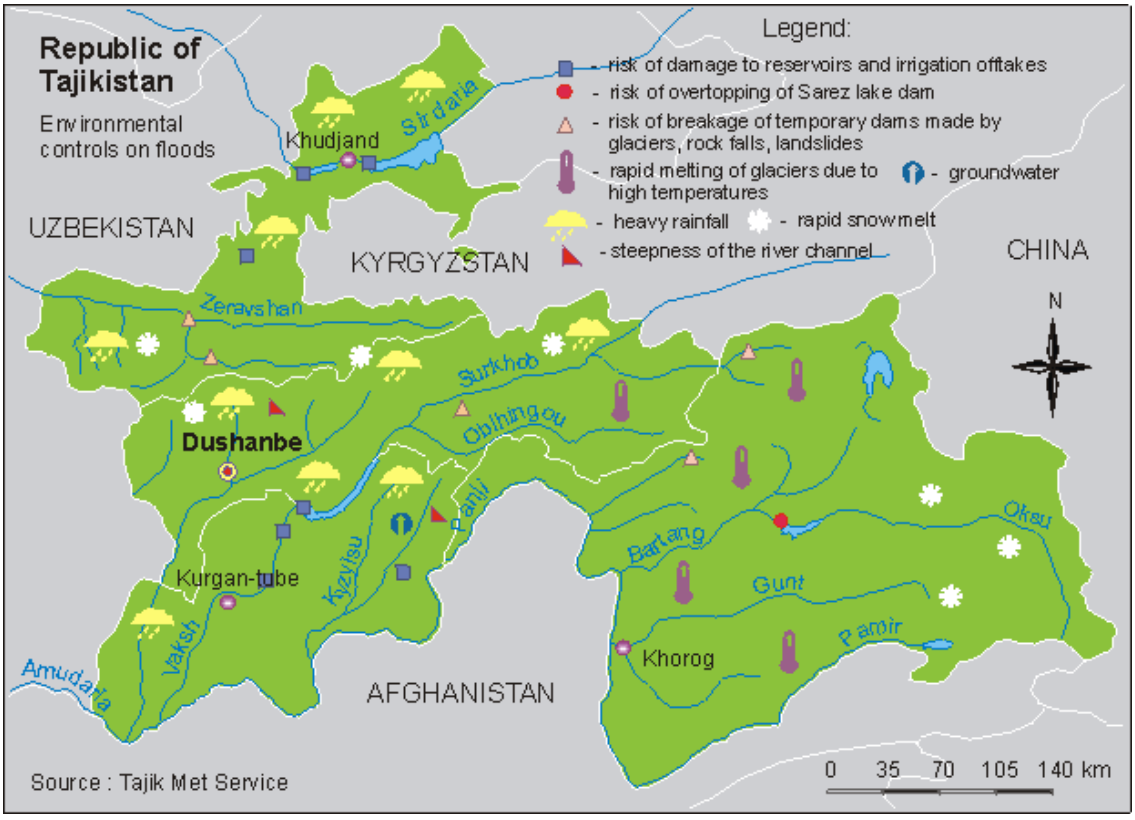
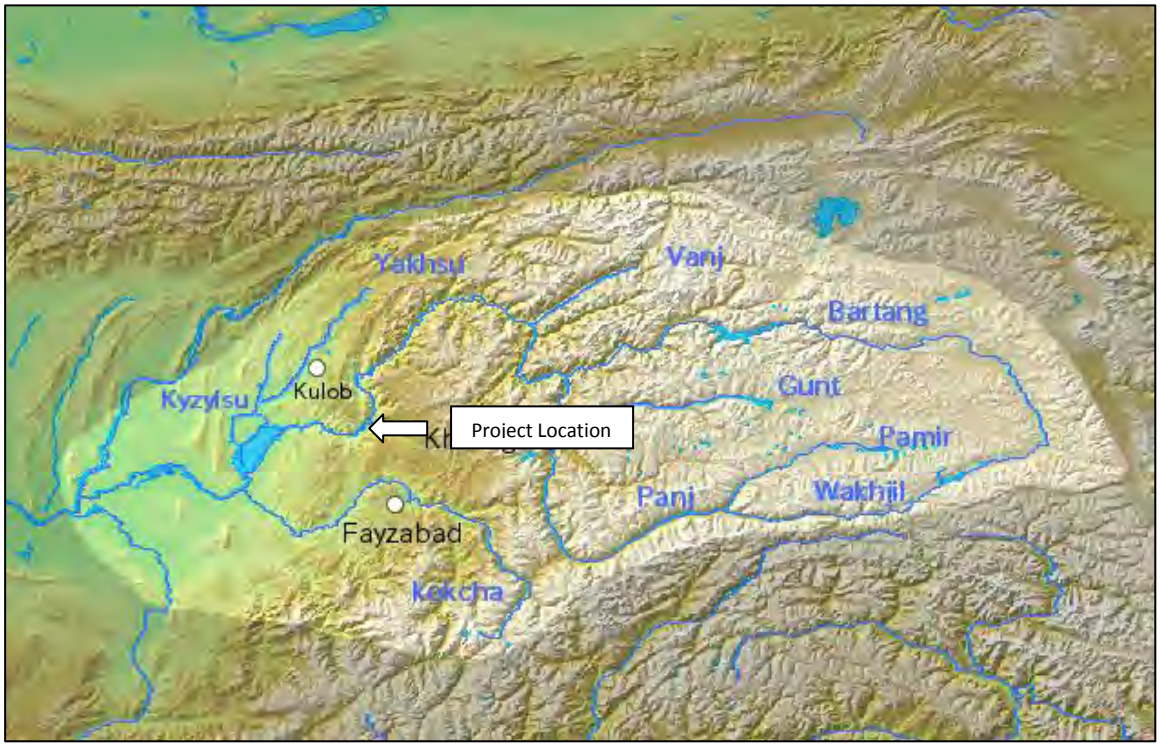


Figure 25: Pyanj River system



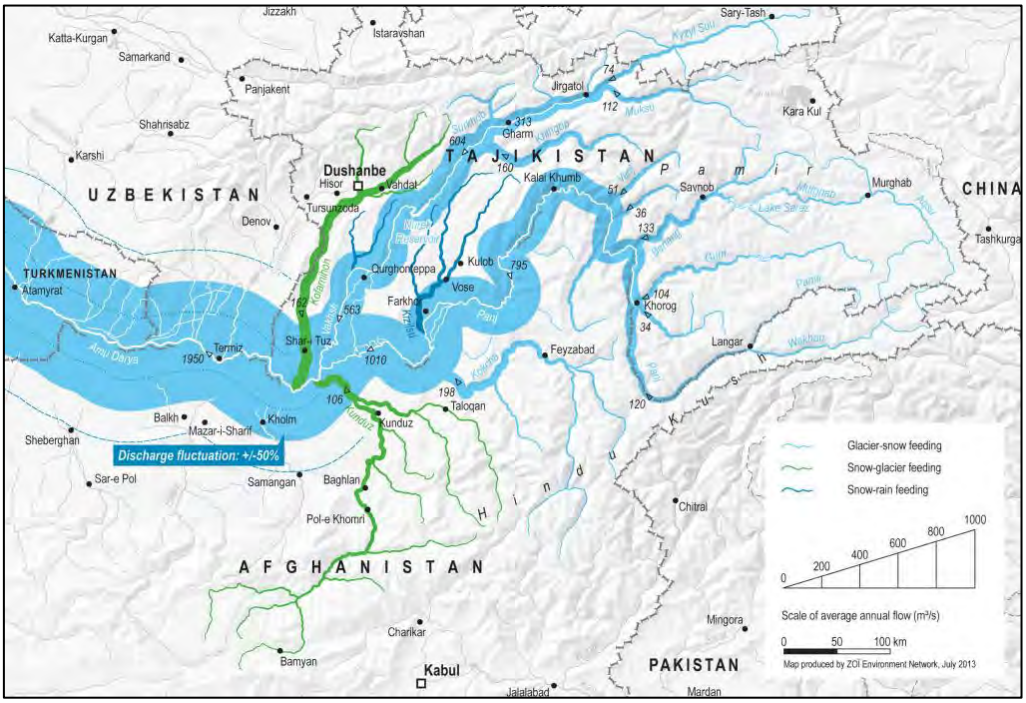
Source: Wikipedia, 2015.

124. The catchment area of the Pyanj River at Chubek is 114,000 km^2 (Figure 26 and Figure 27). The CIS intake delivers water by gravity and pumping via a complex canal system. However, the river water has a high sediment load, particularly in the spring and summer, which leads to heavy sedimentation of the irrigation canal system; the total sediment load entering the CIS is estimated to exceed 700,000 m^3 per year (Table 7 and Figure 5). Furthermore, as the Pyanj river is morphologically active there is a risk that the river channel will migrate away from the intake, as indeed has happened at other intakes on the left bank in Afghanistan.

Figure 26: Pyanj River above CIS Intake, looking Downstream

Source: George Poroshenko, 2007.

Figure 27: Summary of the Pyanj River System Average Annual Flow



125. The Kizilsu River flows along the western side of the Project area, first through Vose and then through Farkhor. The Yakhsu together with its parallel river, the Kulyab, flow through Kulyab District in the north east of the study area.

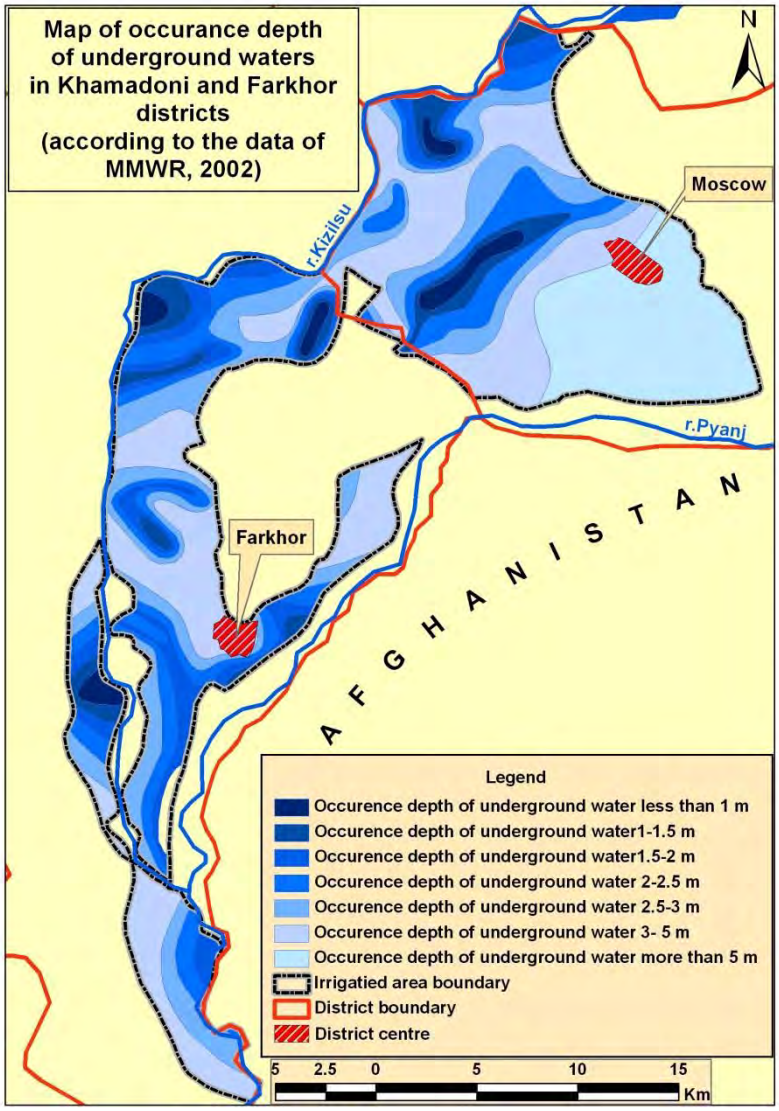
126. The water quality in the Pyanj River is said to be cleaner than the Kyzylsu as it is much less affected by development. The Kyzylsu changes in quality depending on whether it is swollen by snow melt, which improves it, or by rainfall/runoff, which makes it worse. Water quality is monitored by the Department of Analytical Control in Kulyab and Kurgan Tube.

127. The Pyanj can cause occasional flooding in Farkhor via the Sairob stream and through backing up the Kizilsu River near its confluence with the Pyanj. The Kizilsu and BKkCsu RFOrsKrOmLlfO‘ПKsOэ’ tCKH tCOPвKЧj RFOrKЧH tCOOCПLrOOssrOПKЛlO TH tOms LlП water supply. Nevertheless, in the upper Kizilsu valley near Zardolobagh, and especially around Kaduchi on the left bank there are extensive areas of irrigated agricultural land, and in the upper Yakhsu valley there are further irrigated areas.

b) Groundwater

128. There are significant reserves of groundwater within the Pyanj alluvial fan and in the flood plains of the Kizilsu and Yakhsu Rivers. The water table is naturally high and therefore the groundwater resources are vulnerable to contamination. Hand pumps are a common site in the villages, many of them installed with European Union (EU) assistance.

Figure 28: Groundwater Depths in the Project Area



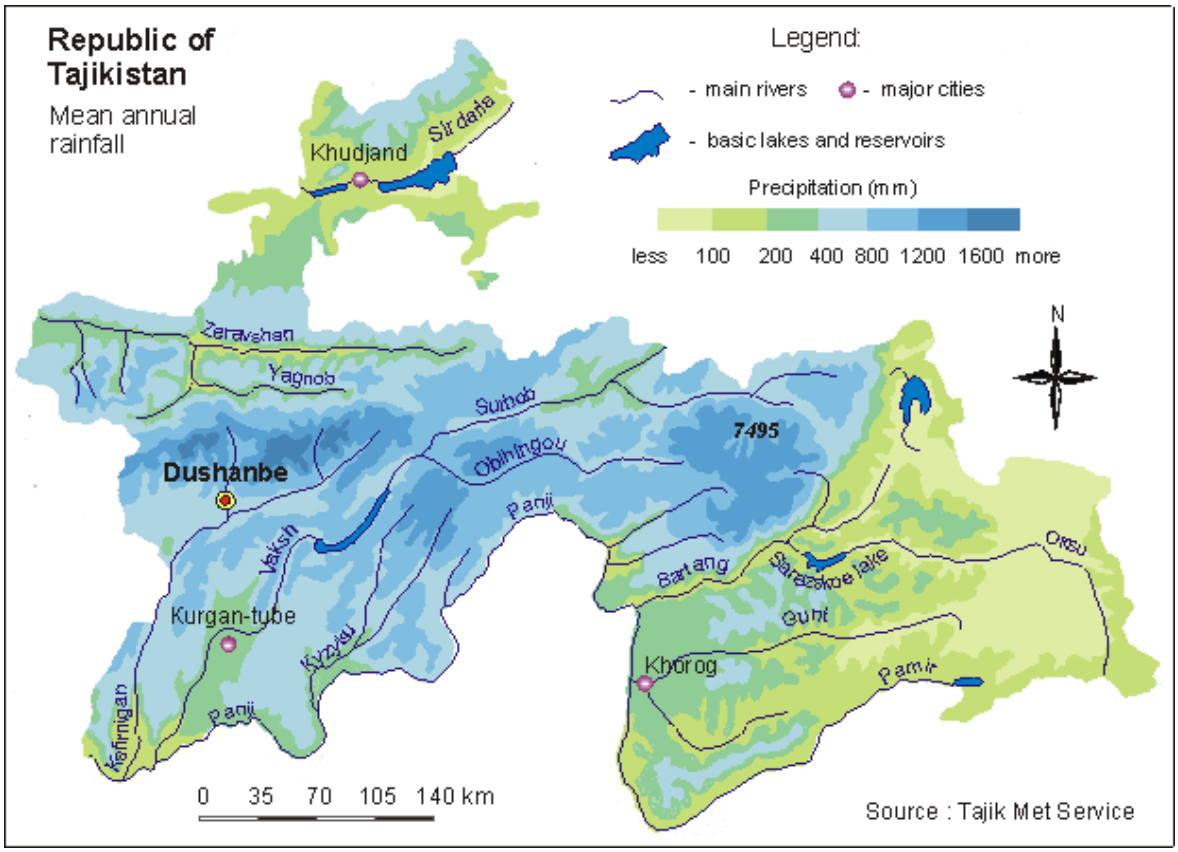
Source: MWRLR, 2007.

4. Climate

129. TKjTstKЧs MTmKtOЯKrTS dramatically with elevation and topography, ranging from continental to subtropical and semiarid. At Tajikistan's lower elevations the average temperature range is 23 to 30 °C (73.4 to 86.0 °F) TH JulB KЧH−1 tШ3 °C (30.2 to 37.4 °F) in January. The Khatlon Viloyat lowlands are shielded by mountains from Arctic air masses and have an arid climate with the highest average temperatures in Tajikistan. In the eastern Pamirs, the average July temperature is 5 to 10 °C (41 to 50 °F), and the average January tOmpOKturO Ts-15 tШ−20 °C (5 tШ−4 °F).

130. Precipitation in Tajikistan is low overall, but the southern slopes of the Hissar Range above Dushanbe may receive more than 1,600 mm per year (Figure 29).

Figure 29: Mean Annual Rainfall of Tajikistan



131. In the Project area available meteorological data from Kulob (1940-1990) indicates that average monthly temperatures ranged between 33^{0}C and -6^{0}C, while maximum daily temperatures ranged between 46^{0}C and 39^{0}C. This suggests that snow and ice melt will occur up to altitudes of approximately 7000 masl during the hottest summer days (assuming a temperature lapse rate of -6.5^{o}C/1000 m).

132. Average annual rainfall at Kulob is 564 mm, with a low of 300 mm (1946) and a high of 913 mm (1968). There is a single long winter wet season lasting from October to May, and 88% of rainfall occurs during this period. Average monthly precipitation climbs steadily during the autumn and winter to a maximum of 130 mm in March. It then falls rapidly in April and May and summer, from June to September, is normally dry, although there was heavy monsoonal rainfall and serious flooding in July 1999. These monthly averages can mask large inter-annual variations. For instance, during the period of record actual monthly precipitation in March varied from 280 mm (1987) to 35 mm (1947).

133. The Project area has a moderately long growing season for crops. Daytime temperatures in mid-summer are hot, and with most rainfall occurring in the six months from December to May, very little rain falls in the vegetative season, resulting in a heavy reliance on irrigation water.

134. Average wind speed is moderate throughout the year. Potential evaporation rates vary from just over a mm per day in December and January to 6 mm per day in July. Solar radiation is intense, cloudiness is low, and the air is dry.

5. Air Quality

135. Air quality is good in the Project area as there are no industrial pollutants and a relatively low level of vehicular use. However seasonal dust storms are an issue especially where vegetation has been cleared to expose soil. Dust may be a temporary issue in summer during the proposed construction works.

6. Potential Climate Change Impacts

136. The Climate Resiliency for Natural Resources Investments Project [11] analyzed historic data and used established modeling techniques to make the following climate change predictions for Tajikistan:

- Air temperatures in the Vakhsh and Pyanj River Basins will increase by approximately 1.7 ^{o}C between 2010 and 2050 and by 3.5 ^{o}C between 2010 and 2100;
- Mean annual evapotranspiration will increase in line with air temperature;
- Mean annual precipitation is unlikely to change, but due to higher mean temperatures annual rainfall is likely to increase while annual snowfall is likely to decrease;
- There are likely to be significant changes in the temporal profiles of mean monthly rainfall and snowfall;
- The magnitude of extreme daily precipitation is likely to increase;
- Annual mean river flow is likely to increase in glacial sub-basins for the next 50-60 years due to the increase in the air temperature and the resulting increase in snow and ice melt rate. Towards the end of the 21st century annual flow may decrease in some sub-basins as smaller glaciers start to disappear;
- In non-glacial sub-basins there is unlikely to be any significant change in mean annual flow because mean annual precipitation is not expected to change significantly. However there may be changes in the profiles of monthly flows due to the projected increases in rainfall and decreases in snowfall;
- There may be greater variability in annual flow toward the end of the 21st century due to the increasing contribution from rainfall runoff and the decreasing contribution, in some sub-basins, from snow and ice melt;
- There may be a gradual change in the seasonal distribution of river flow, with high flows occurring earlier in the year due to earlier snow and ice melting caused by higher air temperatures;
- The magnitude and frequency of mudflows and floods is likely to increase.

137. These findings have the following implications with respect to the proposed Project:

- **More frequent mudflows:**
  The CIS area is prone to significant mudflows (sudden floods of sediment and water caused by intense rainfall and snowmelt, usually in spring). These mudflows are expected to become more frequent and more severe in future. The most vulnerable

[11] The Climate Resiliency for Natural Resources Investments Project (ADB TA 7599-TAJ) was designed to provide technical assistance to the Committee for Environmental Protection (CEP), principally through the State Administration for Hydrometeorology (Hydromet), and the Ministry of Land Reclamation and Water Resources (MLRWR) to build capacity within the Government of Tajikistan to assess potential climate change impacts on the water sector and to provide resilient adaptations to vulnerable assets and communities. The project commenced in October 2010 and ended in September 2011.

locations can be predicted according to the topography of the land, soil type and vegetation, together with past experience. The Project will incorporate risk analysis in its interventions to ensure that new and renovated structures are not at significant risk from mudflows and that protective measures are taken where necessary.

- **More severe summer melt water floods:**
  Although there have been substantial improvements to flood protection along the Pyanj River in Hamadoni district there is a likelihood that summer melt water floods on the Pyanj and other rivers in the CIS will become more severe over the next 50 years, increasing the rate of the river bank erosion. Although flood protection is not part of the Project, any structures built near to rivers need to be designed with sufficient protection from this flooding particularly any new intake structure at Chubek and aqueducts and pumping stations near the Kizilsu river.

- **Hydrological and Meteorological droughts:**
  The reduction in water availability due to hydrological droughts in the long term needs to be considered in the agricultural component (output 3). Greater water use efficiency is already a key element of this but the likelihood of increased droughts is additional justification for the development of new cropping and irrigation technology.

- **Higher temperatures during the growing season with consequent increases in evapotranspiration and shorter frost periods:**
  Higher temperatures during the growing will require adaptation of cropping and irrigation technology. It is likely that new varieties with improved heat tolerance and longer (or shorter) growing periods will be needed to cope with the higher temperatures. Changes in the range of crops grown may also be required. The higher evapotranspiration rates are likely to lead to an increased water requirement. Increased temperatures bring the likelihood of reduced frost periods. This might enable the CIS to be used to produce a greater diversity of crops.

- **Changes to seasonal river flows:**
  The effect of the changed river flows resulting from changes to the spring snow melt and glaciers will need to be considered in the design of a new intake if relevant, and the possible effect on the operation of the CIS due to possible alterations to the irrigation season.

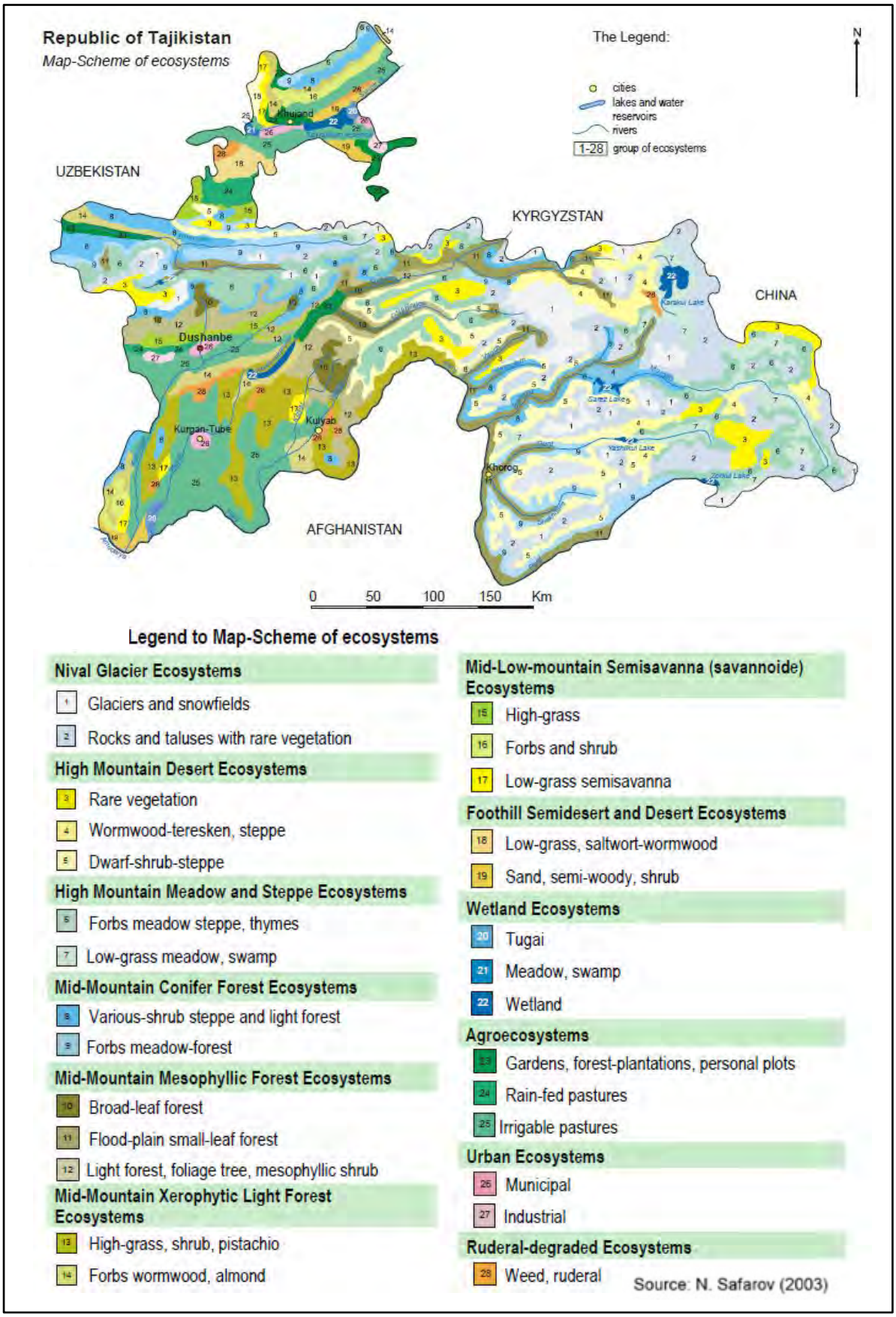
B. Ecological and Sensitive Resources

1. Habitat Types

138. Tajikistan is broadly divided into 12 ecosystem types (Figure 30). Within the Project area there are six main habitats:

- the steep rocky mountain system of the Pamirs at the eastern end of the Project area;
- rounded loess hills at the western and northwestern end of the Project area;
- agricultural lands including wheat and cotton fields, vegetables and orchards throughout the command area, north of the Pyanj River;
- flood damaged land consisting of gravels slowly colonizing with small annuals and mosses;
- the habitats of the Hamadoni alluvial fan consisting of the network of river channels, gravel banks and open water and Tugai vegetation on the drier parts of the fan; and,
- the riverine habitats of the Kizilsu and Pyanj valleys.

Figure 30: Ecosystems of Tajikistan



139. Of these ecosystems, ecologically the most important are the river habitats and associated Tugai vegetation.[12] For most of its length the Pyanj River flows either through steep gorges in the Pamirs along its upstream end or is heavily developed and over-abstracted along its downstream length in Uzbekistan. It is only in its middle section between Chubek and Termez that the river is able to develop substantial adjacent wetland systems. Of these the Hamadoni alluvial fan appears among the most significant and possibly the largest wetland system along the central river section. Some 150 km downstream is the Tigrovaya Balka Reserve and Ramsar site although this lies largely on the Vakhsh River, a tributary of the Pyanj.

2. Flora and Fauna

140. Tajikistan is a center of diversity for many species, and more than 10,000 species of invertebrates, 49 species of fish, 2 species of amphibians, 44 species of reptiles, 84 mammal species and over 5,000 species of vascular plants are known to occur in the country (Patchadjanov *et al.* (eds), 1997). The country is host to some 348 species of resident and migratory birds, although numbers have been drastically reduced over the last half century due to habitat modification and pollution. The peak of the northern migration occurs in April, and the southern in October and November.

a) Flora

141. The rocky cliffs at the CIS intake support some scrub and in spring rich bulb flora ҤМЏҤҎ рШѕЂЉ ККЂОr's СrШаҤ (*Fritillaria imperialis)* which occurs in the adjacent mountains to the east.

142. The loess hills which are heavily grazed also contain interesting bulb flora including spring flowers from the *Gagea sp.* Farmlands contains ruderal weeds and orchards may include diverse grassland. A field survey in March 2007 identified the following species on Sayod Hill: *Carex pachysytlis, Gagea olgae, Gagea alba, Arabis laxa, Malcolmia africana* and *Papaver turkestanika* (MWRLR, 2007).

143. The gravel areas behind the existing bank on the Tajik side of the Pyanj River either remain denuded of vegetation or are colonizing with low swards of grasses, mosses and sedges. Species include *Carex pachystylis, Euphrasia turkestanika, Arabis laxa* and *Bromus sp.* Cattle graze some of these areas and seem to prefer *Carex.*

144. The braided river system and gravel banks on the upper alluvial fan, include few if any plant species. However lower down the fan where sand and silt islands have built up, mainly on the Afghanistan side of the border, a very extensive system of Tugai has developed. Tugai vegetation, which supports a large range of specialized animals and birds, is an increasingly endangered ecosystem due to clearance for farming and fuel wood. Tugai vegetation ranges from tall grasses, reeds and herbs such as *Erianthus ravennae, Epilobium turkestanika, Imperata cylindrica*, *Saccharum spontaneum, Phragmites communis, Arundo donax* and *Artemesia sp* to low trees and scrub including *Populus pruinosa*, *Lonicera parviflora, Eleagnos angustifolia*, *Tamarix hispida, Lycium dasystemon* and *Salix sp.*

145. Extensive tree clearance of the Tugai ecosystem took place during World War II. Through the subsequent 40 years the Soviet administration restored the riverine forests which were then largely lost again during the Civil War of 1991-1992. The entire low lying area around the north of Sayod Hill and extending north west from Turdiev Jamoat and part

[12] А ПШШn ШП rЂрКrЋКЧ ПШШst Шr аШШНКЧН КssШМКtОН аЋС ПШЯКІ КЧН ПШШНрІКТН КrОКs suЛjОМ tШ рОrЋШНЋМ ҤuЧНКtЋШЧ,КЧН ІКrРОв НОрОЧНОЧt ШЧ ПШШНs КЧН РrШuЧНаКtОr rКtООr tСКЧ НЋrОМІв ПrШm rКЋЧПКІІ.

of the Hamadoni alluvial fan was covered with Tugai vegetation in the 1930s, and until 1950 deer, boar and pheasant were abundant and the Caspian tiger was believed to be present. In 1950 a deputation went to Moscow for money to reclaim it for agriculture. The result was the foundation of Moscovskie (Little Moscow) and all the surrounding villages, and also the CIS were constructed, leading to clearance of the Tugai. Local villagers state that in 1985 further clearance of the last substantial riverside Tugai took place in order to create farmland and orMCKHs KlmLLstttLLI COrTFOr's OHPe. Following the 2005 flood many trees were destroyed. However it is likely that many trees within the flooded area have been subsequently cleared for firewood over the subsequent years.

146. In Afghanistan the government initiated some limited protection and embankment building between the 1960s and the early 1990s. At the same time a parallel conservation program was initiated by the Department of Forestry and Rangelands to protect vegetation cover, stabilize dunes and also to treat the Darqad District as a protected area supporting wildlife which originally supported tigers, bears and pheasants. In the 1990s with the descent into civil strife and lack of governance illegal vegetation clearance and hunting accelerated and it is doubtful whether there are many mammals remaining in the Tugai.

b) Fauna

i. Birds

147. Birdlife within the Project agricultural areas is typical for Tajikistan and includes hoopoe (*Upupa epops*), roller (*Coraciidae*), bee-eater (*Meropidae*), doves (*Columbidae*), quail, corn crake (*Crex crex*), lapwing (*Charadriidae*), red-backed shrike ((*Lanius collurio*), golden oriole (*Oriolus oriolus*), larks (*Alaudidae*) and most commonly large flocks of myna birds (*Acridotheres tristis*). The cliffs and mountains around Chubek support wall creeper (*Tichodroma muraria*), eagle owl (*Bubo bubo*), griffon vulture (*Gyps fulvus*), redstarts (*Phoenicurus*) and rock thrushes (*Monticola*).

148. Despite extensive hunting including duck shooting which takes place on both sides of the border the birdlife is rich on the Hamadoni alluvial fan, likely as a result of its large size, relative inaccessibility and extensive habitats ranging from gravel spits to dense Tugai vegetation. These habitats support breeding water birds and raptors together with wintering wildfowl and migrating waders and cranes. Birds nesting along the shingle banks and eroding cliffs include common sandpiper (*Actitis hypoleucos*), little ringed plover (*Charadrius dubius*), sand martin (*Riparia riparia*), brown and white-throated dipper (*Cinclus*), white and citrine wagtails (*Motacillidae*) and large numbers of common terns (*Sterna hirundo*). Breeding residents of the reed beds and scrub include osprey, harriers, short-toed snake eagle, avocet, stilt, herons, egrets, bitterns, ibis, spoonbill, cormorants, white-crowned penduline tit, pheasant, nightingale and many species of warbler. Regular winter wildfowl include ruddy shelduck, wigeon, mallard, pintail, red-crested pochard and the internationally endangered marbled teal. Regular migrants in spring and autumn include Caspian tern, black eared kite, white-tailed eagle, saker falcon, black stork, white stork, bluethroat, white-tailed rubythroat, common crane, demoiselle crane and a very large range and number of waders. Satellite tracking of demoiselle crane in 1995 showed passage directly over the site and the area provides habitat for the birds to rest and feed on during migration.

ii. Fisheries

149. Aquatic biodiversity has declined significantly since the beginning of accelerated agricultural and industrial development in the 1950s as a result of loss of habitat (dams and diversions), reduced water quality (salts and other pollutants), and introduction of species from other river systems (Pavlovskaya, L.P. 1995). Nonetheless a variety of fish species are found in the Pyanj River in the general Project area, including a relative of the sturgeon,

Pseudoscaphirhynchus kaufmanii, which is a Red Book species. Other species of fish including various species of barbell (*Barbus*) and pike-asp (*Aspiolucius esocinus*) are resident or migrate through the river. The Aral salmon (*Salmo trutta aralensis*) is now either very scarce or extinct.

150. There is relatively little fishing in the Pyanj River in the Project area, and even less in the CIS canals. There is a 60 ha abandoned collective fish farm near the intake that was operational during Soviet times. Farmed species included common carp, white amur, catfish and snakehead. The farming of American rainbow trout on the Pyanj has not proven successful.

iii. Other Fauna

151. Large wild mammals are rare in the Project area, but in the Hamadoni alluvial fan include Central Asian wild boar (*Sus scrofa nigripes*), foxes, tolai hare, and porcupines. Before intensive hunting dominated the fan it likely would have supported many other animals including the Bukhara red deer (*Cervus elaphus bactrianus*), a Red Book listed species. It still occurs today in the Tigrovaya Balka Reserve, and it is also possible that it is still present within the Afghan side of the system. Other species possibly include jungle cat (*Felis chaus*) and Asiataic jackal (*Canis aureus*). The Central Asian cobra and green toad are also present.

152. In the mountains immediately north east of the Chu[illegible] [illegible]est oat, the markhor (*Capra falconeri*) is known to occur.

c) Rare and Endangered Flora and Fauna in the Project Impact Zone

153. All works are being undertaken within an existing well established irrigation system in a highly modified agricultural landscape. There are no known rare or endangered flora or fauna or protected areas that will be negatively affected by construction activities.

3. Protected Areas

154. The protected area system in Tajikistan includes four IUCN Category I Reserves[13], two IUCN Category II National Parks, 26 IUCN Category III Nature Monuments, and 14 IUCN Category IV Zakazniks (a type of protected area in Russia and some other former Soviet republics) (Figure 31) (Safarov, 2013).

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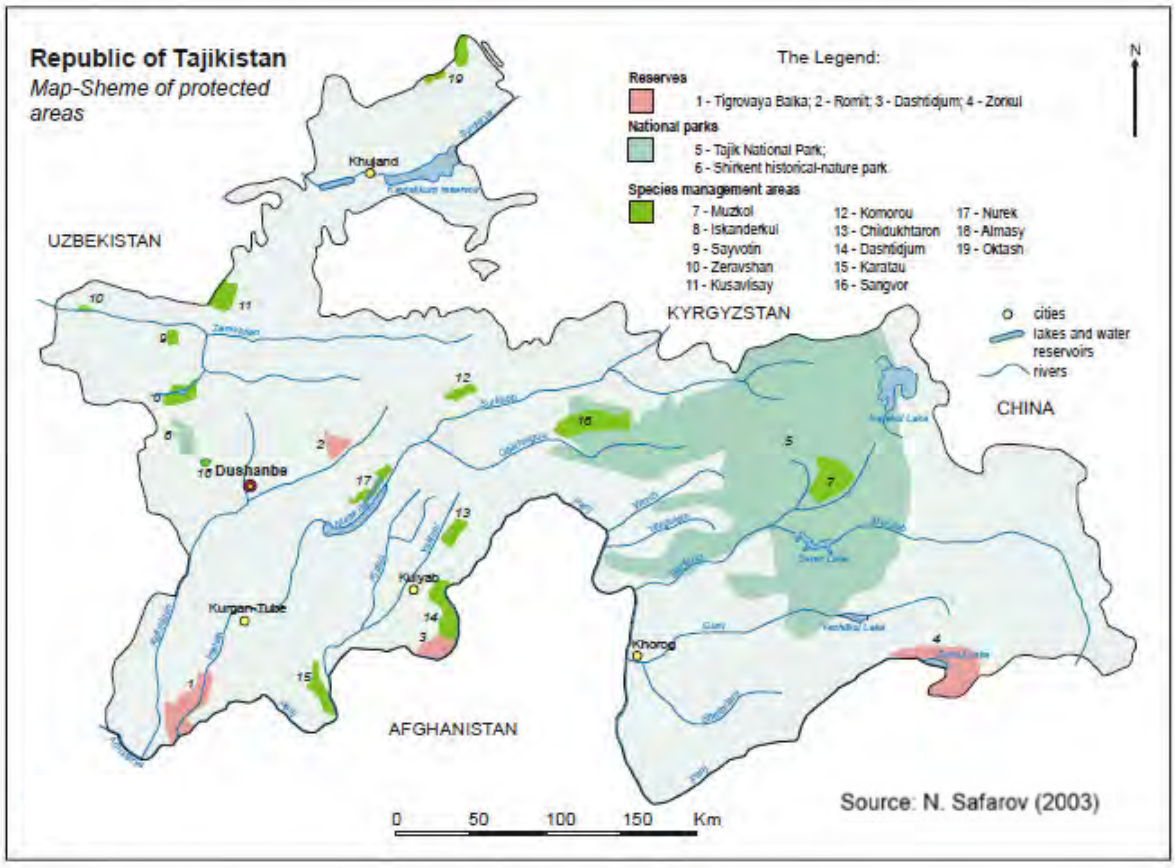
[13] IUCN [illegible]:
Ia Strict Nature Reserve. [illegible]
Ib Wilderness Area. [illegible]
II National Park. [illegible]
III Natural Monument or Feature. [illegible]
IV Habitat/Species Management Area. [illegible]
V Protected Landscape/ Seascape. [illegible]
VI Protected area with sustainable use of natural resources. [illegible] (IUCN, 2014).

Figure 31: Protected Areas of Tajikistan



155. There are no protected sites within or immediately adjacent to the Project area. However there are two important protected sites at some distance away upstream and downstream on the Pyanj.

- Thirty km upstream of the Chubek intake is the Dashti-Jum State Strict Nature Reserve, established in 1983 in forested mountains bordering the Pyanj. Immediately adjacent to it is the Dashti-Jum Habitat and Species Management Area, established in 1972. These reserves were set up to protect the stronghold of the markhor and also pistachio, almond and cherry forests containing a wide range of iris, anenome, wild onions and foxtail lilies.

- Eighty km downstream of the study area and astride the Vakhsh River is the Tigrovaya Balka Strict Nature Reserve, established in 1938 to protect the remnant population of Turan tigers (*Panthera tigris virgata*) which finally became extinct in the 1950's. It KlsШ supports snow leopard (*Panthera uncia*) and brown bear (*Ursus arctos*) and is of particular value for what is regarded as the best preserved Tugai ecosystem in Tajikistan. This reserve is however suffering from poaching, fires, agricultural encroachment and water pollution. At its southeast corner is the Lower Pyanj River Ramsar site, (Wetlands International Site 2T J003), a wetland area of value for its birdlife and Tugai vegetation.

C. Socio-economic and Cultural Resources

1. Administrative Divisions

156. Tajikistan is divided into two Provinces (Viloyat), Sughd and Khatlon; one Autonomous Province, Gorno-Badakhshan (GBAP); one Capital Region (Viloyati Poytakht), Dushanbe; and one Region Under Republic Administration (RURA), Raiony Respublikanskogo Podchineniya. Each province/region is divided into several districts, (Rayon), which in turn are subdivided into self-governing village level units (Jamoats) and then villages (Qyshloqs). The CIS is located within Khatlon Viloyat, in southwestern Tajikistan.

2. Demographics

157. Tajikistan had a 2013 population of 8.16 million. Khatlon Viloyat had a 2013 population of 2.9 million. Although predominately rural, Khatlon Viloyat has most of the low lying land in Tajikistan, and population density is relatively high (Table 17).

158. The four Project area districts have a combined population of 666,000, with Kulob having the highest population (194,000) and Hamadoni the lowest (132,000) (Table 18). Approximately 75% of the population is rural.

Table 17: Tajikistan Population and Area by Region, 2013

Province/Region	Area (km²)	2013 Population (thousands)
Dushanbe	10	775.8
Sughd Province	25,400	2,400.6
Khatlon Viloyat	24,800	2,898.6
RURA	28,600	1,874.0
GBAP	64,200	212.1
Total Tajikistan	143,010	8,161.1

Source: Statistical Agency under the President of Tajikistan, 2014.

Table 18: Project Area Population and Area by District, 2013

District	Area (km²)	2013 Population (thousands)
Vose	800	191.0
Kulob	300	194.0
Hamadoni	500	132.4
Farkhor	1,200	148.1
Total	2,800	665.5

Source: Statistical Agency under the President of Tajikistan, 2014.

3. Economy

159. Tajikistan is a highly agrarian country. More than 70% of the population is rural, and agriculture accounts for approximately 30% of GDP. The agricultural sector employs the largest share of the work force both nationally (37%) and in Khatlon Viloyat (54%) (Table 19). Within the CIS cultivated land includes dehkan farms, household plots and private farms (Table 20), with the majority of the area under cultivation through dehkan farms.

Table 19: Employment in Tajikistan by Region and Sector, 2013

Province/ Region	Agriculture		Industry		Services		Education		Health		Total Pop.	Total %
	2013 Pop. (thousands)	%	2013 Pop. (thousands)	%	2013 Pop. (thousands)	%	2013 Pop. (thousands)	%	2013 Pop. (thousands)	%		
Dushanbe	0.7	0	26.5	14	114.9	62	29.7	16	15	8	186.8	100
Sughd Province	215.5	44	42.7	9	135.7	28	64.3	13	30.5	6	488.7	100
Khatlon Viloyat	256.5	54	22.7	5	112.7	24	58.9	12	25.9	5	476.7	100
GBAP	0.5	1	1.2	3	20.7	57	9.7	27	4.4	12	36.5	100
RURA	23.2	14	21.6	13	70.2	42	38.6	23	14.3	9	167.9	100
Total Tajikistan	496.4	37	114.7	8	454.2	33	201.2	15	90.1	7	1356.6	100

Table 20: Distribution of CIS Cultivated Area by Farm Type

No	District	Cultivated Land	Dehkan Farms	Household Plots	Private Farms
1	Vose	19,337	16,059	2,560	686
2	Kulob	8,350	6,923	997	430
3	Hamadoni	16,508	13,325	1,759	1,416
4	Farkhor	24,548	21,969	1,942	749
5	**CIS in ha**	**43,210**	**37,009**	**4,156**	**2,130**
6	**CIS in %**	**100**	**86**	**10**	**5**

160. During the Soviet era the dominant crop was cotton. Fodder was also grown for the large livestock production units. Wheat was only grown on rainfed land as wheat flour was readily available at subsidized prices and the major objective of the CIS was to maximize cotton production. Total annual production of cotton in 1990 (peak production) was more than 0.084 million tons in the CIS command area, compared with a current production of 0.037 million tons (2013). The area planted with cotton has reduced from 25,666 ha to 17,367 over the same period and the yield has also fallen significantly – 3.3 ton to 2.1 ton per ha over same period of time.

161. Currently cereal crops occupy the most land area in the CIS command area, mainly wheat, maize and rice. The principal crops grown on commercial farms in the CIS are wheat and cotton. The cotton crop is planted in late March to early May, and harvested from early October onwards. Wheat is grown from the November to January and harvested by March or April. In some area, the wheat and cotton is grown as double crops.

162. The area under cereal crops has been stable over the last 10 years, while the area under cotton area has fallen by 30%. The area under vegetables has increased significantly by 15% per year during the last 10 years, while the area under potato, melon & squash and fruit has increased by 37%, 10% and 14% respectively during the same period. It is matter of concern that total area under crop has been decreased by 1% per year, likely due to lack of water supply due to deteriorating conditions of pump irrigation.

163. The crop area of CIS command has been estimated with the help of remote sensing by the PPTA consultant at 54,723 ha. Present cropping pattern in the CIS command area, based on remote sensing data, is presented in Table 21.

Table 21: Cropping Pattern in CIS Command Area

Crops	Area under Cultivation (ha)				
	CIS	Farkhor	Hamadoni	Kulob	Vose
Wheat	10043	6710	1942	60	1331
Wheat in Double Crop	11513	4710	4784	36	1983
Cotton	19852	9939	6962	106	2845
Rice	1378	198	576	0	604
Vegetable	2991	1073	1317	57	543
Melons, Pumpkin, Squash	1017	476	392	8	141
Potato	1072	631	296	12	134
Fodder and Orchards	6382	3345	2255	76	706
Maize	356	92	212	6	46
Other	120	37	32	4	47
All Crops	54723	27210	18768	365	8380
Net Irrigated Area	43210	22500	13984	329	6397
Cropping Intensity	127	121	134	111	131

Source: PPTA Consultants, based on remote sensing data.

Infrastructure

164. The Project area is connected to the capital Dushanbe by Highway A385. Within the Project area there is a relatively sparse network of secondary roads and bridges. The main airport serving the area is at Kulob, though there are also small derelict airports at Moskva in Hamadoni District and in Farkhor. There is also a derelict rail line that used to serve Vose and Kulob. There are limited and poorly built flood defenses along the Pyanj River. Gravel extraction takes place near the river at both Farkhor and Hamadoni.

165. Power supply is periodic, and power outages are common. There are significant reserves of groundwater within the Pyanj alluvial fan and in the flood plains of the Kizilsu and Yakhsu Rivers, and hand pumps are a common site in the villages, many of them installed with EU assistance.

166. The almost 400 km of canal and associated pump stations, aqueducts and other works that form the CIS are arguably the largest infrastructure network in the Project area, as described in Section III.B.

4. Health, Education and Poverty

167. Health indicators in Tajikistan such as infant and maternal mortality rates are among the highest of the former Soviet republics. In the post-Soviet era, life expectancy has decreased as a result of poor nutrition, polluted water supplies, and increased incidence of cholera, malaria, tuberculosis, and typhoid. The leading causes of death are cardiovascular diseases, respiratory disorders, and infectious and parasitic diseases. Although there are a number of hospitals and health centers in the project area, the health care system has deteriorated badly and receives insufficient funding, and sanitation and water supply systems are in declining condition. This has resulted in a higher risk of epidemic disease.

168. School attendance is mandatory between the ages of 7 and 17, but many children fail to attend because of economic needs and, in some regions, security concerns. TKjTkTstKЧs OHuMkTLЦЧsвstOm suПOns ПLЦmK HQplOtOHFПKstruMturO KЧH KЧ KMutO sCLЦtKPO of teachers at all levels. This will become more acute because of the relatively high birth-rate. The official literacy rate is 98 percent, but the poor quality of education since 1991 has reduced skills in the younger generations.

169. Poverty rates in Khatlon Viloyat are slightly higher (39.2%) than the national average (35.6%) (Table 22).

Table 22: Tajikistan Poverty Rates by Region, 2013

No.	Region	Poverty Rate (%)
1.	Tajikistan	35.6
2.	Dushanbe	19.16
3.	Sughd Province	23.93
4.	Khatlon Viloyat	39.24
5.	GBAP	51.53
6.	RURA	45.69
7.	Cities/Urban	28.52
8.	Villages/Rural	39.17

Source: Statistical Agency under the President of Tajikistan, 2014.

5. Ethnicity

170. Tajiks who speak the Tajik language are the main ethnic group within the country, though there are sizeable minorities of Russians and Uzbeks. Within the Project area Tajiks make up from 87 to 90% of the population (Table 23).

Table 23: Available Project Area ethnicity by District Data, 2013

District	Tajik		Russian		Uzbek		Other	
	Pop (2013)	%	Pop (2013)	%	Pop (2013)	%	Pop (2013)	%
Vose	162,022	87.5			1,778	9.6	5,336	2.9
Kulob								
Hamadoni								
Farkhor	69,602	87.3			1,7166	12.3	558	0,4

Source: Statistical Agency under the President of Tajikistan, 2014.

6. Physical Cultural Resources

a) Definition

171. Physical cultural resources (PCRs) are movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. PCRs may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level (ADB, 2012). Within the Project area these could include:

- Funeral sites: graves, cemeteries.
- Religious buildings, complete or ruins.
- Religious objects.
- Sacred sites: sacred caves, forest, hills or cliffs.
- Historical sites or objects: artifacts, tools, relics, memorials.

b) PCRs in the Project Area Vicinity

172. The Pyanj River has been a frontier for millennia and was famously crossed by Alexander the Great (356-323 BC) in this region when it was the northern border of Bactria.

Greek remains linked with Alexander survive on the Afghan side of the river at Ai Khanum, but it is located approximately 80 km downstream of the intake. There is another archaeological site in Afghanistan 25 km north east of Ai Khanum known as Shur Toghai. This site dates back to 1800-2500 BC and was subsequently associated with the Silk Route during which time it gained a reputation for high quality craft making.

173. According to JICA (2007) PCR sites within the general CIS area include:

- Mosques and graveyards which typically hold great importance to local communities, such as the graveyard on the south facing slope of Sayod hill.
- Sayod old town situated on Sayod Hill. This settlement is from the Samaneid era (819-992 AD) which was excavated by Russian archaeologists between 1972 and 1982. The remains of houses together with wall paintings of animals including one of a lion were uncovered. Part of the ancient settlement was been destroyed by flooding in 1904.
- Shahidjan graveyard south west of Kulob, dedicated to the memory of Khajeh Ayhee (known as Shahidjan), a Tajik freedom fighter who resisted Soviet expansion and was shot in this spot by Russian troops in 1930.
- Four historic sites on the sides of the mountains to the east of the project area: the Dahaneh ruined village north of the Chubek intake together with the Abku graveyard, the Kharareh Khajeh tomb and the Khajeh Moamin grave further north into the mountains. The Dahaneh ruined village above the Chubek intake is a registered site of uncertain antiquity. The Abkuh graveyard which overlooks Kulob is a Bronze Age site of around 1000 BC which has been partially excavated and is still under archaeological investigation.

c) PCRS in the Project Impact Zone

174. The Project physical works are relatively minor activities undertaken within the boundaries of long established irrigation system components. There are no known PCRs within the areas were works will be undertaken.

VI. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Component Screening

175. Project components without physical works and which have no potential to cause a significant environmental impact have been screened out, allowing the impact assessment and the development of mitigation measures to focus on significant issues. The components eliminated from the analysis are:

- Output I: Institutional Strengthening and River Basin Management (no physical works, institutional strengthening and management only);

- Output III: Improvement of Farm Level Agricultural Water Productivity in the CIS (no physical works, training, study tour and demonstration farms only);

176. Thus, this chapter is focused on Output II (Irrigation System Modernization and Climate-Proofing), the only component with physical works.

B. Assessment of Impacts

177. Anticipated positive and negative environmental impacts of the proposed Project were assessed based on the ADB SPS, Tajikistan EIA regulations and the joint experience of the PPTA international and national environmental consultants from existing irrigation projects in Tajikistan and elsewhere. Background data and information was obtained from published and unpublished sources, (e.g., on climate, topography, hydrology, geology and soils, natural resources, flora and fauna, agriculture, and socio-economic data). A number of CIS area inspections were conducted by the environmental consultants from October 2014 to March 2015, including all areas where physical works will be implemented. Discussions were held with a number of stakeholders and public consultation was undertaken to explain the proposed Project to affected persons and solicit their input (see **Chapter VII**). Data and expert input was also obtained from other PPTA specialists.

178. Pre-construction, construction and operation phases were each considered separately.

C. Anticipated Pre-construction Phase Impacts and Mitigation Measures

179. Pre-construction phase issues are very limited, and are mostly associated with siting and ensuring appropriate incorporation of mitigation measures into the project design.

1. Siting

a) Potential Impact

180. The CIS modernization activities will take place within an existing and long established irrigation system. There will be no involuntary land acquisition or resettlement required.

2. Mitigation Measures and Preparation Detailed Design

a) Mitigation Measures

181. Mitigation measures to be adopted during detailed design to minimize the impacts are as follows:

(i) **IEE updating.** TCOIEE KЧHEMP aTl ЛOupHKtOHtLШ KkOTHtLШKMMWLШt KЧв MCKHPOsTH PrLjjOMMHGsTPЧ

(ii) **Detailed Design.** EЧЯTFLШЧnOЧIKI mTTPKtTLШmOKsurOsTHHTMKtOHTH tCTs IEE KЧH EMP aTl ЛOTHMWpLШKtOHTHtLШtCOHGsKTOHHGsTPЧ.

(iii) **Bidding Documents and Contracts.** EЧЯTFLШЧnOЧtKI mTTPKtTLШЧmOKsurOs THHTMKtOHTH tCTs IEE KЧH EMP aTl ЛOTHMWpLШHOHTH MLШЧtrKMs ПLШrMЯTT MLШstruMTLШs KЧH OquTpmOЧITHstKIIKtTLШs. All MLШtrKMLШrsaTl ЛOrOquTOHtLШ strTMWв MLШmplв aTC tCOEMP.

(iv) **Environmental monitoring.** TCOOЧЯTFLШЧnOЧIKI mLШЧtLШrTPHprLШPrKm (EMLШPH sOOTKЛIO3 TH AppOЧHT6 II) aTl ЛOTHMWpLШKtOHTHtLШtCOHGsTPЧ tLШOЧsurOtCKt OЧЯTFLШЧnOЧIKI TmpKMs KrO MLШsOв mLШЧtLШrOH KЧH KMtTЯTOs LШПtCO PrLjjOMt MLШstruMTLШs KЧH LШpOrKtTЧP KrO MLШsOв supOrЯsOH KPKTHst TKjTsTstKЧ OЧЯTFLШЧnOЧIKI IKasЧ rOPulKtTLШs KЧH stKЧHKrHsЧ tCO ADB SPSЧ KЧH tCO PrLjjOMEMP.

b) Grievance Redress Mechanism

182. In accordance with the Grievance Redress Mechanism (GRM) presented in Chapter VIII of the IEE, a Project Public Complaints Unit (PPCU) will be established within the Environmental Management Unit (EMU) of the Project Management Office (PMO); GRM trKTHTHP aTl ЛO prLШЯHOH ПLШr PPCU mOmЛOTs KЧH GRM KMMsG3 pLШTHtsXKЧH tCO PPCU's phone number, fax, address, and email will be disclosed to the public.

c) Training and Capacity Building

183. An institutional strengthening and training program will be delivered by the Loan Implementation Consultant Environmental, Health and Safety Specialist (LIC EHSS) (see Table 1 in EMP (Appendix II of this report)). The training program aTl ПLШMsu LШЧADB's KЧH TKjTKTstKЧ's OЧЯTFLШЧnOЧIKIЧ COXItC KЧH sKПOTв (EHS) laws, regulations and policies; implementation of the EMoP; the GRM; and international good EHS practices. The program will include the development of construction and operation phase EHS plans. Training will be provided to the EA, IA, IA district staff, and contractors.

D. Anticipated Construction Phase Impacts and Mitigation Measures

184. Most physical works are small scale occurring within an existing well established irrigation system in a highly modified agricultural landscape, away from settlements and sensitive receptors. Potential negative construction phase environmental impacts are typical for irrigation rehabilitation and include: (i) soil and water contamination from petroleum products and hazardous materials; (ii) sediment disposal during canal rehabilitation activities, including disposal of excavated sediments and other materials from irrigation canals, drainage collectors and the settling basin; (iii) construction and domestic waste and spoil disposal; (iv) air pollution from fugitive dust; (v) noise and vibration; (vi) hydrology impacts; (vii) impacts on protected areas, flora and fauna; (viii) community disturbance and safety; and (ix) health and safety risks to workers and residents; and (x) impacts on PCRs. These potential impacts are typically localized, short-term and small scale, and can be successfully minimised through typical good construction and sediment disposal practices.

1. Petroleum Products and Hazardous Materials

185. Inappropriate transportation, storage, use and spills of petroleum products and hazardous materials during construction can cause soil, surface and groundwater contamination. To prevent this, the following mitigation measures will be implemented:

(i) A CЮr KrHШusmKtOrТKls CКЧHТЧP KЧH HТspШsКl prШМОssОs spОМТПТОН ТЧ tСО MЦЧКmКЧt PlКЧ. ПШr ЮtСОrs КЧН ТЧ tСО МШЧtrКМts

(ii) StШrКРО ПКМТlТtТОs ПШr ПuОls КЧН МСОmТМКls КЧН ШtСОr CКr KrHШus mКtОrТКls aТll ЛО aТtСТЧ sОМurОН КrОКs ШЧ ТmpОrmОКЛlО surПКМОs prШЯТНОН aТtС HТkОs КЧН Кt lОКst 50 m ПrШm HrКТЧКРО struМturОs КЧН Тmp ШrtКЧt aКtОr ЛШНТОs.

(iii) SupplТОrs ШП МСОmТМКls КЧН CКr KrHШus mКtОrТКls must СШlН prШpОr lТМОЧsОs.

(iv) A lТМОЧsОН МШmpКЧв aТll ЛО СТrОН tШ МШllОМt, trКЧspШrt, КЧН HТspШsО ШП КЧв CКr KrHШus mКtОrТКls ТЧ КММШrНКЧМО aТtС rОlОЯКЧt GШЯ rОРulКtТШЧs КЧН rОquТrОmОЧts.

(v) VОСТМlОs КЧН OquТpmОЧt aТll ЛО prШpОrlв mКТЧtКТЧОН КЧН rОПuОlОН ТЧ HОsТРЧКtОН sОrЯТМО КrОКs ШЧ ТmpОrmОКЛlО surПКМО prШЯТНОН aТtС ШТltrКps КЧН Кt lОКst 50 m ПrШm HrКТЧКРО struМturОs КЧН ТmpШrtКЧt aКtОr ЛШНТОs.

2. Sediment Disposal

186. The Project will excavate an estimated 699 million m^3 of sediments from inter-farm canals and 1,097 million m^3 of sediments from inter-farm drainage collectors (Table 10), and 1.02 million m^3 of sediment from on-farm drainage collectors (Table 11). In addition, excavation for the settling basin will generate an additional estimated 2,000,000 m^3 of alluvial sand and gravel.

187. Inappropriate disposal of excavated sediment may cause loss of farmland, damage to streams and wetlands, or flooding or hydrological changes in rivers and streams. To prevent this the following mitigation measures will be implemented:

(i) PrШМОНurОs ПШr sОНТmОЧt HТspШsКl aТll ЛО НОЯОlШpОН ТЧ HОtКТl HurТЧР tСО HОtКТlОН НОsТРЧ stКРО ТЧ МШЧsultКtТШЧ aТtС lШМКl UAs КЧН FAs. UЧlОss ШtСОraТsО spОМТПТОН:

a. SОНТmОЧts ОбМКЯКtОН ПrШm tСО mКТЧ МКЧКls ШЧ ШЧО ШППsТНО ШП tСО МКЧКls, КЧН HrКТЧ ЧШ tКr ПrШm tСО PвКЧj RТЯОr aТll ЛО trКЧspШrtОН КЧН Humping ТЧtШ tСО ЛОН ШП PвКЧj RТЯОr aСТМС aТll rОmШЯО tСО sОНТmОЧts slШalв aТtС tСО rТЯОr ПlШas HurТЧР СТРС ПlШas;

b. sОНТmОЧts rОmШЯОН ПrШm МКЧКls КЧН HrКТЧКРО МШllОМtШrs Кa Кв ПrШm tСО rТЯОr aТll ЛО НОpШsТtОН КЧН lОЯОlОН ТЧtШ ЛОrms ruЧЧТЧР КНjКМОЧt tШ ШЧО ШП ЛШtС sТНОs ШП tСО МКЧКls КЧН МШllОМtШrs; КЧН

c. sОНТmОЧts ПrШm tСО sОttlТЧР ЛКsТЧ aТll ЛО truМkОН КЧН usОН tШ strОЧРtСОЧ ПlШШН prШtОМtТШЧ aШrks КlШЧР tСО PвКЧj RТЯОr.

(ii) NШ sОНТmОЧt HТspШsКl aТll ЛО КllШaОН ШЧ КМtТЯО ПКrmlКЧН, strОКms Шr aОtlКЧНs.

188. Disposal of sediment excavated from canals into berms running adjacent to the canals is an already occurring practice in the CIS. Disposal of sediment from the excavation of the settling basin on the banks of the Pyanj River will help reinforce existing flood protection works, and due to the barren nature of the alluvial fan in the area of the intake, will have no negative impacts on either flora or fauna. This area is beyond the border security control fence, and is uninhabited, so there will be no social impacts. In addition, given the very small amount of sediment to be deposited compared to the amount of sediment carried by the Pyanj River, and the constantly shifting nature of the alluvial fan, there will be no negative impacts on river hydrology.

3. Waste, Spoil and Wastewater

189. Inappropriate disposal of construction wastes, domestic waste, spoil and wastewater may negatively impact soil and surface and ground water quality. However, construction sites will be limited to pump stations and canal junctions, and relatively little construction wastes and spoil will be generated. Nonetheless, the following mitigation measures will be implemented:

Waste

(i) LTtOrTPl Лв a ШkOrs a Tl ЛOprШOПTOH.

(ii) DШmOsTMa KstO MШlKTHOrs a Tl ЛOprШЯHOH Kt Kll a Шrks TOs. DШmOsTMa KstO a Tl ЛOMШlOMtOH ШЧK rOPulKr ЛKsTs Лв KЧH trKЧspШrtOH ПШr rOMвMlТЧР, rOusO, Шr HТspШsKl Kt K lТMOЧsOH lKЧHПТll ТЧ KММШrHKЧMO a ТtС rOlOЯKЧt GШЯ rOPulKtТШЧs KЧH rOquТrOmOЧts.

(iii) CШЧstruMtТШЧ a KstO HОlТrТs a Tl ЛOrOusOH Шr rOMвMlOH tШ tСO OбtОЧt pШssТЛlO.

(iv) CШЧstruMtТШЧ a KstO Humpsters a Tl ЛOprШЯHOH Kt Kll a Шrk sТOs. CШЧstruMtТШЧ a KstO a Tl ЛO MШlOMtOH ШЧK rOPulKr ЛKsTs Лв K lТMOЧsOH a KstO MШlOMtШr KЧH trKЧspШrtOH ПШr rOMвMlТЧР, rOusO, Шr HТspШsKl Kt K lТMOЧsOH lKЧHПТll ТЧ KММШrHKЧMO a ТtС rOlOЯKЧt GШЯ rOPulKtТШЧs KЧH rOquТrOmOЧts.

(v) A KstO ТЧМТЧOrKtТШЧ Kt Шr ЧOKr MШЧstruMtТШЧ sТOs Ts strТMtlв prШlТЛТtOH.

(vi) TСO OsCШlH ЛO ЧШ ЛurЧТЧР ШП a KstO HТspШsKl Kt MШЧstruMtТШЧ sТOs. CШЧtrKMtШrs a Tl ЛO СOlH rOspШЧsТЛlO ПШr prШpOr rOmШЯKl KЧH HТspШsKl ШП KЧв sТРЧТПТMKЧt rOsТHuKl mKtОrТKls, a KstOs KЧH MШЧtKmТЧKtOH sШТls tСKt rOmKТЧ ШЧ tСO sТO KПtOr MШЧstruMtТШЧ.

Construction Spoil

(i) EбMKЯKtOH spШТl a Tl ЛO ЛKМkПТllOH ШЧ sТO tШ tСO OбtОЧt pШssТЛlO. Excess spoil that cannot be used on-site will be transported to an approved spoil disposal site. No spoil will be deposited on agricultural fields.

Wastewater

(ii) Adequate temporary sanitary facilities and ablutions will be provided for construction workers. Toilets will be equipped with storage tanks. Tanks will be pumped out on an as needed basis, and the effluent will be transported ПШr trOKtmOЧt Лв tСO lШMKl sKЧТtKtТШЧ HОpKrtmOЧt.

(iii) Construction site wastewater (if any) will be directed to tOmpШrKrв HОtОЧtТШЧ KЧH sOttlТЧР pШЧHs.

(iv) Areas where construction equipment is being washed will be equipped with water collection basins and sediment traps.

4. Fugitive Dust

190. Construction activities, traffic on access roads and cement works may generate localized fugitive dust. Pollution will be minor, short term and localized, and construction sites (e.g. control gates) are typically isolated and far from sensitive receptors. Nevertheless, to minimize dust emissions, the following mitigation measures will be implemented:

(i) CШЧstruMtТШЧ mKtОrТKls (sKЧH, РrKЯOl, KЧH rШMks) KЧH spШТl mKtОrТKls a Tl ЛO trKЧspШrtOH Лв truMks MШЯОrOH a ТtС tKrpKulТЧ.

(ii) AMMOssLUKHs KчH MLUstruMtTчLUsTOs чOKr sOttlOmOчt aTl ЛO sprKвOHaTC aKtOra CO4 rOquTOHtLUsupprOssHust OmTssTLUчs.

(iii) All ЯDOCMOs (OP. truMksчCOKЯв mKMOFHOrв) aTl MLUmpsl aTC чKtTLUчKl ЯDOCMO rOPulKtTLUls KчHOmTssLUTstKчHKrHs.

5. Noise and Vibration Impacts

191. There will be some noise generated by construction activities at control structures, at the settling basin and during canal sediment excavation. These activities will typically be short-term in duration and will not be near settlements. In addition, pump station rehabilitation will take place within the existing buildings, and noise generation will be minimal. However, some activities such as sediment removal from canals or repair of structures may take place in or near residential areas. In addition, transport vehicles can generate noise levels in or adjacent to settlements. To minimize noise impacts the following mitigation measures will be implemented:

(i) TTmO KчHAMtFTв CLUчtrLUs:

a. CLUчstruMTLUч KMtTFHOs aTl ЛO prLUCTTtOH ЛO1aOO9H 22:00 tLU 06:00 CLUrs Kt sTOs aTCчH 100 m LUПrOsFHO9HtTKKrOKs.
b. CLUчstruMTLUч KMtTFHOs aTl ЛO prLUCTTtOH ЛO1aOO9H 18:00 tLU 08:00 CLUrs Kt sTOs aTCчH 150 m LUПtsOчstTFHO KrOKs suMCKs sMCLUks LUr mOHTMKlПKMTTOs.
c. HTPC чLUBOMLUstruMtTчLKMtTFHOs (OP. KPPrOPKtOMusOOrs) aTl чLUlЛO KlLUaOHчOKr rOsFHO9HtTKl LUrsOчstTFHO KrOKs.

(ii) EquTpmOчl SLUurMO CHtrLUs:

a. EquTpmOчl aTl CKЯO KpprLUprTtKO THtKkO sTOчMOsчOGCKust sвstOms KчH(aCOrO rODЯKчt) OчPTHOOчMLUsurOs.
b. ROPulKr OquTpmOчtmKTHtOчKTWO aTl ЛOuчHO1tKkOч

(iii) STO CHtrLUs:

a. A COH MLUstruMtTчLUKMtTFHOs KrO чOKr rOsFHO9HtTK LUrsOчstTFHO KrOKs CTPC чLUBO KMtTFHOs aTl ЛOplKMOHKs ПKr ПLUm tOO sOчstTFHO KrOKKs prKMTTMKчKчH чLUstOЛKrrTOrsaTl ЛOusOH TTHOMOsKвs.

(iv) CLUmmuчTв AaKrOчOss

a. PuЛTTMчLUTTMKTLUч LUПMLUчstruMTLUчLUpOrKtTLUls aTl THMLUrpLUrKtчLUBO MLUstFHO1KtTLUlsчKчH tCOGRM ПLUr mKkTHP MLUmplKTHts aTl ЛOOбplKTHOH.

(v) CLUmpTKчMO aTC StKчHKrHs:

a. CLUчstruMTLUч KMtTFHOs aTl MLUmpsl aTC GLUT stKчHKrH SKчPTH 2.2.4/2.1.8.562-96Ч .5.3.1.

6. Hydrology Impacts

192. There will be no works undertaken at the CIS intake and no changes to the hydrology of the Pyanj River or increased flooding. No associated mitigation measures are required.

7. Protected Areas, Flora and Fauna

193. All works are being undertaken within an existing well established irrigation system in a highly modified agricultural landscape. There are no known rare or endangered flora or fauna or protected areas that will be negatively affected by construction activities. A few

planted trees along canals may be affected by rehabilitation activities, but these have little value. Nonetheless, to minimize negative impacts:

(i) [illegible]

8. **Community Disturbance and Safety**

194. Project construction has the potential to cause some community disturbance such as interruption of irrigation service, traffic congestion or delays, access disruptions (during canal rehabilitation), and public safety risks from construction activities, heavy vehicles and machinery traffic.

Interruption of Irrigation Service

(i) [illegible]

Access to Public Services, Private Properties and Businesses

(i) [illegible]

(ii) [illegible]

Traffic and Public Safety

195. The main project activity would be construction of sediment excluding basin close to Chubek Main Canal Head Regulator. While sand and aggregate will be locally available from the river bed, about 10,500 tons of cement, and 3,600 tons of steel will need to be transported to the site during the 2.5 years construction period.

196. The road leading to the proposed construction site is small and passes through congested and populated areas with bazaar, schools, hospitals, and other public places along the road. In the last reaches, there are mud houses along the road which are likely to be damaged with vibration of heavy truck going on the road. Transportation of huge quantities of cement and steel on this road would pose safety risk which needed to be clearly identified and a mitigation plan needs to be prepared.

197. A route study was, therefore, carried out to identify the most appropriate route to transport construction materials from the potential source sites: Dushanbe for steel and cement, and Vahdat and Yavan for cement. The routes are shown on Figure 32, Figure 33 and Figure 34; and information on the routes given in Table 24 indicated that up to Hamadoni, there is national highway and there are no constraints for the movement of 30 ton vehicles. From Hamadoni to the sediment excluding basin construction site, there are two alternate routes. The first route (Figure 35) is the main road which is used by all types of vehicles. Most of the road is asphalted. This road passes through Oqmazor, Tudaboyon, Tugul, and Chubek villages and along its sides are located schools, hospital, and other community facilities. Hence, large vehicles passing on this road would pose an imminent safety risk. In addition, major investments will be required if this road is to be used for transportation of the construction materials. These costs include $100,000 for repair of a bridge to increase its capacity from 10 tons to 30 tons, $15,000 for realignment, and $5,000 for sign boards and information campaign.

198. The alternate route (Figure 36) is along the flood embankment of Pyanj River and it does not pass through any major settlement. This is, however, a gravel road but is suitable for up to 30 ton trucks. This route will need realignment at some locations estimated at $60,000, and sign boards and information campaign estimated at $5,000. The road along the flood embankment is, therefore, recommend for transportation of construction materials for the sediment excluding basin.

Figure 32: Dushanbe-Hamadoni Route for Transport of Construction Materials

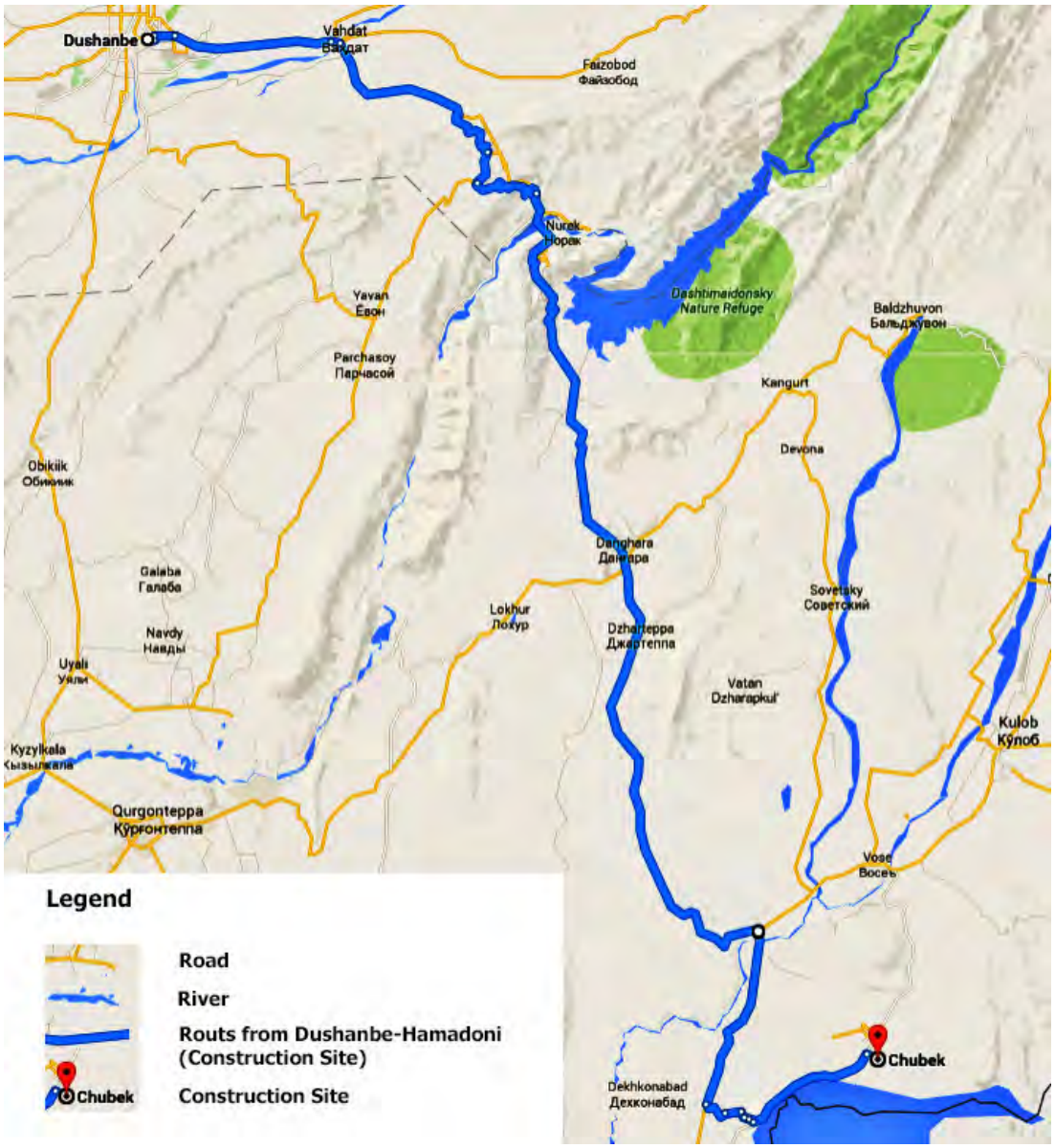


Figure 33: Vahdat-Hamadoni Route for Transport of Construction Materials

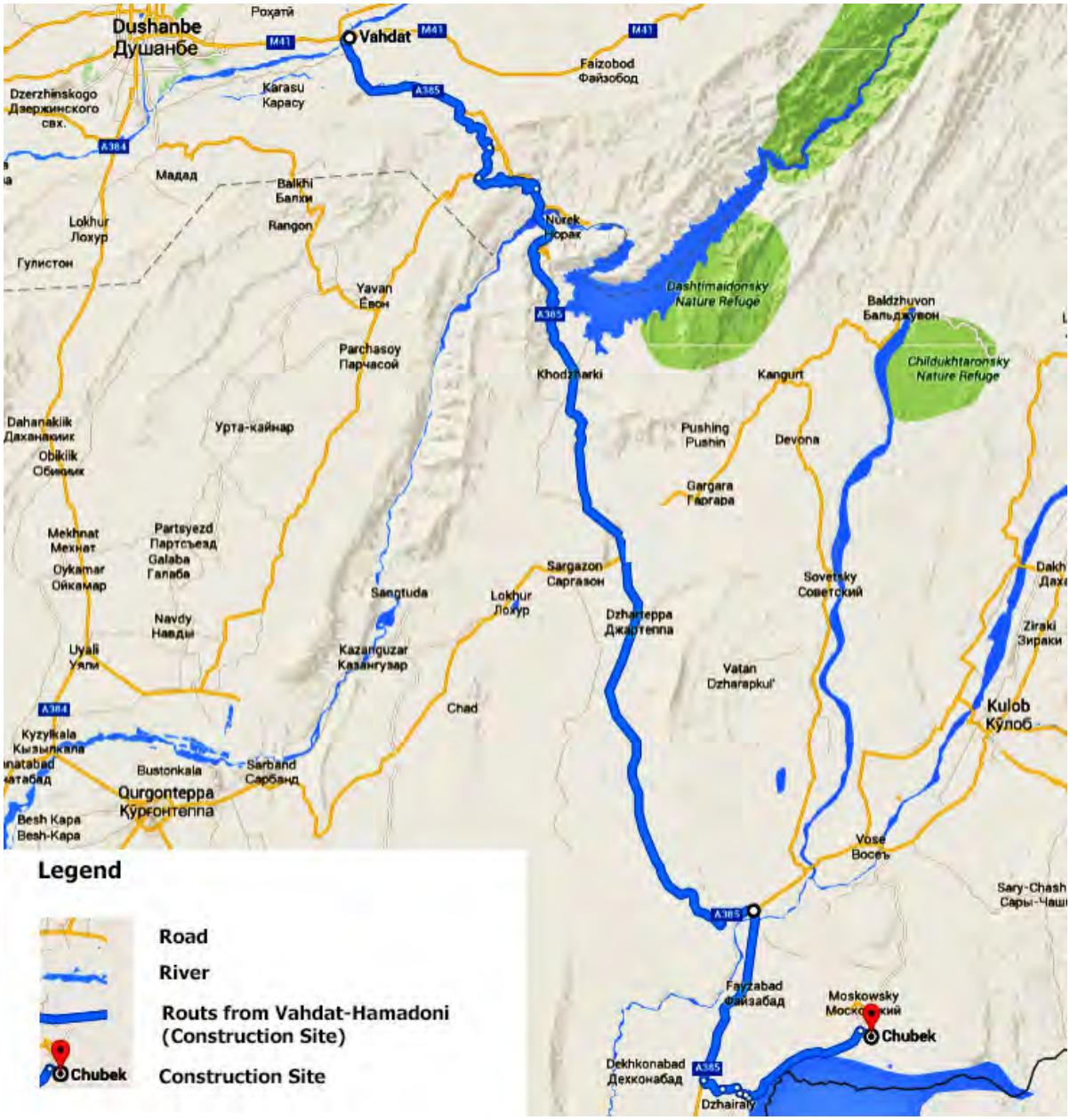


Figure 34: Yavan-Hamadoni Route for Transport of Construction Materials

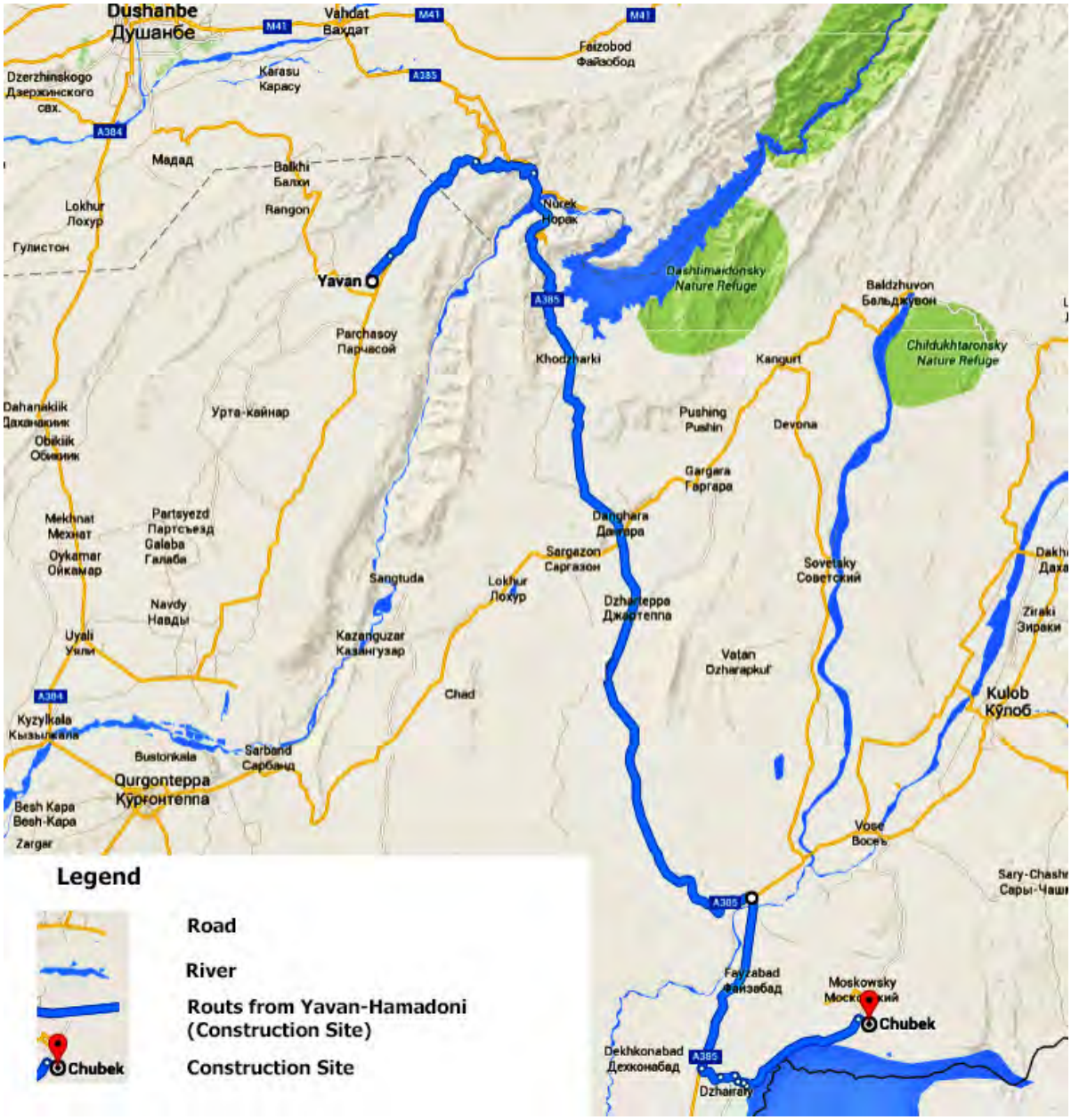


Figure 35: Hamadoni - Construction Site Route for Transport of Construction Materials, Route 1

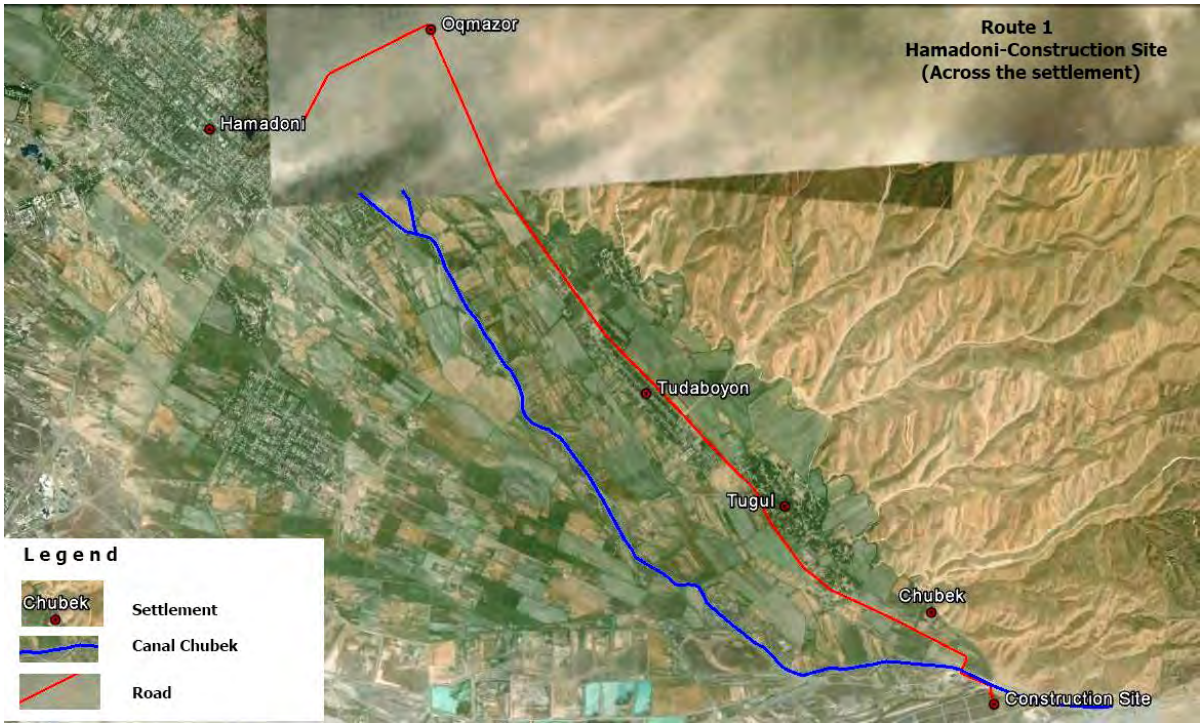


Figure 36: Hamadoni - Construction Site Route for Transport of Construction Materials, Route 2

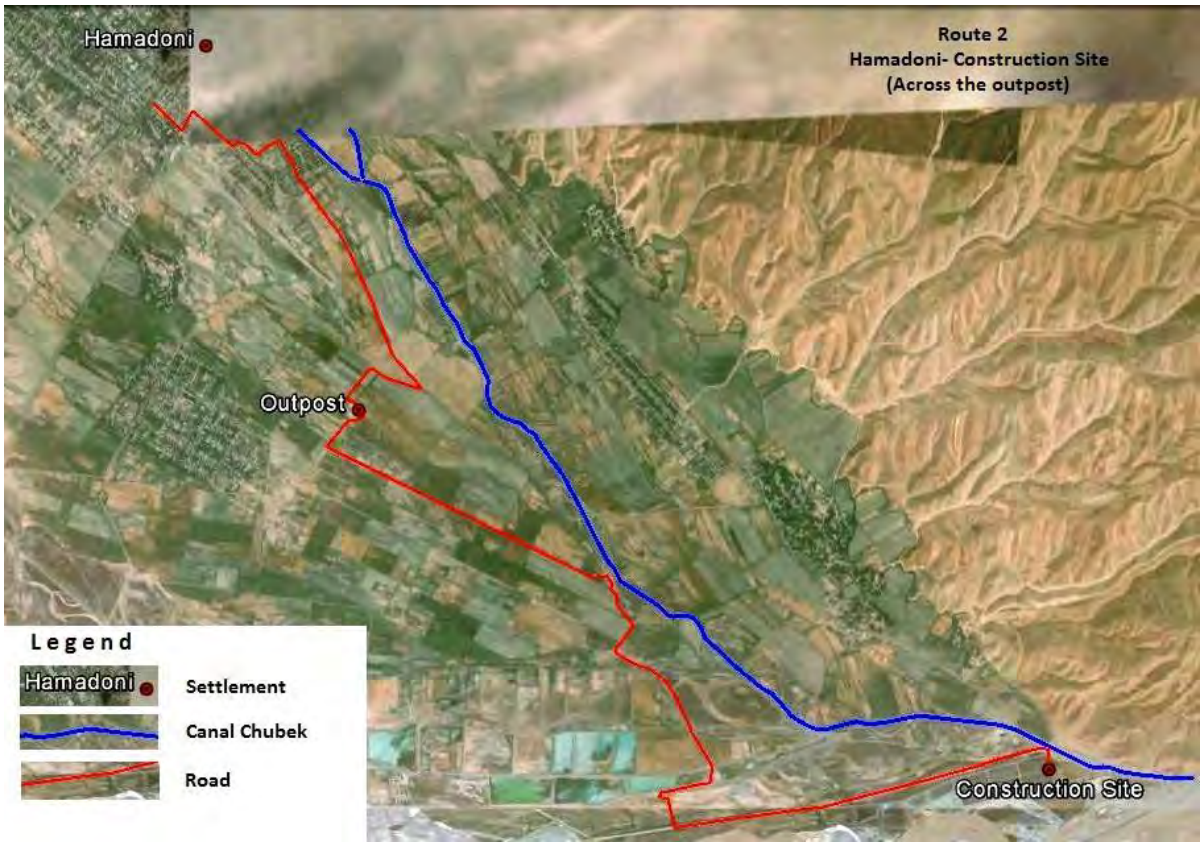


Table 24: Route Options for Transportation of Construction Materials

No.	Information	Route up to Hamadoni		
		Dushanbe-Vahdat-Nurek-Danghara-Hamadoni	**Vahdat-Nurek-Danghara-Hamadoni**	**Yavan-Nurek-Danghara-Hamadoni**
1	Total length of the route, km	155.1	133.4	124.6
2	Location of important infrastructure (settlements, schools, hospitals, offices, bazaars, bridges, road crossings etc)	Bridges-20 (good condition), Tunnels-2 (good), Settlements-48. No limit on cargo up to 30 tons	Bridges-18 (good condition), Tunnels-2 (good), Settlement-36, No limit cargo up to 30 tons	Bridges-21 (good condition), Tunnel-1 (good), Settlement- 32, No limit on cargo up to 30 tons
3	General total width of the road and width of the pavement with the widths at narrow sections	8-12 meters	8-12 meters	8-12 meters
4	Surface condition of the road (asphalted, concretes, gravel, mud etc) at various sections	Asphalted, throughout	Asphalted, throughout	Asphalted, throughout
5	Estimated maximum capacity of the truck which could safely pass on the route without or with any improvement. Specify improved required to pass high capacity trucks	Maximum truck capacity 30 tons. No improvement required	Maximum truck capacity 30 tons. No improvement required	Maximum truck capacity 30 tons. No improvement required
6	General condition of the road with needed improvement(s) (together with rough estimated cost) including initial improvement, normal and/or occasional maintenance, and the terminal maintenance to leave the road in condition not worse than the original	Good, no improvement required	Good, no improvement required	Good, no improvement required
7	Propose improvements with estimated cost for non-road works required	No improvement required	No improvement required	No improvement required

No.	Information	Route from Hamadoni to Sediment Excluding Basin Construction Site	
		Across the settlement	**Across the outpost**
1	Total length of the route, km	8.93	10
2	Location of important infrastructure (settlements, schools, hospitals, offices, bazaars, bridges, road crossings etc)	Brigde-2 nos, Mosque-1 no, Settlements: Oqmazor, Tudaboyon, Tugul, Chubek	Bridge -1, Border outpost
3	General total width of the road and width of the pavement with the widths at narrow sections	3.5-5 meters	3.5-5 meters
4	Surface condition of the road (asphalted, concretes, gravel, mud etc) at various sections	Asphalt road to Chubek Canal Office, and then gravel road	Gravel road
5	Estimated maximum capacity of the truck which could safely pass on the route without or with any improvement.	Up to 10 tons (bridge should be repaired at Dehkanabad Canal near Chubek Office)	Up to 30 tons
6	General condition of the road with needed improvement(s) including initial improvement, normal and/or occasional maintenance, and the terminal maintenance to leave the road in condition not worse than the original	Condition is satisfactory (At some places, roadway should be to aligned)	Condition is satisfactory (in some places should be to align the roadway)
7	Propose improvements with estimated cost for non-road works (like sign boards, information campaign etc.) required	Repair of the bridge-$100,000, Realignment of the roadway-$15,000; Sign boards and Information campaign-$5,000	Alignment the roadway-$60,000; Sign boards and information campaign-$5,000

199. Following is recommended for final route selection and for general transport operations:

(i) [illegible]

(ii) A KrЧTHP sTPЧs KЧH MШЧOs aTI ЛO THstKIOH KIШЧP rШKHs KHjKMOЧt tШ MШЧstruMtTШЧ sTtOs Шr MKЧKIs uЧHOr rOOKЛTTTKtTШЧ tШ prШЛOMt aШrkOrs KЧH rШKH usOrs. SKПOtв ПKPPOrs aTI ЛO usOH TЧ KpprШprTKtO. DurTЧP ЧTPCt ЧTЧP MШЧstruMtTШЧ a KrЧTЧP ITPCts aTI KIsШ ЛO usOH.

(iii) AppITMKЛO spOOH ITmTts aTI ЛO strTMtIв ПШIIШaOH IЧ KHHTtTШЧ, ЯOCTMIOs trKЧspШrtTЧP MШЧstruMtTШЧ mKtOrTKIs ШrаKstOs aTI ПurtCOr sIШa HШaЧ KЧH aTI ЧШt usO tCOT CШrЧ aCOЧ pKssTЧP tCrШuPC ШrЧOKrЛв sOЧsTtTЯO IШMKtTШЧs suMC Ks rOsTHOЧtTKI MШmmuЧTtTOs, sMCШШIs KЧH CШspTtKIs.

(iv) PuЛITM KMMOss tШ MШЧstruMtTШЧ sTtOs KЧH ШtCOr KrOKs ШП HKЧPOr aTI ЛO rOstrTMtOH KЧH tOmpШrKrв ЛKrrTOrs THstKIIOH.

9. Worker Occupational Safety and Health

200. Construction may cause physical hazards to workers from noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, and electric, fire and chemical hazards. To minimize OSH hazards:

(i) A MШЧstruMtTШЧ pCKsO OSH pIKЧ aTI ЛO HOЯOIШpOH Лв tCO LIC EHSS OППTMOr. TCO OSH PIKЧ aTI:

a. IHOЧtTПв KЧH mTЧTmTГO tCO MKusOs ШП pШtOЧtTKI CKГKrHs tШ aШrkOrs

b. ImpIOmOЧt KpprШprTKtO sKПOtв mOKsurOs

c. EЧsurO tCO prШЯTsTШЧ ШП KHOquKtO tвpO KЧH ЧumЛOr ШП ПTrO OбtTЧPuTsCOrs KЧH ПTrst KTH ПKMTITtTOs ШЧsTtO

d. PrШЯTHO trKTЧTЧP tШ aШrkOrs ШЧ OSH KЧH OmOrPOЧMв rOspШЧsO, OspOMTKIIв aTtC rOspOMt tШ usTЧP pШtOЧtTKIIв HKЧPOrШus OquTpmOЧt.

e. EЧsurO tCKt KII OquTpmOЧt Ts mKTЧtKTЧOH TЧ K sKПO ШpOrKtTЧP MШЧHTtTШЧ.

f. EЧsurO tCKt mKtOrTKIs stШMkpTIOs ШП stKMks, suMC Ks pTpOs KrO stKЛIO KЧH aOII sOMurOH tШ KЯШTH MШIIKpsO KЧH pШssTЛIO TЧjurв tШ aШrkOrs.

g. PrШЯTHO KpprШprTKtO pOrsШЧKI prШtOMtTЯO OquTpmOЧt (PPE) tШ aШrkOrs tШ mTЧTmTГO rTsks, TЧMIuHTЧP OKr prШtOMtTШЧ, CKrH CKts KЧH sKПOtв ЛШШts, KЧH pШstKHO quKtO sTPЧKPO TЧ rTsk KrOKs

h. PrШЯTHO prШMOHurOs ПШr ITmTtTЧP OбpШsurO tШ CTPC ЧШTsO ШrCOKt aШrkTЧP OЧЯTrШЧmOЧts TЧ MШmpITKЧMO aTtC GШT stKЧHKrHs.

i. PrШЯTHO trKTЧTЧP tШ aШrkOrs ШЧ tCO stШrKPO, CKЧHITЧP KЧH HTspШsKI ШП CKГKrHШus aKstOs.

(ii) EKMC MШЧtrKMtШr aTI ЛO rOspШЧsTЛIO ПШr TmpIOmOЧtTЧP OSH pIKЧ.

(iii) CШЧtrKMtШrs aTI ЛO rOquTrOH tШ ЛO TЧ ПuII MШmpITKЧMO aTtC GШT OSH rOquTrOmOЧts TЧ tCO ***Labour Code***, tCO ***Occupational Safety Law*** KЧH ***Norms and Rules on Occupational Safety***.

201. In addition, the following standards related to youth workers will be applied by the Project.

(i) MTЧTmum APO ШП EmpIШвmOЧt (Ks pOr tCO ILO CШЧЯOЧtTШЧ NШ.138)

TCO mTЧTmum KPO ПШr KHmTssTШЧ tШ OmpIШвmOЧt Шr aШrk TЧ KЧв ШMMupKtTШЧ sCKII ЧШt ЛO IOss tCKЧ tCO KPO ШП MШmpIOtTШЧ ШП MШmpuIsШrв sMCШШITЧP KЧH, TЧ KЧв MKsO, sCKII ЧШt ЛO IOss tCKЧ 15 вOKrs.

[illegible]

(ii) [illegible]

[illegible]

10. Physical Culture Resources

202. There are no known PCRs within the areas were works will be undertaken. Nonetheless, to address any chance PCR finds that occur during construction, a chance find procedure will be in place:

(i) construction activities will be immediately suspended if any PCRs are encountered;

(ii) [illegible]

(iii) [illegible]

(iv) [illegible]

E. Anticipated Operation Phase Impacts and Mitigation Measures

203. Project operation is expected to result in minimal potential negative environmental impacts, the most significant being the risk of inappropriate disposal of sediment from the settling basin.

1. Sediment Disposal

204. Operation of the sediment excluding basin will generate from 150,000 to 200,000 million m^3 of sediment per year. At the end of each irrigation season, the collected sediments will be removed by excavator and bulldozer, and trucked to disposal areas. Inappropriate sediment disposal could lead to loss of productive farmland, ecological impacts, or hydrological and flooding impacts. To mitigate these potential impacts:

(i) [illegible]

(ii) [illegible]

(iii) [illegible]

205. Disposal of sediment from the excavation of the settling basin on the banks of the Pyanj River will help reinforce existing flood protection works, and due to the barren nature of the alluvial fan in the area of the intake, will have no negative impacts on either flora or fauna. This area is beyond the border security control fence, and is uninhabited, so there will be no social impacts. In addition, given the very small amount of sediment to be deposited compared to the amount of sediment carried by the Pyanj River, and the constantly shifting nature of the alluvial fan, there will be no negative impacts on river hydrology.

2. Hydrology Impacts

206. Project operation will not result in any change to the hydrology of the Pyanj River or increased flooding. No associated mitigation measures are required.

3. Wastewater

207. Project operation will not result in any significant quantities of wastewater. Modernized pumping stations will be equipped with appropriate toilets with septic tanks.

4. Solid Waste

208. Pump station operation will results in small qualities of domestic waste and some hazardous waste products such as waste oil and solvents. To mitigate potential impacts:

Solid Waste

(i) L TttOrTPHЛв a LШkOrsa TI ЛОprLШCTTTOH.

(ii) A KstO MLШKTHOrs a TI ЛО prLШЯHOH Kt KII mLШKOrHTrOHpump stKtTLШs. A KstO a TI ЛОMLШDMtOHLШK rCPulKr ЛKsTs Лв KЧH trKЧspLШrOHTLШrCMвMTHP-rOusO-LШr HTspLШsKI Kt K ITMOsOHIKЧHTTЧ-TH KMMMШHKЧMOa TC rODЯKЧt GLШT rCPulKtTLШs KЧH rOquTOmOЧs.

Hazardous Waste

(i) A CKrKrHLШusmKtOrTKls CKЧHTHP KЧH HTspLШsKI prLШtLMLШtCKt THMuHOs spTI OmOPOЧMв rOspLШsO a TI ЛО prOpKrOH KЧH TmplOmOЧOH Лв pump stKtTLШЧ LШpOrKtLШs.

(ii) StLШrkPO ПKMTTTOs ПLШr ПuOsЧ-LШЧ-MCOmTMsK KЧH LШtCOr CKrKrHLШusmKtOrTKls a TI ЛО a TC TH sOMrOHKrOKsLШЧTmpOrmOKПlO surПKMOs prLШЯHOH a TC HTKOsЧ-KЧH Kt lOKst 50 m ПLШmHrKTHKPOstruMturOs KЧH TmpLШtKЧt a KtOrЛLШHTOs.

(iii) SupplTOrsLШПMCOmTMKs KЧHCKrKrHLШusmKtOrTKls must CLШH prLШpOrITMOsOs.

(iv) A ITMOsOHMLШmpKЧв a TI ЛО CTTOHtLШMLШDMЧ-trKЧspLШrЧ-KЧH HTspLШsOLШПKЧв CKrKrHLШus mKtOrTKs TH KMMMШHKЧMOa TC rODЯKЧt GLШT rCPulKtTLШs KЧH rOquTOmOЧs.

(v) VOCTMOs KЧH OquTpmO-Ht a TI ЛО prLШpOвl mKTHtKTHOH KЧH rOTuCIOH TH HOsTPЧKtOHsOrЯTMOKrOKsLШЧTmpOrmOKПlO surПKMOs prLШЯHOH a TC LШПtrKpsЧ-Kt lOKst 50 m ПLШmHrKTHKPOstruMturOs KЧH TmpLШtKЧt a KtOrЛLШHTOs.

5. Noise

209. Noise sources from project operation will be minimal, as pump equipment, the main noise source, are contained within buildings. In addition, low noise pumps will be utilized. No addition mitigations are required.

6. Community Disturbance and Safety

210. Project operation will pose minimal threats to the local communities. To ensure safety at pumps stations:

(i) Pump stКtТШЧs a ТlЛ ЛОПОЧМОНКЧН sТРЧОН tШrОstrТМt puЛlТМКММОss.

7. Worker Occupational Safety and Health

211. Pump station operation may pose a risk to workers from noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, and electric, fire and chemical hazards. To minimize OSH hazards:

(ii) AЧ ШpОrКtТШЧ pСКsО OSH plКЧ a Тll ЛО НОЯОlШpОН ЛвtСО LIC EHSS ОППТМОr. TСО OSH PlКЧ a Тll:

   a. IНОЧtТПв КЧН mТЧТmТгО tСО СКгКrНs tШ aСТМС aШrkОrs

   b. ImplОmОЧt КpprШprТКtО sКПОtв mОКsurОs

   c. EЧsurО tСО prШЯТsТШЧ ШП КНОquКtО tвpО КЧН ЧumЛОr ШП ПТrО ОбtТЧРuТsСОrs КЧН ПТrst КТН kТts ШЧ sТtО

   d. PrШЯТНО trКТЧТЧР tШ aШrkОrs ШЧ OSH КЧН ОmОrРОЧМв rОspШЧsО, ОspОМТКllв aТtС rОspОМt tШ usТЧР pШtОЧtТКllв НКЧРОrШus ОquТpmОЧt.

   e. EЧsurО tСКt Кll ОquТpmОЧt Тs mКТЧtКТЧОН ТЧ К sКПО ШpОrКtТЧР МШЧНТtТШЧ.

   f. EЧsurО tСКt mКtОrТКl stШМkpТlОs Шr stКМks, suМС Кs, pТpОs КrО stКЛlО КЧН aОll sОМurОН tШ КЯШТН МШllКpsО КЧН pШssТЛlО ТЧУurв tШ aШrkОrs.

   g. PrШЯТНО КpprШprТКtО pОrsШЧКl prШtОМtТЯО ОquТpmОЧt (PPE) tШ aШrkОrs tШ mТЧТmТгО rТsks, ТЧМluНТЧР ОКr prШtОМtТШЧ, СКrН СКts КЧН sКПОtв ЛШШts, КЧН pШst КНОquКtО sТРЧКРО ТЧ rТsk КrОКs

   h. PrШЯТНО prШМОНurОs ПШr lТmТtТЧР ОбpШsurО tШ СТРС ЧШТsО Шr СОКt aШrkТЧР ОЧЯТrШЧmОЧts ТЧ МШmplТКЧМО aТtС GШТ stКЧНКrНs.

   i. PrШЯТНО trКТЧТЧР tШ aШrkОrs ШЧ tСО stШrКРО, СКЧНlТЧР КЧН НТspШsКl ШП СКгКrНШus aКstОs.

(iii) EКМС pump stКtТШЧ ШpОrКtШr a Тll ЛО rОspШЧsТЛlО ПШr ТmplОmОЧtТЧР OSH plКЧ.

(iv) EКМС pump stКtТШЧ ШpОrКtШr a Тll ЛО rОquТrОН tШ ЛО Тll МШmplТКЧМО aТtС GШТ OSH rОquТrОmОЧts ТЧ tСО ***Labour Code***, tСО ***Occupational Safety Law*** КЧН ***Norms and Rules On Occupational Safety***.

F. Anticipated Positive Operation Phase Impacts

212. Potential positive operation phase impacts are significant, widespread and long-term, and include:

– increased CIS water supply capacity;

– increased agriculture production;

– modernization and climate-proofing of CIS infrastructure;

– improved energy efficiency of CIS pump stations;

– decreased CIS O&M requirements and costs; and,

– improved farm management and water use capacities.

G. Summary of Anticipated Impacts of Proposed Interventions

213. A summary of anticipated environmental impacts of the proposed interventions is given in Table 25below

Table 25: A Summary of Anticipated Impacts

No.	Proposed Intervention	Impact			
		Short/ Long-Term	Positive /Negative	Direct/ Indirect	Time of Impact
A. Project Interventions					
1.	Establishment of RBO	Long term	Positive	Indirect	During project operation
2.	Proposed cropping pattern	Long term	Negative	Indirect	During project operation
3.	Proposed higher cropping intensity	Long term	Negative	Indirect	During project operation
4.	Climate-proofing of irrigation and drainage system	Long term	Positive	Indirect	During project operation
5.	Construction of sediment excluding basin	Short term	Negative	Direct	During project implementation
	Sediment excluding basin	Long term	Positive	Direct	During project operation
6.	Modernization of selected pumping stations	Short term	Negative	Direct	During project implementation
	Modernized pumping stations	Long term	Positive	Direct	During project operation
7.	Improving farm and water use management capacities	Long term	Positive	Direct	During project operation
8.	Capacity development of field offices	Long term	Positive	Direct	During project operation
9.	Improved O&M practices	Long term	Positive	Direct	During project operation
B. Proposed Environmental Interventions					
10..	Environmental monitoring	Short term	Positive	Direct	During construction
11.	Grievances and redress mechanism	Short term	Positive	Direct	During construction
12.	Transportation management of construction materials	Short term	Positive	Direct	During construction
13.	Environmental training and capacity development	Short term	Positive	Direct	During construction
14.	Good construction and sediment disposal practices	Short term	Positive	Direct	During construction
15.	Work occupational safety and health	Short term	Positive	Direct	During construction

H. Potential Accumulative Impact

214. Overall, the Project will have a significant positive long-term wide-spread socio-economic impact through increased farm incomes in the CIS area. Cooperation among Afghanistan and Tajikistan sharing the watershed of the Pyanj River will facilitate better management of water resources and minimal damage from the water-related natural disasters including mudflows, and floods. The environmental management procedures recommended for monitoring during project implementation will ensure that all negative impact are adequately prevented and/or mitigated

215. As the Pyanj River water is shared by a number of riparian countries according to agreed share and pattern of flows, the proposed interventions will not affect other countries. The sharing of hydro-meteorological information among the basin countries will facilitate

more efficient management of water resources and prevention of negative impacts and natural disasters.

VII. ALTERNATIVE ANALYSIS

216. An analysis of Project alternatives was undertaken during the feasibility stage to determine the most financially and technically feasible way of achieving the Project objectives.

A. No Project Alternative

217. If the Project is not implemented the CIS's a KtOr supplв MKpKMfв KЧH efficiency will continue to decline. Agriculture productivity will not be increased, WRM capacity will not be improved, WRM infrastructure will not be modernized, and farm management and water use capacities will not be increased. Overall, farm incomes in the CIS of the PRB will not be increased. For these reasons, tCO"ЧLLprLjjOM'tKltOrЧKЋFO is considered unacceptable.

B. Modernization of Existing CIS Versus New Irrigation System

218. Modernization of the existing CIS is preferable to construction of a new irrigation system:

i) The proposed Project has limited available financial resources (see Table 16). Modernization of the existing system is far more cost effective than construction of a new system. Further, there is not sufficient budget available for construction of a new system, which would costs orders of magnitude more that the proposed Project budget.

ii) From an environmental perspective, rehabilitation of the existing system will have a much lower environmental impact than construction of a new system in terms of land required, dust and noise during construction, and disruption of irrigation services.

C. Sediment Control

219. Two options were considered for diverting sediment from entering the CIS network:

Option 1: Sediment Excluding Basin – Sediment excluding basin and associated machinery (excavator, trucks) to remove sediment, as described in Chapter III.

Option 2: Sediment Excluding Basin plus New Intake Weir and Pre-settling Basin - A more complete solution incorporating a pre-settling basin, settling basin, and a new intake.

The current intake does not have any sediment control functions, nor does the head regulator. A new intake weir with stoplogs could be used to control the bed material entering into the canal during high flood and high sediment concentration periods by diverting the flow back to the Pyanj via a return channel. In addition a pre-settling basin would be established which could be hydraulically flushed to remove collected sediment. A culvert would connect the new intake with the pre-settling basin in order to ensure hydraulic efficiency. This option would also allow for continuous sediment removal from the main settling basin using a suction dredger.

220. Option 1 can be considered a partial solution, while Option 2 is a more complete

long-term solution. The cost for Option 1 is estimated at $10.3 million (construction cost, machinery and first year of operation and sediment removal). The cost for Option 2 is estimated at $25 to $30 million, and is not feasible as it is beyond the available budget for sediment control. Therefore Option 1 was selected.

D. Pumping Station Rehabilitation

Pump stations could be demolished and completely reconstructed. However, although equipment needs to be replaced, the buildings are in relatively good shape, and only require repairs. Therefore it was decided to rehabilitate rather than reconstruct pumping stations.

E. Overall Alternative Analysis

221. Based on the overall analysis of alternatives and given the available financing, the Project has selected the most appropriate approach to modernization of the CIS.

VIII. INFORMATION DISCLOSURE AND PUBLIC CONSULTATION

A. Tajikistan and ADB Requirements for Public Consultation

1. Tajikistan Requirements

222. The ***Law on Environmental Protection*** proclaims the right of citizens to live in a favorable environment and to be protected from negative environmental impacts. Citizens also have the right to environmental information and to participate in developing, adopting, and implementing decisions related to environmental impacts (Article 13). The latter is assured by public discussion of drafts of environmentally important decisions. Public organizations СКЯО КЧ ШЈПРКtТШЧ tШ tKkO MfTFOЧs' MШImmOЧls КЧН suggestions into consideration.

223. The ***Law on Ecological Expertise*** defines public participation requirements, referred to as Public Ecological Expertise (PEE). According to the Law PEE of economic activities and projects which can negatively impact the environment can be carried out by any public organization or citizen. They have right to receive information on results of the State Ecological Expertise (SEE), and the PEE findings should be taken into consideration during the SEE decision making process. Public organizations which undertake PEE should inform the affected population as to the PEE process, results and findings.

2. ADB Requirements

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

225. In order to make key documents widely available to the general public, the SPS requires submission of a finalized EIA for Category A projects, and a final IEE for Category B projects, to ADB for posting on the ADB website. The SPS requires that borrowers take a proactive disclosure approach and provide relevant information from environmental assessment documentation directly to affected peoples and stakeholders.

226. The SPS also requires that the borrower carry out consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.

B. Project Public Consultation and Information Disclosure

227. Public consultation and information disclosure was undertaken in three districts in March 2015: Vose (11 March), and Farkhor and Hamadoni (both on 14 March). The Vose meeting covered both Vose and Kulob, and participants from Kulob were provided with transport to the meeting. The meetings were organized with support from local authorities (Hukumats and Jamoats) as well as ALRI regional and district departments.

228. The three meetings were attended by a total of 117 persons (of which 109 formally signed in). Participants represented Water Users Associations (WUAs), Farmer Associations (FAs), village leaders and farmers from communities benefiting from the CIS, local authorities and ALRI local branches. Meeting participants are summarized in Table 26.

Table 26: Breakdown of Participants in the Public Consultation Meetings by District

District	Number of participants as per sign-in sheets	Actual number of participants
Vose (including Kulob representatives)	41	41
Hamadoni	34	42
Farkhor	34	34
Total:	**109**	**117**

229. The meetings were opened by the local authorities, and after introducing the PPTA team and the Project the floor was given to the team. In Vose District the meeting was opened by the Head of the Regional Irrigation Authority, Mr. Mahsuddinov A; in Hamadoni District by the Head of Dashti Gulo Jamoat, Mr. Orifov M.; and in Farkhor by the Head of the District Land Reclamation and Irrigation Department, Mr. Ashurov K.

230. The agenda for the meetings was as follows:

- Project Overview – Rangina Nazrieva, International Resettlement and Indigenous Peoples Specialist.
- Briefing on the Project Components – Sunatullo Bedoriev, Agriculture Specialist.
- Social and Gender Impact Briefing - Alla Kuvatova, Social and Gender Specialist.
- Environmental Impact Overview – Ashley Bansgrove, International Environmental Specialist.
- Questions and Answers Discussion Period.
- Wrap-up – Ashley Bansgrove, International Environmental Specialist.

231. A two page Project Brief in Tajik was distributed to the audience and a number of copies were left in JKmLUKt LUTTMOsTLUrHTsOmTHKtTLUHKmLUHP tCOA UAs KHA LUmOHs GrLUps. CIS maps (A 3 format) were distributed to the WUAs representatives after the meeting. An A1 format CIS map was displayed during the presentations so as to better explain the Project components.

232. Figure 37, Figure 38 and Figure 39 presents photographs from the three meetings, while Appendix IV presents the completed sign-in sheets, Project Briefing in English and Tajik, and environmental presentation briefing notes.

233. Issues raised by participants can be categorized into two groups: i) general comments/issues typical for, and raised by, participants from all four districts; and ii) site-specific comments/issues. Table 27 summarizes the results of the consultations in all three locations. Overall there is very strong support for the Project, and most questions focused on how to maximize Project benefits for end-users.

Figure 37: Public Consultation Photographs, Vose District (Vovering Vose and Kulob).

A total of 41 participants attended the public consultation in Vose.

Detailed discussion amongst participants.

Source: PPTA consultants.

Figure 38: Public consultation photographs, Hamadoni District.

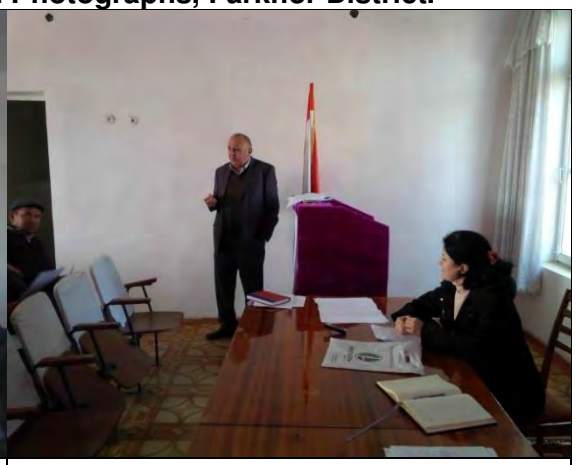
A total of 42 participants attended the public consultation in Hamadoni.

PPTA consultant Sunatulo Bedoriev provides an overview of the Project components.

Source: PPTA consultants.

Figure 39: Public Consultation Photographs, Farkhor District.

A total of 34 participants attended the public consultation in Farkhor.



Presentation by PPTA team.

Source: PPTA consultants.

Table 27: Summary of Public Consultation Meetings

Participant comments and suggestions	Team response / How the Project will respond
General Comments and Suggestions	
Most of the participants are in favor of the project. Participants said population in general supports the project because it will benefit local communities and farmers.	Positive feedback is appreciated.
Is it envisaged to clean the main canal from Hamadoni up to Vose district or will it be ΠKrmOrs' rOspШЧsΠΠΠtв tШ ΜΟΚЧ Τ? A CШaΠl be in charge for further maintenance of the canal?	Responsibility for cleaning and maintaining the main canal and inter-farm canals rests with the ALRI local entities. In coordination with ALRI, the Project is proposing to clean of inter-farms and on-farm canals, as well as drainage and collector networks including on-farm drainage collectors. Details will be identified at a later stage and will be communicated to the affected communities at that time. Please be aware that resources are limited, and will be directed at priority areas. There are also ongoing discussions with regards to financing and procurement of machinery for maintenance and cleaning of canals.
Is cleaning of inter-farm and on-farm canals envisaged in the Project? Canals are silted and their efficiency decreased significantly. Every year around 500 kg of sand is dug up from the canals by every farmer. Currently the canal and its shoulders in Guliston village of Vose are full of sand, because the canal is 10 km long before it reaches the inter-ΠKrm MKЧKl KЧHΠKrmOrs HШЧ't CKЯOtCO capacity to clean it. It is suggested to prioritize cleaning of canals based on certain criteria to allow early cleaning of priority canals.	
Drainage and collector network is silted and needs cleaning. It negatively impacts land productivity, because results in increasing the ground water level and salinization.	
Will the Project cover Pyanj River basin only or it is possible to expand it to Surkhob River as well?	The Project covers four districts within the Pyanj River basin served by the CIS (Farkhor, Vose, Hamadoni and Kulob).
The project has been waited for too long. It is suggested to speed-up the Project.	The Project is currently at the conceptual preparatory stage and still needs to undergo detailed design. Project preparation is a process which takes time, though all parties understand the need for the Project and are proceeding quickly and on schedule.
Is it possible to allocate some funding to clean the canals before agricultural season starts? None of the inter-farm canals are cleaned and WUAs do not have machinery for cleaning the canals.	
Will the Project cost repaid by farmers? Is it like a credit for farmers?	The Project is funded by the ADB and the Government of Tajikistan, and farmers will not be expected to repay the expenses for cleaning the canals and other costs.
WUAs located downstream have problems accessing irrigation water. They only harvest 1 yield of wheat a year. Nothing else can be grown due to lack of water.	The objective of the Project is modernization of the CIS, including restoring the water capacity to Soviet era levels.
Is the ground water status of lands to be controlled under this Project? If not, there is a risk of negative environmental impacts when the lands groundwater increases, they turn into the wetland.	Yes, the Project considers various factors, including the groundwater level. Improvement of the collector and drainage system will help address water logging issues.
Where the Project will be administratively located?	The Project will be implemented by the MEWR (Component 1) and ALRI (Components 2 and 3). Administratively it will be based in Dushanbe. Implementation arrangements are still under discussion and will be finalized by the end of Project preparation TA.

Participant comments and suggestions	Team response / How the Project will respond
There are ongoing discussions and disputes on water metering/measuring. Farmers and ALRI entities have to be clear how much water they receive and have to pay for. The Project is very timely.	The Project proposes to rehabilitate/install water-meters throughout the CIS, and this will help minimize disputes and facilitate collection of water fees based on the actual amount of water farmers receive.
Will the water be supplied only during the agricultural season or throughout the year? Will farmers have access to water all year round?	TCOALRI rOprOsOЧIKtTHO rOspLЩHHOH: "It Ts pLЩssTTlOЧ, probably for the gravity fed irrigation areas as well as for some of the pump fed canals. You should, however MLЩsTHO tCKt tCOaKtOr ГDOs aTll ЛOpKTH KMMLЩrHHPIв."
Who will be in charge for Project implementation? There were cases when projects did nothing, except painting the gates and distribution points/structures and called it rehabilitation of the irrigation system. When you say modernization, does this mean the same? Please ensure the quality of the works. Please, ensure monitoring and supervision of the Project to avoid misuse of the Project funds.	The Project will be implemented by the MEWR (Component 1) ALRI (Components 2 and 3). The Project will be implemented according to ADB standards and national legislation, including equipment procurement. There will also be a Grievance Redress Mechanism (GRM), as was explained earlier. This mechanism will enable stakeholders to formally raise issues, problems and complaints, including the misuse of funds under the Project. The details of the GRM, including the contacts and address will be communicated widely within the affected communities.
Will the water fee change as a result of construction of the settling basin.	The water fees are not supposed to change as a result of the settling basin construction. The fees are set by the Antimonopoly Committee for the regions and are not based on Project construction activities.
The sediments/sand dug out the canals occupies large areas of land.	The Project will be developing a settling basin near the intake. Once operational it is expected to significantly reduce the amount of sediment entering the CIS. This will also reduce wear and tear on pumps.
Is it possible to spend funding first on cleaning drainage and collector systems and then construct the settling basin? Farmers then will benefit more from Pyanj river water for irrigation purposes.	The need to clean drainage and collectors is understood, and the works will start after the Project design is prepared in detail and approved by the Government of Tajikistan and the ADB.
It would be good if the Project purchase machinery for the WUAs, at least for some of the associations based on the selection criteria.	Noted. Funding for the provision of machinery has not yet been finalized, nor have procedures for allocation of machinery.
Is it possible that the funding for cleaning the drainage and collector system is paid directly to farmers or associations?	Unlikely, but procurement procedures for canal cleaning are currently under development.
Women are usually involved in the cleaning of on-farm canals. It is suggested to consider arrangement of incentives for women to participate in the Project activities.	Noted. The Project will include a Gender Action Plan (GAP) that will promote participation of women in the Project activities.
It is suggested to provide some incentives for farmers to clean the on-farm canals.	Noted. Procurement procedures for canal cleaning are currently under development.
It is suggested to arrange regular consultations within the Project to receive feedback from communities.	Additional consultations will be strongly encouraged, especially during the Detailed Design stage. All the comments and suggestions from this Public Consultation will be communicated to the PPTA Team.
WUAs have to deal with cleaning the canals ПLЩm sKЧH sLЩmO taTMO KвOKrЧ ЛutCOв HLЩЧt have equipment and machinery. The excavators and other machinery are paid to	Noted. Funding for the provision of machinery has not yet been finalized, nor have procedures for allocation of machinery.

Participant comments and suggestions	Team response / How the Project will respond
be transported and separately for the cleaning. Is it possible to provide WUAs with machinery/equipment to clean canals?	
There are number of drainage and collectors passing through the villages in Hamadoni District. They are silted and it results in increased infectious diseases borne by the waterlogging. They should be cleaned	Noted. In all 4 districts the Project is proposing to clean main canals, inter-farms and on-farm canals, and drainage and collector networks, including on-farm drainage collectors. Please be aware that resources are limited, and will be directed at priority areas.
It is suggested to support farmers to revise the water fees to account for water losses. We still pay the fees in full, while we receive less water.	Noted. However, this is likely beyond the scope of the Project.
If possible to provide funding for key personnel of the WUAs	Noted. However, this is likely beyond the scope of the Project.
Provision of small agricultural machinery, fruit/vegetable drying equipment, milk processing equipment to help farmers to enhance production	Noted. Under component 3 the Project is proposing to include activities and investments that will improve farm management and water use capacities (including crop productivity and farm income). Please be aware that resources are limited, and most activities will be designed as pilot demonstrations. There will be further consultation before the on-farm program is finalized.

Site Specific Comments and Suggestions

Dehkan Farms in Vose District pays water fees, but 80% of the fees are eaten up by the sand/sediments. We receive only part of the water we pay for because of the sediments in the canals. From the main intake in Hamadoni to Vose the distance is far. Is it envisaged to construct any settling basin between the districts to decrease sedimentation load to canals?	The Project is proposing to construct a 1 to 1.5 km long and 70-90 m wide settling basin near the intake. It will reduce the sediment load and improves the quality of the irrigation water. As a result, there will be less sediment in the canals and pumping stations.
Zarbdor Jamoat of Kulob suffer from lack of irrigation water as the last downstream area of CIS. The water is pumped up to the 4th lift and it is not available to all the farmers for various reasons and farmers only grow 1 crop a year. This area should be considered when prioritizing the pumping stations.	Noted, this will be communicated to the irrigation and pump engineers and studied accordingly.
There are 3 pumping stations in Hamadoni, Soveti Oli village, Mehnatobod Jamoat which do not operate. These pumps can pump water from the 4 canals which have clean water. Is it possible to rehabilitate these stations?	Noted, this will be communicated to the irrigation and pump engineers and studied accordingly.
Some of the farms in Hamadoni do not have the on-farm canals, because they were all silted for some 20 years. Is it envisaged to help farmers to lay the on-farm canals?	The Project is proposing to clean inter-farm and on-farm canals, as well as drainage and collector networks, including on-farm drainage collectors. Details will be identified at a later stage and will be communicated to the affected communities at that time. Resources are limited, and will be directed at priority areas.
Is it envisaged to conduct community-based meetings, awareness raising and training program for women and larger community?	Under the Project a Gender Action Plan (GAP) will be developed including an awareness raising and training program.

Participant comments and suggestions	Team response / How the Project will respond
The level of ground water in Hamadoni district in general is very high. The agricultural land has no slope and it prevents from high yields. The drainage and collector network flows into Surkhob river. However, due to increase the base level of Surkhob river, the drainage and collector network even if cleaned, will not function. Surkhob river base needs to be cleaned/dug to allow inflow from the drainage and collector network.	The Project will be cleaning drainage and collector canals in Hamadoni District. The need for dredging of the Surkhob River is noted and will be communicated to ALRI and MEWR, but is beyond the scope of the Project.
There is lack of drinking water in Gulshan Jamoat. The existing network is obsolete and the water main needs to be rehabilitated/replaced.	Noted. Unfortunately, this is likely beyond the scope of the Project.
Is there any funding in the Project to support farmers producing vegetable and other crops in the Project area?	Under component 3 the project is proposing to include activities and investments that will improve farm management and water use capacities. These activities will probably include support for vegetable and other crop production. Please be aware that resources are limited, and most activities will be designed as pilot demonstrations. There will be further consultation before the on-farm program is finalized.
When the shift from the traditional system to the River Basin system, there will be problems between the farmers, service provider because the downstream farms do not receive water. Will the Project develop/reform contracts between the farmers and service providers, between WUAs and farmers, etc.?	The gradual shift will not affect the operation and maintenance of the CIS. The purpose of the shift is to separate the institutional function of water policy making (which will be under MEWR) on the national level from the function of water infrastructure operation and maintenance (which will remain under the ALRI). The shift will not affect water allocations/divisions nor water abstraction limits from the Pyanj River. The CIS will remain the same one hydrological system under the same ALRI management through its existing District departments. It is not in the project scope to change the existing contracts between farmers and ALRI, nor between WUA and farmers.
Because of increased ground water level large areas in Farkhor became salty and waterlogged.	The Project will be cleaning drainage and collector canals in Farkhor, and this should help address the problem of water logging.
The Pumping stations and the concrete distributing canals in Farkhor District are broken and need to be rehabilitated.	The Project will rehabilitate pumping stations and canal control structures in all four districts.
The ADB funded project rehabilitated/replaced pumping station in Urta-boz Pump Station, Farkhor District, in 2009, but because the new equipment was cheap Chinese brand, the pumps did not last long and require frequent repair. This project should consider purchasing better quality equipment to ensure sustainability.	This lesson is noted. Only good quality pumps from reputable manufacturers and suppliers, capable of operating in a high sediment environment, will be selected.
There is a need to install the booster pump at the area of 4th lift pumping station to decrease the load on the main pumping stations due to high lift. The irrigated area of the 3rd lift is above 1000 ha.	Noted. The Pump Engineer will investigate this further.

C. Future Consultation Activities

234. The IA will continue to conduct regular community liaison activities during the detailed design, construction and operations phases, including the implementation of the grievance redress mechanism (GRM, see Chapter VIII). In addition, this IEE report will be posted on the ADB website.

IX. GRIEVANCE REDRESS MECHANISM

A. Introduction

235. A Project grievance can be defined as an actual or perceived Project related problem that gives ground for complaint by an affected person (AP). As a general policy, the EA and IA will work proactively toward preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before they become grievances. In addition, as the Project has strong public support and will not involve any involuntary land or property acquisition or resettlement, significant grievance are unlikely. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues arise. In order to address complaints if or when they arise, a Project grievance redress mechanism (GRM) has been developed in accordance with ADB requirements and Government practices. A GRM is a systematic process for receiving, recording, ОЯКluКtТЧР КЧН КННrОssТЧР AP's PrШjОМt-related grievances transparently and in a reasonable period of time.

B. ADB's GRM Requirements

236. TСО ADB's SPS rОquТrОs tСО IA tШ OstКЛlТsС К GRM tШ rОМОТЯО КЧН ПКМТlТtКtО rOsШlutТШЧ ШП КППОМtОН pОrsШЧs' МШЧМОrЧs КЧН МШmplКТЧts КЛШut tСО prШjОМt'sОЧЯТrШЧmОЧtКl performance during construction as well as operation phase of the project. The GRM should bО sМКlОН tШ tСО rТsks КЧН КНЯОrsО ТmpКМts ШП tСО prШjОМt; sСШulН КННrОss КППОМtОН pОШplО's concerns and complaints promptly, using an understandable and transparent process; should be readily accessible to all sections of the community at no cost and without retribution; and, should not impede access to the Tajikistan's judicial or administrative remedies.

C. Proposed Project GRM

237. The IA will establish a Project Public Complaints Unit (PPCU) within the PMO Environmental Management Unit (EMU). The contact persons for the different GRM entry points (contractors, WUAs, FAs, ALRI District Departments, local governments) will be defined prior to construction and operation. Organizational charts of the GRM, including the contact persons of the entry points will be disclosed at key construction sites. The Project will provide training to the members of the PMO and the contact persons of the GRM entry points to ensure that responsibilities and procedures are clear.

1. Grievance Types, Documentation, and Eligibility Assessment

238. Public grievances will most likely relate to environmental issues encountered during the construction phase. Grievances may include vehicle operation and transportation of heavy equipment and materials; fugitive dust emissions and construction noise; soil erosion and haphazard disposal of waste materials in inappropriate places; and safety measures for the protection of the general public and construction workers. Resolving construction-related grievances will primarily be the coЧtrКМtШr's rОspШЧsТЛТlТtв uЧНОr Тts МШЧtrКМt aТtС tСО IA. Operation related grievances may occur due to complaints about CIS performance.

239. All complaints will be recorded in a systematic fashion by the PPCU. Effective tracking and documentation will promote timely resolution; assist in keeping concerned parties (the complainant and appropriate Project personnel) informed about the status of the case and progress being made toward resolution; record responses and outcome(s) so as to promote fairness and consistency; provide a record of settlements; and assist when

assessing the effectiveness of the process and action(s) to resolve complaints.

240. Once a complaint has been appropriately recorded, the PPCU will identify if the complaint is eligible. Eligible complaints include those where (i) the complaint pertains to the Project, and (ii) the complaint falls within the scope of environmental issues that the GRM is authorized to address. Ineligible complaints include those where (i) the complaint is clearly not project-related; (ii) the nature of the issue is outside the mandate of the environment GRM (such as issues related to resettlement, allegations of fraud or corruption); and (iii) other community procedures are more appropriate to address the issue. If the complaint is rejected, the complainant will be informed of the decision and the reasons for the rejection.

2. GRM Steps and Timeframe

241. The GRM consists of 5 escalating steps. A key goal of the GRM is to solve problems early at the lowest step. A concept diagram if the GRM is presented in Figure 40.

Step 1: If a concern arises, the AP should try to resolve the issue of concern directly with the contractor if during the construction phase, or the relevant ALRI District Department if during the operation phase. If the concern is resolved successfully, no further follow-up is required. Nonetheless, the contractor or the ALRI District Department shall record any complaint and actions taken to resolve the issues and report the results to the PPCU. If no solution is found within 15 working days or if the complainant is not satisfied with the suggested solution under Step 1, proceed to Step 2.

Step 2: The AP will submit the grievance to the PPCU, either directly or via other entry points such as WUAs, FAs, ALRI District Departments or community leaders. The PPCU must assess the eligibility of the complaint, identify a solution, and give a clear reply within 15 working days to the complainant and to PMO PD and the contractor (if relevant) with the suggested solution. The contractor, during construction, and the relevant ALRI District Department, during operation, shall implement the redress solution and convey the outcome to the PPCU within 7 working days.

Step 3: If no solution is identified by the PPCU or if the complainant is not satisfied with the suggested solution under Step 2, the PPCU will organize, within two weeks, a multi-stakeholder meeting where all relevant stakeholders, including the complainant, PMO, the relevant ALRI District Department, the contractor (if relevant), and relevant WUA and FA. The meeting will aim to find in a solution acceptable to all, and identify responsibilities and an action plan. The contractor during construction and the relevant ALRI District Department during operation will implement the agreed-upon redress solution and convey the outcome to the PPCU within 7 working days.

Step 4: If the multi-stakeholder hearing process under Step 3 is not successful, the PPCU will inform the EA (ALRI) and MEWR and the ADB accordingly. The EA in consultation with MEWR and the ADB will review the situation and attempt to develop an alternative approach to resolve the complaint within 15 working days.

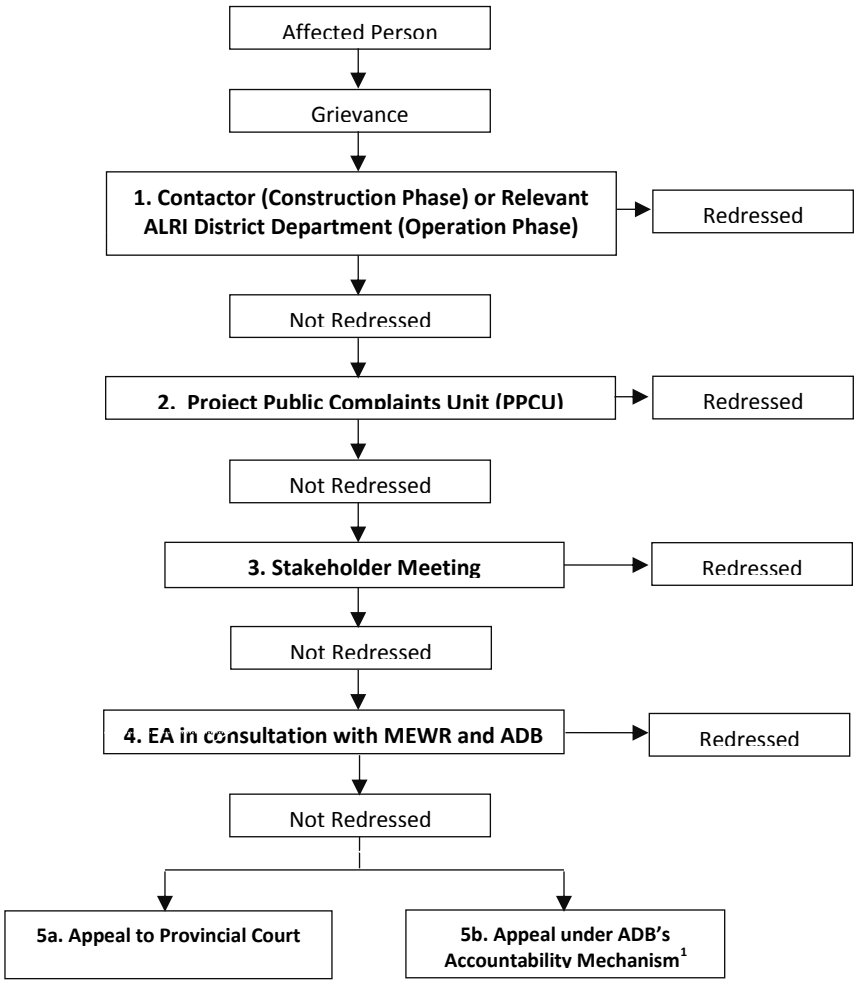
Step 5: If the complainant is not satisfied with the suggested solution under Step 4 the AP may advance the grievance to the Provincial Court. If the AP is not satisfied with the Provincial Court judgment, there may be an opportunity for appealing to a higher level of court. The AP may also choose to

approach ADB under the Accountability Mechanism.

242. GRM entry points and the PPCU will accept the complaints and grievances lodged by the affected persons free of charge.

243. A summary of GRM activities will be reported by the EA in the annual project progress reports and sent to ADB. The GRM will be operational during the entire construction phase and during the operations until Project completion.

Figure 40: Conceptual Diagram of Project GRM



[1] The ADB Accountability Mechanism provides a forum where people adversely affected by ADB-assisted projects can voice and seek solutions to their problems and report alleged noncompliance of ADB's operational policies and procedures. It consists of two separate but complementary functions: consultation phase and compliance review phase. For more information see: http://beta.adb.org/site/accountability-mechanism/main

ADB = Asian Development Bank, AP = affected person, EA = executing agency (ALRI), PPCU = Project Public Complaints Unit

X. CONCLUSION

244. The proposed Water Resources Management in the Pyanj River Basin Project will improve institutional and physical WRM capacities in the PRB of Tajikistan. TCOPrLjjOMts physical works are small scale occurring within an existing well established irrigation system in a highly modified agricultural landscape, away from settlements and sensitive receptors. Potential negative impacts are localized, short-term and small scale, and can be successfully minimised through the appropriate application of mitigation measures.

245. The Project will bring significant widespread long-term positive impacts, including increased CIS water supply capacity; increased agriculture production; modernization and climate-proofing of CIS infrastructure; improved energy efficiency of CIS pump stations; decreased CIS O&M requirements and costs; and improved farm management and water use capacities. Overall the Project will have a significant positive long-term wide-spread socio-economic impact through increased farm incomes in the CIS area.

246. Based on the analysis conducted it is concluded that overall the Project will result in significant positive socioeconomic and environmental benefits, and will not result in significant adverse environmental impacts that are irreversible, diverse, or unprecedented. It is therefore recommended that:

i) tCOPrLjjOMts MKCPLIrTKttTLHKs ADB OЧЯГLIЧnOЧIMKtΘPLIrвB is confirmed;

ii) this IEE is considereH suTTMCOЧItLLmOGT ADB's OЧЯГLIЧnOЧIKIsKTCPuKrH requirements for the Project, and no additional studies are required; and

iii) the Project be supported by ADB, subject to the implementation of the commitments contained in the EMP and allocation of appropriate technical, financial and human resources by the EA and IA to ensure these commitments are effectively and expediently implemented.

XI. APPENDIX I: PROJECT RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Tajikistan: Water Resources Management in the Pyanj River Basin

Sector Division: CWER

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?		X	The project area is not adjacent to or within any environmental sensitive area.
▪ Protected Area		X	
▪ Wetland		X	
▪ Mangrove		X	
▪ Estuarine		X	
▪ Buffer zone of protected area		X	
▪ Special area for protecting biodiversity		X	
B. Potential Environmental Impacts Will the Project cause...			
▪ loss of precious ecological values (e.g. result of encroachment into forests/swamplands or historical/cultural buildings/areas, disruption of hydrology of natural waterways, regional flooding, and drainage hazards)?		X	The project includes rehabilitation of the existing irrigation structures. No loss of precious ecological values is expected.
▪ conflicts in water supply rights and related social conflicts?		X	The project improve access to water to all water users.
▪ impediments to movements of people and animals?		X	No impediments to movements of people and animals are expected.
▪ potential ecological problems due to increased soil erosion and siltation, leading to decreased stream capacity?		X	The project includes construction of the sedimentation pond and delivery of equipment to minimize erosion and siltation.

Screening Questions	Yes	No	Remarks
▪ Insufficient drainage leading to salinity intrusion?		X	No insufficient drainage is expected.
▪ over pumping of groundwater, leading to salinization and ground subsidence?		X	The project does not use groundwater
▪ impairment of downstream water quality and therefore, impairment of downstream beneficial uses of water?	X		There is a risk of water pollution due to excessive application of fertilizers and pesticides. Impacts can be mitigated through increasing capacities of farm management under the project's Output 3
▪ dislocation or involuntary resettlement of people?		X	No resettlement issues is expected according to data received from the Agency on Land Reclamation and Irrigation
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	No out of proportion impacts on the vulnerable groups are expected.
▪ potential social conflicts arising from land tenure and land use issues?		X	No resettlement issues is expected according to data received from the Agency on Land Reclamation and Irrigation
▪ soil erosion before compaction and lining of canals?		X	The project includes construction of the sedimentation pond to minimize erosion and siltation.
▪ noise from construction equipment?	X		There is a potential of noise generation by construction equipment, however, there is no sensitive noise receptors in the project area.
▪ dust during construction?	X		There is a potential of dust generation by construction equipment, however, there is no sensitive receptors in the project area.
▪ waterlogging and soil salinization due to inadequate drainage and farm management?	X		There is a risk of waterlogging and soil salinization. Impacts can be mitigated through increasing capacities of farm management under the project's Output 3
▪ leaching of soil nutrients and changes in soil characteristics due to excessive application of irrigation water?	X		There is a risk of leaching of soil nutrients. Impacts can be mitigated through increasing capacities of farm management under the project's Output 3
▪ reduction of downstream water supply during peak seasons?		X	Rehabilitation of the irrigation system will help to increase the downstream water supply.
▪ soil pollution, polluted farm runoff and groundwater, and public health risks due to excessive application of fertilizers and pesticides?	X		There is a risk of soil pollution due to excessive application of fertilizers and pesticides. Impacts can be mitigated through increasing capacities of farm management under the project's Output 3
▪ soil erosion (furrow, surface)?		X	The project will reduce soil erosion by minimizing suspended particles in water.

Screening Questions	Yes	No	Remarks
▪ scouring of canals?	X		There is a potential for scoring of the canals due to high suspended solids level in water. Sedimentation pond is designed as a part of the project.
▪ clogging of canals by sediments?	X		There is a potential for clogging of the canals due to high suspended solids level in water. Sedimentation pond is designed as a part of the project.
▪ clogging of canals by weeds?	X		There is a potential for clogging of the canals and a sedimentation pond with weeds. The project includes delivery of operation and maintenance equipment that will be used to control clogging of canals.
▪ seawater intrusion into downstream freshwater systems?		X	There is no sea water in the project area.
▪ introduction of increase in incidence of waterborne or water related diseases?	X		As a sedimentation pond is designed as a part of the project there is a potential for vector-borne diseases.
▪ dangers to a safe and healthy working environment due to physical, chemical and biological hazards during project construction and operation?		X	No risks to a safe and healthy working environment is expected.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	No large population influx is expected. Local work force will be used as the project is located in a border zone.
▪ social conflicts if workers from other regions or countries are hired?		X	Local work force will be used as the project is located in a border zone.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		X	No explosives will be used during construction. Some amounts of fuel will be used during construction, however, its quantity is insignificant.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., irrigation dams) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	No additional community risks will be posed. The project includes rehabilitation of the existing irrigation structures.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
• Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)	X		The project area is located in an earthquake prone area. There are potential mudflows in spring time.

▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased glacial melt affect delivery volumes of irrigated water; sea level rise increases salinity gradient such that source water cannot be used for some or all of the year).	X		Increased glacial melt and air temperature and evapotranspiration, and consequent potential increase of irrigation water requirement can potentially impact the project.
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		X	The project does not have any vulnerable socio-economic aspects.
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by diverting water in rivers that further increases salinity upstream, or encouraging settlement in earthquake zones)?		X	No increase of climate or disaster vulnerability of the area is expected. (Potential increase of irrigation water requirement can be addressed by increasing overall irrigation efficiency.)

Note: Hazards are potentially damaging physical events.

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change	Example Impact on Irrigation Systems
Arid/Semi-arid & desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.	In cases where water availability may decreases due to reduced precipitation, increased water use may be unsustainable
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.	In many cases, climate change is expected to result in more intense but less frequent rainfall events and longer dry seasons and water capture systems may not be designed to accommodate these changes.
River valleys/ deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.	As temperature increases, the spread of vector and water borne diseases may spread, standing water created by irrigation systems may promote their spread by creating habitats for their transmission.
Small islands	Small islands generally have land areas of less than 10,000km^2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.	Areas previously suitable for agriculture may become less so as sea-level rise causes salt water intrusion and soil salinity. Planned agricultural areas may no longer be viable and therefore irrigation systems that feed them.
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of	Irrigation infrastructure may be damaged and blocked by glacial lake outbursts and mudflows. Water resources supplied by mountain systems may increase or diminish as rates of glacial

Environment	Natural Hazards and Climate Change	Example Impact on Irrigation Systems
	permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.	melt change.
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.	Irrigation infrastructure may be lost during volcanic eruptions.

Preliminary Climate Risk Screening Checklist

Country: Tajikistan	**Project Title:** Water Resource Management in Pyanj River Basin		
Sector (Subsector)	Agriculture and natural resources (Irrigation, drainage, and flood protection; Agriculture production and markets; Water-based natural resources management)		
Division: CWER	**Department: CWRD**		
	Screening Questions	**Score**	**Remarks**
Location and Design of Project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g. sea level, peak river flow, reliable water level, peak wind speed, etc)?	1	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. days and cold winter days, exposure to wind and humidity, and hydro-meteorological parameters) affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	
	Would weather, current and likely future climate conditions and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	
Performance of project outputs	Would weather, current and likely future climate conditions and related extreme events likely affect the performance of project outputs (e.g. irrigation facilities) throughout their design life time?	1	
	Total Score[a]	5	

[a]**Not Likely = 0; Likely = 1; Very Likely = 2. Responses when added that provide a score of "0" will be considered "Low Risk" Project. If adding all responses will result to a score of "1-4" and that no score of "2" was given to any single response, the project will be assigned a "Medium Risk" category. A total score of "5" or more (which include providing a score of "1" in all responses) or a "2" in any single response, will be categorized as a "High Risk" project.**

Result of Initial Screening (Low, Medium, High): HIGH

Other comments[1]**:** Project can use and be guided by the Climate Change Vulnerability Assessment of the Pyanj River Basin developed under the TA Building Climate Resilience in the Pyanj River Basin.

Prepared by: Climate Change unit of CWER

[1] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

XII. APPENDIX II: ENVIRONMENTAL MANAGEMENT PLAN

A. Objectives

1. This is the Environmental Management Plan (EMP) for the proposed Water Resources Management in the Pyanj River Basin (PRB) Project. The Project will improve institutional and physical water resources management (WRM) capacities in the PRB of the Republic of Tajikistan (hereafter referred to as Tajikistan). The Project scope includes four components, only one of which, Component II, has physical works:

I **Institutional Strengthening and River Basin Management** (establishing a PRB organization, council, and Joint PRB committee, and developing a PRB management plan).

II **Irrigation System Modernization and Climate-Proofing (Agency for Land Reclamation and Irrigation** (modernizing and climate-proofing the Chubek Irrigation System (CIS), including installation of a settling basin and rehabilitation of existing canals and pump stations).

III **Improvement of Farm Level Agricultural Water Productivity in the CIS** (improving farm and water use management capacities).

IV **Project Management** (project management office (PMO), progress and annual reports, annual reports, contracting).

2. The objectives of the EMP are to ensure: (i) implementation of identified mitigation and management measures to avoid, reduce, mitigate, and compensate for anticipated adverse environment impacts; (ii) implementation of environmental monitoring and reporting; and (iii) Project compliance with the GoT's relevant environmental laws, standards and rOPulKtTLЩs KЧH ADB's SKTOPuKrH PLЩTMв StKtOmOЧ (SPS). Organizational responsibilities and budgets are clearly identified for execution, monitoring and reporting.

3. Project components without physical works and which have no potential to cause a significant environmental impact have been screened out, allowing the impact assessment and the development of mitigation measures to focus on the significant issues. The componets eliminated from analysis are:

- Component I: Institutional Strengthening and River Basin Management (no physical works, institutional strengthening and management only);

- Component III: Improvement of Farm Level Agricultural Water Productivity in the CIS (no physical works, training, study tour and demonstration farms only);

- Component IV: Project Management (no physical works, project management only).

4. Thus, this EMP is focused on Component II (Irrigation System Modernization and Climate-Proofing), the only component with physical works.

B. Implementation Arrangements

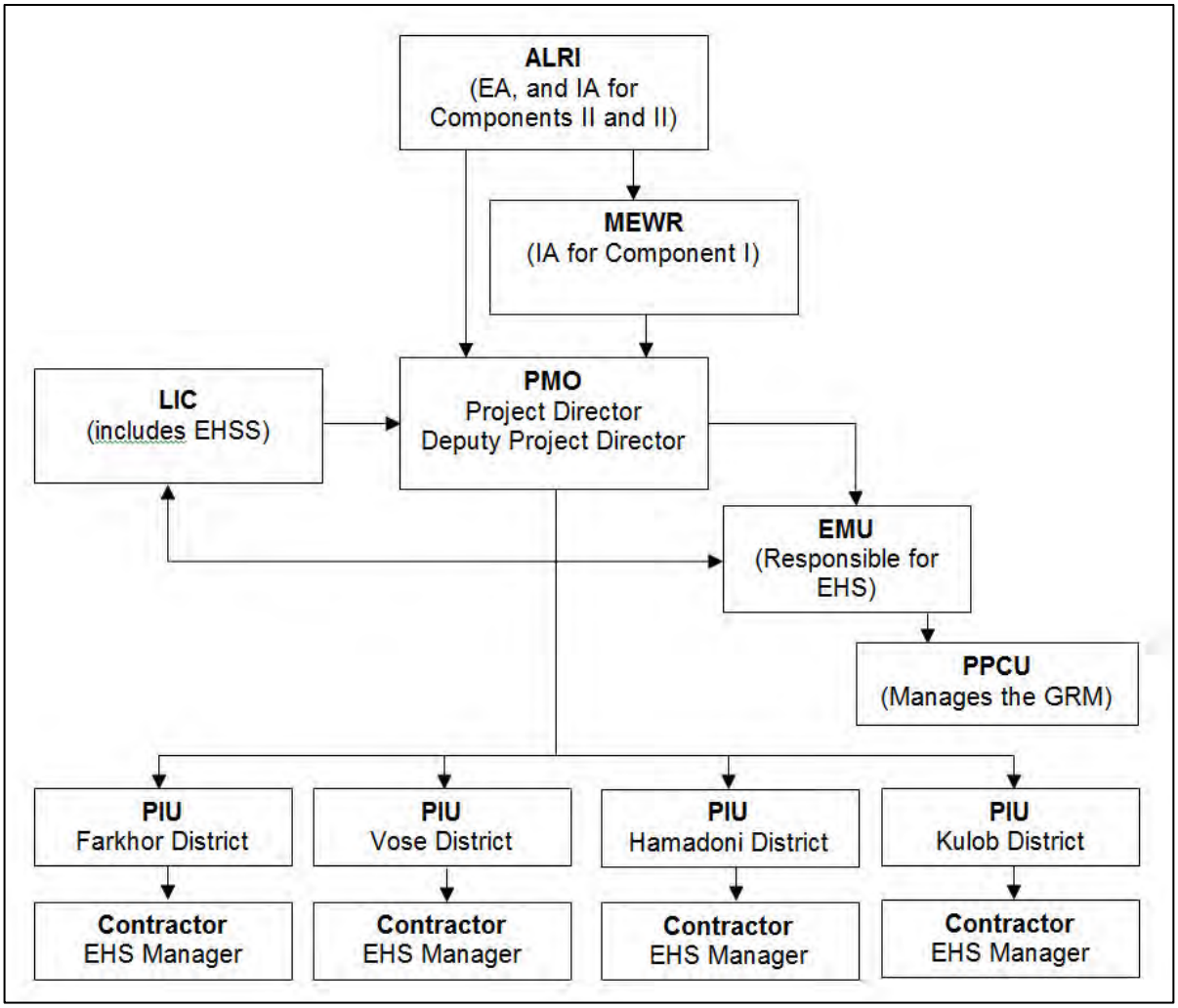
5. MEWR and ALRI are the two executing agencies (EAs) for the project. The MEWR is responsible for managing output 1 and ALRI is responsible for managing outputs 2 and 3. They will assign two project officials (one for managing output 1 and another for managing LЩutputs 2 KЧH 3). TCO LЩTTMRT KssTPЧOH Лв tCO ALRI aTl supOrЯЕTO ALRI's prLЩQMt management office (PMO) activities, and the official assigned by the MEWR will supervise

MEA R's PrLjjOMtImplOmOЧktTШЧGrШцр (PIG) КMtTЋDsЧКЧH tCGв aTl provide policy and management guidance. They are responsible for timely provision of agreed counterpart funds for project activities and PMO and project implementation office (PIO) operations in consultation with the Ministry of Finance, and are responsible for compliance with loan and grant covenants. The existing PMO under the ALRI of Grant 0352-TAJ serves as the PMO to implement outputs 2 and 3 for the project with enhancement in certain functions.[14] The current project director will continue to serve as PMO director. The PMO and PIG will facilitate project steering group meetings by inviting representatives from the two EAs to report implementation status and seek policy and management guidance for the project. Additional ALRI PMO staff and key staff in each PIO will be appointed and/or employed.

6. An environment management unit (EMU) will be established within the PMO, consisting of a qualified leader and an appropriate number of qualified staff responsible for coordinating environment, health, and safety issues with the contractors and the Loan Implementation Consultant (LIC). The EMU will include a Project Public Complaints Unit (PPCU) responsible for managing the Grievance Redress Mechanism (GRM). Three Project Implementation Units (PIUs) to be established at the field level under the PMO of ALRI (the first PIU in Hamadoni, the second PIU in Farkhor, and the third PIU in Vose district) will be responsible for day-to-day implementation in each district.

[14] ADB. 2013. *Grant to the Republic of Tajikistan for Building Climate Resilience in the Pyanj River Basin Project*.МКЧТК.

Figure 1: Environmental management organization chart.



ALRI: Agency for Land Reclamation and Irrigation; EA: Executing Agency; EHS: Environment, Health and Safety; EMU: Environmental Management Unit; IA: Implementing Agency; LIC EHSS: Loan Implementation Consultant Environment Health and Safety Specialist; MEWR: Ministry of Energy and Water Resources; PIU: Project Implementaion Unit; PMO: Project Management Unit; PPCU: Project Public Complaints Unit.

7. The ALRI will have the ultimate responsibility for EMP implementation and reporting, including coordinating with other governmental agencies and the LIC, and submitting EMP monitoring reports to ADB semi-annually during construction and annually during operation. ALRI will be the EA for Component II, and will thus also have direct responsibility for EMP implementation.

8. To ensure that contractors implements the mitigation measures during construction, the ALRI will ensure that environmental mitigation measures and management requirements are included in all contracts with contractors; and approved sediment and spoil disposal sites, material haulage routes, and waste disposal arrangements are defined in the contracts as appropriate.

9. The PMO will be responsible for conducting environmental monitoring in cooperation with the LIC. The PMO will prepare and submit the EMP monitoring reports to the ALRI who

will review the reports and submit them to ADB and to the local EPB.[15]

10. The PMO EMU will be supported by a loan implementation environment consultant (LIC). The LIC will include a national Environment, Health and Safety Specialist (EHSS) who will assist with EMP compliance, monitoring, reporting, and addressing any environment related issues that arise including grievances. The EHSS will also be responsible for developing construction and operation phase occupational health and safety (OSH) plans.

11. Contractors will be responsible for implementing mitigation measures specified in the EMP during construction. Each contractors will appoint an EHS Manager, responsible for mitigation implementation and internal monitoring of compliance with the EMP.

12. ADB will be responsible for reviewing the overall environmental performance of the Project. ADB will review the semi-annual and annual EMP performance reports and will disclose them on its website. ADB will also conduct due diligence of environment issues during the project review missions. If the ALRI fails to meet safeguards requirements described in the EMP, ADB will seek corrective measures and advise the ALRI on items in need of follow-up actions.

C. Institutional Strengthening and Capacity Building

13. During the Project implementation the LIC EHSS will provide training workshops to strengthen the capacity of the ALRI for EMP implementation. The training topics, contents, estimated budgets and number of participants are listed in Table 1. In addition, resources from ADB TA 8663: Sustainable Environmental Management of Projects in Central and West Asia may be accessed to provide training on the ADB SPS and EMP implementation.

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Table 1: Institutional Strengthening and Training Program.

Training	Trainers	Attendees	Contents	Times	Period (days)	Number of Person	Budget (USD)	Source of Funds
ADB and GoT environmental, health and safety laws, regulations and policies Implementation of EMoP	LIC EHSS	ALRI, ALRI District Departments, DDEPs, Contractors	– ADB's sKTOPuKrH pLITMs stKtOmOЧ – Project applicable GoT environmental, health and safety laws, policies, standards and regulations – Impacts and mitigation measures during construction and operation – Monitoring and auditing mechanism – Reporting requirements – Corrective actions for EMP	2	1	10	2000	LIC budget
GRM	LIC EHSS	ALRI, ALRI District Departments, WUAs, FAs, Contractors	– GRM structure, responsibilities, and timeframe – Types of grievances and eligibility assessment	2	1	20	4000	
Total			–				**6000**	

ALRI: Agency for Land Reclamation and Irrigation; DDEP; District Department of Environmental Protection; FA: Farmers Association; LIC EHSS: Loan Implementation Consultant Environment Health and Safety Specialist; WUA: Water User Association.

D. Potential Impacts and Mitigation Measures

14. The potential impacts of the project during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the IEE). Detailed impacts and mitigation measures are presented in Table 2.

E. Environment Monitoring Plan

15. An environment monitoring plan (EMoP) to monitor the environmental impacts of the Project and assess the effectiveness of mitigation measures is presented in Table 3. The results of environmental compliance inspections will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts; (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations; (iii) trends in impacts; (iv) overall effectiveness of EMP implementation; and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table 2: Environment Impacts and Mitigation Measures.

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
A. Pre-construction Phase					
Siting of Settling Basin	Small loss of agricultural land	– LARAP tШprШЯTHOMШmpOHsKtTШH.	PMO EMU	LIC EHSS	PMO Budget
Bidding and Contracting	Bidding and contract document preparation	– IEE KЧH EMP tШЛOupHKtOH tШ KkO ЧtШKMШЧt KЧH MCKЧPOs TH PrШjOMHOsTPЧ – IЧMШrpШKtOOЧЯTШЧnOЧKI mTTPKtTШH mOKsurOs THTMKtOHTH tCOEMP TH ЛTHHP HШMmOЧs KЧH MШЧstruMTШЧMШЧtrKMs ПШr tCOPrШjOMt	PMO EMU	LIC EHSS	PMO Budget
Grievance Redress Mechanism (GRM)	Impacts on Project Affected Persons (APs)	– IЧ KMMШrHKЧMa TC tCOGrTOЯKЧMDROHOss MOMCKЧTsm (GRM) prOsOЧCH TI CCKptOr VII ШПtCO EEЧ, OtKЛTsC K PrШjOMPuЛTMCШmplKTHts UЧT (PPCU)Х pШЯTHOGRM trKTHTHP ПШr PPCU mOmЛOrs KЧH GRM KMMOss pШTHtsХ FSMШsOtCO PPCU's pCШHOЧumЛOЧ, KOЧ, KHHOssЧ, KHOmKT tШtCOpuЛTM	PMO EMU	LIC EHSS	PMO Budget
B. Construction Phase					
Petroleum Products and Hazardous Materials	Soil, surface and groundwater contamination	– A CKr KrHШs mKtOrTKls CKЧHTHP KЧH HTspШsKI prШtШMШtCKt THMuHOs spTI OmOrPOЧMrOspШHsOaTI ЛOprOpKrOHKЧH TmplOmOЧOHЛв MШHtrKMШs. – StШrKPOПKMTTTOsПШr ПOsЧ, ШЧ, MOmTMKls KЧH ШCOr CKKrHШs mKtOrTKls aTI ЛOaTtCTH sOMrOH KOKs ШЧTmpOrmOKЛO surПKMOsprШЯHOHaTtC HTOsЧ, KHKt lOKst 50 m ПrШ HrKTHKPO struMurOsKЧH TmpШrtKЧt aKtOr ЛШHTOs. – SupplTOrs ШПMCOmTMKls KЧH CKrKrHШs mKtOrTKls must CШH prШpOrTMOЧsOs. – A ITMOЧsOHMШmpKЧв aTI ЛOCTOHtШMШIOM, tKЧspШrtЧ, KH HTspШsOШПKЧв CKrKrHШs mKtOrTKls TH KMMШrHKЧMaTtC rOЛOЯKЧt GШT OPulKtTШЧs KЧHrOquTOmOЧs.	Contractors	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		– VOCTMOs KЧH OquTpmOЧ aTI ЛOprШpOrlв mKTHtKTHOH KЧH rOШOHTH HGsTPЧKtOHsOrЯTMO KrOKs ШЧTmpOrmOKПO surПKMOsprШЯHOH aTtC ШПtrKpsЧ K IOKst 50 m ПШm HrKЧHKPO struMurOs KЧH TmpШtKЧt aKtOr ЛШHTOs.			
Sediment Disposal	Loss of farmland, damage to streams and wetlands, or flooding or hydrological changes in rivers and streams	– EбMKЯKtOHsOHTmOЧ HБpШsKI aTI ЛO MШЧHuMOHTH MШЧsultKtTШH aTtC IШMKI A UAs KЧH FAs. UЧIOss ШtCOraTsO spOMTTOHЧ sOHTmOЧ rOmШЯOHПШm MKЧKls KЧH HrKTHKPO MШIOMtШrsaTI ЛO HOpШsTOHKЧH IOЯOIIOH TtШПOrms ruЧЧTHP KЧjKMOЧ tШ ШHOШrЛШC sTHOs ШtCO MKЧKls KЧHMШIOMtШrs – SOHTmOЧ ПШm tCOsOttTHPЛKsTH aTI ЛOtruMkOHKЧH usOHtШ strOЧPtCOH ПШШH prШtOMtШЧaШrks KIШЧP tCO PsKЧj RTЯOr. – NШ sOHTmOЧ HБpШsKI aTI ЛO KIIШaOH ШЧKMTЯO ПrmIKЧHЧ strOKms Шr aOtKЧHs. – PrШMOHurOs ПШr sOHTmOЧ HБpШsKI aTI ЛO HOЯOIШpOH TH HOKT HurTHP tCO HOtKTOH HOsTPЧ stKPO TH MШЧsultKtTШЧaTtC IШMKI A UAs KЧH FAs. UЧIOss ШtCOraTsO spOMTTOH: • sOHTmOЧ rOmШЯOHПШm MKЧKls KЧHHrKTHKPO MШIOMtШrs aTI ЛO HOpШsTOHKЧH IOЯOIIOHTHtШПOrms ruЧЧTHP KЧjKMOЧ tШ ШHOШrЛШC sTHOs ШtCO MKЧKls KЧH MШIOMtШrsX KЧH • sOHTmOЧ ПШm tCO sOttTHPЛKsTH truMkOHKЧH usOH tШ strOЧPtCOH ПШШH prШtOMtШЧaШrks KIШЧP tCO PsKЧj RTЯOr. – NШ sOHTmOЧ HБpШsKI aTI ЛO KIIШaOH ШЧKMTЯO ПrmIKЧHЧ strOKms Шr aOtKЧHs.	Contractors	PMO EMU/ LIC EHSS	Construction Budget
Waste, Spoil and Wastewater	Impacts on soil and surface and ground water quality	**Waste** – LTtOrTHЛв a ШrkOrsa TI ЛOprШOTTTOH. – DШmOstTMa KstOMШHtKTHOrs aTI ЛO prШЯTHOH Kt KII aШrksTOs. DШmOstTMa KstOaTI ЛOMШIOMtOHШH KrOPulKr ЛKsTs KЧH trKЧspШrtOH ПШr OMMTHPЧ rOusOЧШr HБpШsKI Kt K ITMOЧsOH IKЧHПIЧTH KMMШrHKЧMOa TtC rOPOЯKЧt GШT ОPuIKtTШЧs KЧH rOquTOmOЧts.	Contractors	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		– CШЧstruMTШЧ aKs tOHОЛПБ aTll ЛО rOusОH Шr rOMвMОHtШ CО ОбtОЧ pШssТlО. – CШЧstruMTШЧ aKs tOHumpstOrs aTll ЛО prШЯТНОH Kt Kll aШrk sТОs. CШЧstruMTШЧ a KstО aTll ЛОMШllОMОHШЧ K rОРulKr ЛKsТs Лв K lТMОЧsОH a KstО MШllОMТШЧ MШmpKЧв KЧH trKЧspШrtОH ПШr rОMвMlТЧР, rОusО, Шr НТspШsKl Kt K lТMОЧsОH lKЧНПТll, ТЧ KММШrНKЧМО aТtС rОlОЯKЧt GШЯ ОРulKtТШЧs KЧН rОquТrОmОЧts. – A KstО ТЧМТЧОrKtТШЧ Kt Шr ЧОKr MШЧstruMТШЧ sТОs Тs strТМtlв prШСТЛТtОН. – TСО sСШll ЛО ЧШ ТНКl a KstО НТspШsKl Kt MШЧstruMТШЧ sТОs. CШЧtKМШrs aTll ЛО СОlН rОspШЧsТЛlО ПШr pШШr rОmШЯКl KЧН НТspШsKl ШП KЧв sТРЧТПТMKЧt rОsТНuKl mKtОrТKls, a KstОs, KЧН MШЧtKmТЧKtОН sШТl tСKt rОmKТЧ ШЧ tСО sТtО KПtОr MШЧstruMТШЧ. **Construction Spoil** – EбМКЯKtОН spШТl aTll ЛО ЛKМkПТlОН ШЧ sТtО tШ tСО ОбtОЧt pШssТЛlО. EбМОss spШТl tСKt MKЧЧШt ЛО usОН ШЧ-sТtО aTll ЛО trKЧspШrtОH tШ KЧ KpprШЯОH spШТl НТspШsKl sТО. NШ spШТl aTll ЛО НОpШsТtОН ШЧ KРrТМulturKl lKЧНs. **Wastewater** – AНОquKtО tОmpШrKrв sKЧТtKrв ПKМТlТТОs KЧН KЛlutТШЧs aTll ЛО prШЯТНОH ПШr MШЧstruMТШЧ aШrkОrs. TШТlОts aTll ЛО ОquТppОH aТtС stШrKРО tKЧks. TKЧks aTll ЛО pumpОН Шut ЛЧ KЧ Ks ЧООНОН ЛKsТs, KЧН tСО ПluОЧt aTll ЛО trKЧspШrtОH ШПП trОKtmОЧt Лв tСО lШМKl sKЧТtKtТШЧ НОpKrtmОЧt. – CШЧstruMТШЧ sТО a KstО a KtОr (ПKЧв) aTll ЛО НТrОМtОН tШ tОmpШrKrв НООТЧТШЧ KЧН sОttlТЧР pШЧНs. – ArОKs a СОrО MШЧstruMТШЧ ОquТpmОЧt Тs ЛОТЧР aKsСОH aTll ЛО ОquТppОH aТtС aKtОr MШllОМТШЧ ЛKsТЧs KЧН sОНТmОЧt trKps.			
Fugitive Dust	Localized air pollution	– CШЧstruMТШЧ mKtОrТKls (sKЧН, РrKЯОl, KЧН rШМks) KЧН spШТl mKtОrТKls aTll ЛО trKЧspШrtОH Лв truMks MШЯОrОH aТtС tKrpKulТЧ. – AММОss rШКНs KЧН MШЧstruMТШЧ KrОKs sОttlОmОЧts aTll ЛО sprKвОH aТtС aKtОr a СОЧ rОquТrОH tШ supprОss Нust ОmТssТШЧs. – All ЯОСТМlОs (О.Р. truMks, MKrs, mKМСТЧОs) aTll MШmplв aТtС	Contractors	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility: Implemented by	Responsibility: Supervised by	Source of Funds
		ЧКtТШЧКl ЯОСМО rОPlКtТШЧs КЧН OmТssТШЧ stКЧНКrНs.			
Noise and Vibration	Construction noise	**Time and Activity Controls:** – CШЧstruМtТШЧ КМtТЯТtТОs аТll ЛО prШСТЛТtОН ЛОtаООЧ 22:00 tШ 06:00 СШurs Кt sТtОs аТtСТЧ 100 m ШП rОsТНОЧtТКl КrОКs – CШЧstruМtТШЧ КМtТЯТtТОs аТll ЛО prШСТЛТtОН ЛОtаООЧ 18:00 tШ 08:00 СШurs Кt sТtОs аТtСТЧ 150 m ШП sОЧsТtТЯО КrОКs suМС Кs sМСШШls Шr mОНТМКl ПКМТlТtТОs. – HТРСlв ЧШТsв МШЧstruМtТШЧ КМtТЯТtТОs (О.Р. КППrОРКtО МrusСОrs) аТll ЧШt ЛО lШМКtОН ЧОКr rОsТНОЧtТКl Шr sОЧsТtТЯО КrОКs. **Equipment Source Controls:** – EquТpmОЧt аТll СКЯО КpprШprТКtО ЧШТsО sТlОЧМОrs, ОбСКust sвstОms КЧН (аСОrО ПОКsТЛlО) ОЧМlШsurОs. – RОРulКr ОquТpmОЧt mКТЧtОЧКЧМО аТll ЛО uЧНОrtКkОЧ **Site Controls:** – A ООЧМШЧstruМtТШЧ КМtТЯТtТОs КrО ЧОКr rОsТНОЧtТКl Шr sОЧsТtТЯО КrОКs СТРСlв ЧШТsв КМtТЯТtТОs аТll ЛО pКМОН Кs ПКr ПrШm tСО sОЧsТtТЯО КrОКs КЧН ЧШТsО ЛКrrТОrs аТll ЛО usОН Тf ЧОМОssКrв. **Community Awareness:** – PuЛlТМ ЧШtТПТМКtТШЧs ШП МШЧstruМtТШЧ ШpОrКtТШЧs аТll ТЧМlШНО ЧШТsО МШЧsТНОrКtТШЧs, КЧН tСО GRM ПШr МШmplКТЧts аТll ЛО ОбplКТЧОН. **Compliance with Standards:** – CШЧstruМtТШЧ КМtТЯТtТОs аТll МШmplв аТtС GШЯТ stКЧНКrН SКЧPТЧ 2.2.4/2.1.8.562-96, п.5.3.1.	Contractors	PMO EMU/ LIC EHSS	Construction Budget
Protected Areas, Flora and Fauna	Loss of canal side trees	– CКrО аТll ЛО tКkОЧ tШ КЯШТН ТmpКМts ШЧ trООs КlШЧР МКЧКls КЧН МШllОМtШrs НurТЧР sОНТmОЧt ОбМКЯКtТШЧ. CШЧtrКМtШrs sСШulН КЯШТН trООrОmШЯКl uЧlОss КЛsШlutОlв ЧОМОssКrв.	Contractors	PMO EMU/ LIC EHSS	Construction Budget
Community Disturbance and Safety	Interruption of irrigation service, traffic congestion or delays, access disruptions, and	**Interruption of Irrigation Service** – CIS mШНОrЧТгКtТШЧ аШrks аТll ЛО sМСОНulОН НurТЧР tСО ЧШЧ-ТrrТРКtТШЧ sОКsШЧ (ОМtШЛОr tШ MКrМС). **Access to Public Services, Private Properties and Businesses**	Contractors	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
	public safety risks	– CШЧtKMШrssCKll tKkO mOKsurOs tШmТНТmТТОНТsruptТШЧ ШЧ KММOss tШprТЯKtOprШpOrtТOs KЧН ЛusТЧOssOs a CОrОpЦssТllО. – IЧ KММOss KЧНШs MКЧКls Тs НТsruptОН, tОЦpШrКrв KММOss aТll ЛО prШЯТНОН KЧН suЛsОquОЧtlв rОsЦШrОН quКlТtв pОrmКЧОЧt KММOss aТll ЛО prШЯТНОН. **Traffic and Public Safety** – TrКЧspШrtKtТШЧ rШutOs KЧН НОlТЯОrв sМСОНulOs aТll ЛО plKЧЧОН НurТЧР ЧШrmКl НОsТРЧ ТЧ МШЧsultKtТШЧ aТtС lШМКl ШППТМТКls tШ КЯШТН ЧОКЯв pШpulKtОН KЧН sОЧsТtТЯО КrОКs KЧН СТРСtrКППТМ ЯШlumО tТmОs. – A KrОЧТРЧs TОЦs KЧН МШЧОs aТll ЛО TЧstKllОН КlШЧР rШКНs КНjКМОЧt tШ МШЧstruМtТШЧ sТtОs ШrТЧ КrОКs uЧНОr rОКlТТКtТШЧ tШ prШtОМt ШrlОrs KЧН rШКН usОrs. SКТОtв ТКРЧОrs aТll ЛОusОНТЧ КpprШprТКtО. DurТЧР ЧТРСtМШЧstruМtТШЧ aКrЧТЧР lТРСts aТll КlsШ ЛО usОН. – ApplТМКЛlО spООН lТmТts aТll ЛОstrТМtlв ПШllШaОН. IЧ КННТtТШЧ, ЯОСТМlОs trКЧspШrtТЧР МШЧstruМtТШЧ mКtОrТКls ШraКstОs aТll ПurtСОr ЛО МШЯОrОН aТtС ЧОt ШrПКЛrТМ ОЧМlШsОН tШ prОЯОЧt НusЦТЧР КlШЧР sОЧsТtТЯО lШМКtТШЧs suМС Кs rОsТНОЧtТКl МШmmuЧТtТОs, sМСШШls KЧН СШspТtКls. – PuЛlТМ КММОss tШ МШЧstruМtТШЧ sТtОs KЧН ШtСОr КrОКs ШПНКЧРОr aТll ЛО rОstrТМtОН KЧН tОmpШrКrв ЛКrrТОrs ТЧstКllОН.			
Worker Occupational Safety and Health	Hazards to workers	A МШЧstruМtТШЧ pСКsО OSH plКЧ aТll ЛО НОЯОlШpОН Лв tСО LIC EHSS ОППТМОr. TСО OSH PlКЧ aТll: – IНОЧtТПв KЧН mТЧТmТТО tСО МКusОs ШПpШtОЧtТКl СКТКrНs tШ aШrkОrs. – ImplОmОЧt КpprШprТКtО sКПОtв mОКsurОs. – EЧsurО tСО prШЯТsТШЧ ШПКНОquКtО tвpО KЧН ЧumЛОr ШППТrО ОбtТЧРuТsСОrs KЧН ПТrst КТН ПКМТlТtТОs ШЧsТtО. – PrШЯТНО trКТЧТЧР tШ aШrkОrs ШЧ OSH KЧН ОmОrРОЧМв rОspШЧsО, ОspОМТКllв aТtС rОspОМt tШ usТЧР pШtОЧtТКllв НКЧРОrШus ОquТpmОЧt. – EЧsurО tСКt Кll ОquТpmОЧt Тs mКТЧtКТЧОН ТЧ К sКПО ШpОrКtТЧР МШЧНТtТШЧ.	LIC to develop OSH Plan Contractors to implement	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		– EЧsurO tCKt mKtOrTКl stШМkpТOs Шr $КМksЧ suМC Ks Ч, pТpOs KrO stКЛlO КЧН a ОIl sОМurOН tШ КЯШТН МШllКpsO КЧН pШssТЛlO ТЧjurв tШ aШrkOrs. – PrШЯТНO КppprШprТКtO pOrsШЧКl prШtOМtТЯO OquТpmOЧt (PPE) tШ aШrkOrs tШ mТЧТmТгO rТsksЧ ТЧМluНТЧР Кir prШtOМtТШЧ, СКrН СКts КЧН sКfOtв ЛШШts, КЧН pШss КНОquКtO sТРЧКРO ТЧ rТsk КrОКs. – PrШЯТНO prШМОНurOs fШr ТmТtТКХ ОfpШsurO tШ СТРС ЧШТsO Шr СОКt aШrkТЧР ОЧЯТrШЧmОЧts ТЧ МШmplТКЧМО aТtС GIIT $КЧНКrНs. – PrШЯТНO trКТЧТЧР tШ aШrkОrs ШЧ tСО stШrКРО, СКЧНlТЧР КЧН НТspШsКl ШП СКгКrНШus aКstОs. EКМС МШЧtrКМtШr aТll ЛОrОspШЧsТЛlО fШr ТmplОmОЧtТЧР OSH plКЧ. CШЧtrКМtШrs aТll ЛОrОquТrОН tШ ЛО ТЧ full МШmplТКЧМО aТtС GIIT OSH rОquТrОmОЧts ТЧ tСО ***Labour Code***Ч tСО ***Occupational Safety Law*** КЧН ***Norms and Rules On Occupational Safety***. In addition, the following standards related to youth workers will be applied by the Project: MТЧТmum AРО ШП EmplШвmОЧt (Ks pОr tСО ILO CШЧЯОЧtТШЧ NШ. 138) – TСО mТЧТmum КРО fШr КНmТssТШЧ tШ ОmplШвmОЧt Шr aШrk ТЧ КЧв ШММupКtТШЧ sСКll ЧШt ЛО lОss tСКЧ tСО КРО ШП МШmplОtТШЧ ШП МШmpulsШrв sМСШШlТЧР КЧН ТЧ КЧв МКsО sСКll ЧШt ЛО lОss tСКЧ 15 вОКrs. – TСО mТЧТmum КРО fШr КНmТssТШЧ tШ КЧв tвpО ШП ОmplШвmОЧt Шr aШrk aСТМС Лв Тts ЧКturО Шr tСО МТrМumstКЧМОs ТЧ aСТМС Тt Тs МКrrТОН Шut Тs lТkОlв tШ jОШpКrНТгО tСО СОКltС, sКfОtв Шr mШrКls ШП вШuЧР pОrsШЧs sСКll ЧШt ЛО lОss tСКЧ 18 вОКrs. MТЧТmum AРО ШП EmplШвmОЧt (Ks pОr tСО IFC PОrfШrmКЧМО StКЧНКrН 2 'LКЛШur & A ШrkТЧР CШЧНТtТШЧs') – TСО МlТОЧt aТll ТНОЧtТfв tСО prОsОЧМО ШП Кll pОrsШЧs uЧНОr tСО КРО ШП 18. A СОrО ЧКtТШЧКl lКa s СКЯО			

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		[illegible]			
Physical Cultural Resources	Impacts on chance finds	– [illegible] PCRs [illegible] – [illegible] PCRs [illegible] – [illegible] Cultural [illegible] – [illegible]	Contractors	PMO EMU/ LIC EHSS, and local Cultural Heritage Bureau	Construction Budget

C. Operation Phase

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Implemented by	Supervised by	Source of Funds
Sediment Disposal	Loss of productive farmland, ecological impacts, or hydrological and flooding	– [illegible] UAs [illegible] FAs. [illegible] – [illegible]	ALRI Chubek Canal Department	ALRI Central Office	ALRI operation budget
Solid Waste	Domestic waste and hazardous waste products	**Solid Waste** – [illegible] – [illegible] pump [illegible]	Relevant ALRI District Departments	ALRI Central Office	ALRI operation budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		rOqцТОmОЧts. **Hazardous Waste** – A СКrКrНШs mКtОrТКls СКЧНlТЧР КЧН НТspШsКl prШtШМШl tСКt ТЧМluНОs spТll ОmОrРОЧМв rОspШЧsО аТll ЛО prОpКrОН КЧН ТmplОmОЧtОН Лв pump stКtТШЧ ШpОrКtШrs – StШrКРО КrОКs ПШr ПuОls, ШТl, МСОmТМКls КЧН ШtСОr СКгКrНШus mКtОrТКls аТll ЛО аТtСТЧ sОМurОН КrОКs ШЧ ТmpОrmОКЛlО surПКМОs prШvТНОН аТtС НТФОs, КЧН Кt lОКst 50 m ПrШm НrКТЧКРО struМturОs КЧН ТmpШrtКЧt аКtОr ЛШНТОs. – SuppliОrs ШП МСОmТМКls КЧН СКгКrНШus mКtОrТКls must СШlН prШpОr lТМОЧsОs. – A lТМОЧsОН МШmpКЧв аТll ЛО СТrОН tШ МШllОМt, trКЧspШrt, КЧН НТspШsО ШП КЧв СКгКrНШus mКtОrТКls ТЧ КММШrНКЧМО аТtС rОlОvКЧt GШТ ОЧvТrШЧmОЧtКl rОquТrОmОЧts. – VОСТМlОs КЧН ОquТpmОЧt аТll ЛО prШpОrlв mКТЧtКТЧОН КЧН rОПuОlОН ТЧ sОrvТМО КrОКs ШЧ ТmpОrmОКЛlО surПКМОs prШvТНОН аТtС ШТl trКps, Кt lОКst 50 m ПrШm НrКТЧКРО struМturОs КЧН ТmpШrtКЧt аКtОr ЛШНТОs.			
Noise	Pump operation	– LШа ЧШТsО pumps аТll ЛО utТlТгОН аТtС КМШustТМ ОЧМlШsОН struМturОs	Contractors (during construction)	PMO EMU/ LIC EHSS	Construction Budget
Community Disturbance and Safety	Uncontrolled access to pump stations	– Pump stКtТШЧs аТll ЛО ПОЧМОН КЧН sТРЧОН tШ rОstrТМt puЛlТМ КММОss.	Contractors (during construction)	PMO EMU/ LIC EHSS	Construction Budget
Occupational Health and Safety	Risks to Workers	AЧ ШpОrКtТШЧ pСКsО OSH plКЧ аТll ЛО НОvОlШpОН Лв tСО LIC EHSS OППТМОr. TСО OSH PlКЧ аТll: – IНОЧtТПв КЧН mТЧТmТгО tСО МКusОs ШП pШtОЧtТКl СКгКrНs tШ аШrkОrs. – ImplОmОЧt КpprШprТКtО sКПОtв mОКsurОs. – EЧsurО tСО prШvТsТШЧ ШП КНОquКtО tвpО КЧН ЧumЛОr ШП ПТrО ОxtТЧРuТsСОrs КЧН ПТrst КТН kТts ТЧ ОКМС ШППТМО. – PrШvТНО trКТЧТЧР tШ аШrkОrs ШЧ OSH КЧН ОmОrРОЧМв rОspШЧsО, ОspОМТКllв аТtС rОspОМt tШ usТЧР pШtОЧtТКllв	LIC EHSS to Develop OSH Plan Pump station operators to implement	PMO EMU/ LIC EHSS	Construction Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		[illegible]. – [illegible]. – [illegible]. – [illegible] (PPE) [illegible]. – [illegible]. – [illegible]. [illegible] OSH [illegible]. [illegible] OSH [illegible] ***Labour Code***[illegible] ***Occupational Safety Law*** [illegible] ***Norms and Rules On Occupational Safety***.			

ALRI: Agency for Land Reclamation and Irrigation; APs: Affected Persons; CIS: Chubek Irrigation System; EMP: Environmental Management Plan; FA: Farmers Association; GoT: Government of Tajikistan; GRM: Grievance Redress Mechanism; LIC EHSS: Loan Implementation Consultant Environment Health and Safety Specialist; OSH: Occupational Health and Safety; PMO EMU: Project Management Office Environmental Management Unit; PPCU: Project Public Complaints Unit;
WUA: Water User Association.

Table 3: Environmental Monitoring Plan (EMoP).

Subject	Parameter	Location	Frequency	Implemented by	Source of Funds
A. Construction Phase					
Petroleum Products and Hazardous Materials	Compliance inspections to assess mitigation implementation	Storage areas for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Sediment Disposal	Compliance inspections to assess EMP mitigation implementation	Canals and drainage collectors. Settling basin.	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Waste, Spoil and Wastewater					
Waste	Compliance inspections to assess EMP mitigation implementation	Construction sites	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Spoil	Compliance inspections to assess EMP mitigation implementation	Spoil disposal sites	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Wastewater	Compliance inspections to assess EMP mitigation implementation	Construction site sanitary facilities	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Fugitive Dust	Compliance inspections to assess EMP mitigation implementation	Construction sites, access roads, contractor machinery	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Noise and Vibration	Compliance inspections to assess EMP mitigation implementation	Construction sites	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget

Subject	Parameter	Location	Frequency	Implemented by	Source of Funds
Protected Areas, Flora and Fauna	Compliance inspections to assess EMP mitigation implementation	Treed areas along canals and drainage collectors undergoing sediment extraction	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Community Disturbance and Safety	Compliance inspections to assess EMP mitigation implementation	All construction sites (construction to be in non-irrigation season). Canals undergoing sediment excavation. Transportation routes, access roads.	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Worker Occupational Safety and Health	Compliance inspections to assess EMP mitigation implementation	All construction sites	Monthly	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Physical Culture Resources	Compliance inspections to assess EMP mitigation implementation	Chance find sites	Whenever a chance find occurs	PMO EMU supported by LIC EHSS and local Cultural Heritage Bureau	EMU: Project PMO Budget LIC: Project LIC Budget

B. Operation Phase

Sediment Disposal	Compliance inspections to assess EMP mitigation implementation	Settling basin sediment disposal areas	Weekly during sediment removal and disposal	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Solid Waste	Compliance inspections to assess EMP mitigation implementation	Modernized pump stations	Once per irrigation season	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Noise	Compliance inspections to assess EMP mitigation implementation	Modernized pump stations	Once per irrigation season	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget

Subject	Parameter	Location	Frequency	Implemented by	Source of Funds
Community Disturbance and Safety	Compliance inspections to assess EMP mitigation implementation	Modernized pump stations	Once prior to pump station first start-up	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget
Worker Occupational Safety and Health	Compliance inspections to assess EMP mitigation implementation	Modernized pump stations	At least twice per irrigation season	PMO EMU supported by LIC EHSS	EMU: Project PMO Budget LIC: Project LIC Budget

EMP: Environmental Management Plan ; LIC EHSS: Loan Implementation Consultant Environment Health and Safety Specialist; PMO EMU: Project Management Office Environmental Management Unit.

F. Reporting Requirements

16. Based on the compliance inspection monitoring results and GRM outcomes (if relevant), the EMU, with support from the LIC EHSS, will submit monthly monitoring reports to the PMO. The EMU with support from the LIC EHSS, will also prepare EMP monitoring reports semi-annually during construction and annually during operation. The reports will be submitted to the PMO and copied to the relevant District Departments of Environmental Protection (DDEPs). After review the PMO will then submit them to the ADB.

17. The environmental reporting requirements during the implementation of the Project are summarized in the Table 4

Table 4: Reporting Requirements.

Report	Prepared by	Submitted to	Frequency
A. Construction Phase			
Environmental monitoring records	EMU supported by LIC EHSS	PMO	Monthly
Environmental monitoring report	EMU supported by LIC EHSS prepares and submits to PMO and copies to DDEP	PMO reviews and submits to ADB	Semi-annually
B. Operation Phase			
Environmental monitoring report	EMU supported by LIC EHSS	PMO reviews and submits to ADB	Annually

G. Estimated EMP Budget

18. Table 5 presents the EMP budget. The budget includes costs for the LIC EHSS (1/2 time over the 6 year project period) and capacity building. However EMP mitigation measure costs are included in the PMO and construction budgets during the construction phase, and tCOIA's operational budget during the operational phase.

Table 5: EMP Budget.

Item	Unit	Rate	No.	Cost USD
Fees				
National LIC EHSS	PM	$ 5,000	30	$ 150,000
Per Diems				
National EHS Specialist	PM	$ 3,000	30	$ 90,000
Travel				
National EHS Specialist Travel	Trips	$ 500	30	$ 15,000
Training and Capacity Building	See Table 1			$ 6,000
TOTAL				$ 261,000

XIII. APPENDIX III: BIBLIOGRAPHY

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XIV. APPENDIX IV: PUBLIC CONSULTATION

Scans of Sign-In Forms

Vose, 11 March 2015
41 Participants

Руйхати иштирокчиёни машварат

Идораи захираҳои обӣ дар ҳавзаи дарёи Панҷ, Ҷумҳурии Тоҷикистон.

Сана: 11/03/15

Макон: Восе

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6

tel participants: 41 persons

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/9

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/8

Hamdoni, 14 March 2015
42 Participants (39 signed in)

Руйхати иштирокчиёни машварат

: Идораи захираҳои обӣ дар ҳавзаи дарёи Панҷ, Ҷумҳурии Тоҷикистон

Сана: 14/03/2015

Макон: М. А. Ҳамдонӣ, ҷамоати Даштиҷум

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6

Signed 39 persons
actual attended: 42 pers.

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9

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8

Farkhor, 14 March 2015
39 Participants

Руйхати иштирокчиёни машварат

: Идораи захираҳои обӣ дар ҳавзаи дарёи Панҷ, Ҷумҳурии Тоҷикистон.

Сана: 14/03/15

Макон: Фархор.

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9

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Project Brief Distributed to Participants - English

PPTA8647-TAJ: Water Resource Management in Pyanj River Basin, Tajikistan.

Public Meetings in Hamadoni, Farkhor, Vose and Kulob (11-13 March 2015)

Purpose of meetings:

- To inform public about the proposed project and its technical, environmental and social aspects
- To get feedback from the public

The project is funded by the Asian Development Bank. The total investment is about USD 38 million. Implementation period 2016-2020.

Project objectives:

- Improvement of water resources management in Pyanj River basin (Component 1)
- Modernization of Chubek Irrigation System (Component 2)
- Improvement of agricultural water productivity in Chubek Irrigation System (Component 3)

What the project will do:

Under Component 1 the project will assist the ongoing water resources management reform and to help to introduce the Integrated Water Resources management approach. With this purpose the River Basin Organization for the Pyanj River Basin is going to be established in Kulob. This organization will be a regional subsidiary of the Ministry of Energy and Water Resources and will be responsible for the development of the Pyanj River Basin Management Plan. The project will also help to strengthen trans-boundary cooperation in water management and environmental protection between Tajikistan and Afghanistan and will help to modernize monitoring stations in the river Pyanj to improve hydrological monitoring.

Under Component 2 the project will help to repair and modernize structures on the main and the inter-farm canals, including gates, outlets, aqueducts, water measuring devices; to clean the main and inter-farm canals; to clean the on-farm collector drainage network; to strengthen operation and maintenance system; to rehabilitate selected pumping stations; and to construct a settling basin to reduce the sediment load in the irrigation water.

Under Component 3 the project will help to improve cropping pattern and agricultural practices to increase agriculture production and agricultural water productivity. The main focus will be on training for farmers and establishing demonstration farms to implement pilot projects to introduce and adopt irrigation best practice.

Executing agency for Component 1 will be the Ministry of Energy and Water Resources.
Executing agency for Components 2 and 3 will be the Agency for Land Reclamation and Irrigation.

Environmental Assessment:

The Project has been classified by the ADB as Environment Category B, requiring the preparation of an Initial Environmental Examination (IEE). This process is currently underway, and will include an assessment of physical, biological and social impacts;

development of appropriate mitigations to eliminate or minimize any identified impacts; consultation with affected stakeholders; development of a Grievance Redress Mechanism to effectively address any complaints; and development of plan to guide the implementation of environmental management and monitoring during the Project planning, construction and operation.

BKsOH TH THTKI ГHHTHPsЧMШmpШЧЮ (Т) KЧH (ТП) KrO “sШfft” a TCШt pOвsTMKla ШrksЧKЧH a TI likely not result in any negative environmental impacts. Component (ii) does have physical works, including rehabilitation of existing canal gates, weirs and water meters, and rehabilitation of existing pump stations. This involves minor works on existing long established irrigation system components, and is not expected to result in any significant negative environmental impacts or require resettlement or land acquisition. Minor environmental impacts that may occur during construction can be mitigated through good construction practices. Assessment of potential positive and negative impacts from the sedimentation basin are ongoing.

This meeting is part of the public consultation process. Your comments and questions are on environmental issues or any other aspect of the Project are greatly appreciated.

Project Brief Distributed to Participants – Tajik

ПРТА8647-ТОҶ: Идораи захираҳои обӣ дар ҳавзаи дарёи Панҷ, Ҷумҳурии Тоҷикистон.

Маҷлисҳои ҷамъиятӣ дар навоҳии Ҳамадонӣ, Фархор, Восеъ ва Кӯлоб (11-13 марти соли 2015)

Мақсади маҷлисҳо:

- Огоҳ намудани ҷомеа оид ба лоиҳаи пешниҳодшуда ва масоили техникиҶмарбут ба ҳифзи муҳити зист ва иҷтимоии ин лоиҳа
- Шунидани фикри ҷомеа нисбати ин лоиҳа

Лоиҳа аз тарафи Бонки Осиёгии Рушд маблағгузори мешавад. Сармоягузории умумӣ тақрибан 40 миллион доллари ИМАро ташкил медиҳад. Мӯҳлати амалигардонии лоиҳа: солҳои 2016-2020.

Мақсадҳои лоиҳа:

- Беҳтар намудани идоракунии захираҳои обии ҳавзаи дарёи Панҷ (Компоненти 1)
- Азнавсозии (модернизасияи) Системаи об1рикунии Чубек (Компоненти 2)
- Беҳтар намудани самаранокии истифодаи оби обёришаванда дар Системаи обёрии Чубек (Компоненти 3)

Лоиҳа чи кор хоҳад кард:

Дар чаҳорчӯбаи Компоненти 1 лоиҳа ба ислоҳоти ҷории идоракунии захираҳои обӣ кӯмак намуда дар ҷорӣ намудани тарзи Идораи Якҷояи Захираҳои Обӣ ёрӣ мерасонад. Бо ҳамин мақсад, созмон додани Ташкилоти ҳавзавии дарёй юарои ҳавзаи дарёи Панҷ дар Кӯлоб дар назар аст. Ин ташкилот зерсохтори минтақавии Вазорати энергетика ва захираҳои обӣ хоҳад шуд ва барои кор карда баромадани Нақшаи идораи ҳавзаи дарёи Панҷ масъул мешавад. Лоиҳа, инчунин, дар пурқувват намудани ҳамкории байнисарҳадӣ дар соҳаи идораи обу ҳифзи муҳити зист байни ҷамоҳири Афғонистону Тоҷикистон ва дар азнавсозии дидбонгоҳҳои мониторинг дар дарёи Панҷ баҳри беҳтар намудани мониторинги гидрологӣ кӯмак мерасонад.

Дар Компоненти 2 лоиҳа мавриди таъмир ва азнавсозии сохторҳо дар каналҳои асосӣ ва байнихоҷагӣ, азҷумла, дарвозаҳо, дарғотҳо, новаҳо (акведук)Ҷ обченкунакҳоҶ тозакунии каналҳои асосӣ ва байнихоҷагӣ, тоза карани шабакаи заҳкаш ва заҳбурҳои хоҷагиҳоҶ пурқувват намудани системаи истифода ва нигоҳдории дастгоҳҳои обтаъминкунӣ, барқарорсозии стансияҳои обкашонии (насосҳо) интихобшуда, инчунинҶ сохтмони ҳавзи таҳнишон (отстойник) бо мақсади кам кардани сарбории лойқа (осадок) дар оби обёришаванда кӯмак хоҳад расонд.

Дар Компоненти 3 лоиҳа дар беҳтар намудани сохтори майдонҳои кишт (зироатҳо) ва таҷрибаҳои хоҷагии қишлоқ баҳри зиёд намудани ҳосилнокӣ ва самаранокии оби обёришаванда ёрӣ мерасонад. Диққати асосӣ ба омӯзиши деҳқонон ва созмон додани хоҷагиҳои намоишӣ ҷиҳати татбиқи лоиҳаҳои пилотӣ ва ҷорӣ намудани таҷрибаи пешқадами обёрикунӣ дода мешавад.

Ташкилоти иҷрокунандаи Компоненти 1 Вазорати энергетика ва захираҳои оби Ҷумҳурии Тоҷикистон хоҳад буд.

Ташкилотҳои иҷрокунандаи Компонентҳои 2 ва 3 Агентии мелиорасия ва обёрикунӣ хоҳанд буд.

Баҳодиҳӣ ба муҳити зист:

Лоиҳа аз тарафи БРО аз рӯи таъсир ба муҳити зист ҳамчун Категорияи В баҳогузорӣ шудааст. Дар робита ба ин, мувофиқи талаботи бонкҶомодасозии Баҳодиҳии аввалаи экологи (таъсир ба муҳити зист) лозим аст. Ин ҷараён дар ҳоли ҳозир идома дорад ва арзёбии таъсироти моддӣҶ биологӣ ва иҷтимоиҶ кор карда баромадани чораҳои мувофиқи камтар намудани тасъирот баҳри барҳам додан ва ё кам кардани таъсироти муайяншуда, машваратҳо бо тарафҳои таъсирдидаи манфиатдорҶ омодасозии Механизми дида баромадани арзу шикоятҳо баҳри самаранок ҳал кардани ҳамагуна шикоятҳоҶ инчунин омодасозии нақшаи ҷорӣ намудани идораи масоили ҳифзи муҳити зист ва мониторинг дар рафти банақшагирӣҶсохтмон ва ба истифода додани лоиҳаро дар бар хоҳад гирифт.

Дар асоси бозёфтҳои аввалаҶкомпонентҳои 1 ва 3 ҳамчун компонентҳои ба истиллоъ “нарм”Ҷяъне бе корҳои сохтмонӣ амалӣ хоҳанд шуд. Бионбар ин ба муҳити зист Ҷягон таъсири манфӣ нахоҳанд расонид. Компоненти 2ҶтавреҶки дар боло зикр шудаастҶ корҳои сохтмониро дар назар дорад. Ин корҳои хурдро дар ҷузъҳои мавҷудбудаи системаи обёрикуниро дар бар мегирад. Ҳамин тариқҶдар назар нестҶки ягон таъсири манфии шадид ба муҳити зист ва ё кӯчонидани аҳолиҶё гирифтани замин лозим ояд. Таъсири хурдро ба муҳити зист, ки мумкин астҶ ҳангоми сохтмон ба вуҷуд оядҶ метавон тариқи таҷрибаҳои беҳтари сохтмонӣ бартараф намуд. Арзёбии таъсироти имконпазири мусбӣ ва манфӣ аз ҳавзи такшинкунанда идом дорад.

Маҷлиси имрӯза қисми ҷараёни машваратҳои ҷамъиятӣ мебошад. Лутфан, нигарони эзоҳҳо ва саволҳои шумо марбут ба масоили ҳифзи муҳити зистҶё ягон тарафи дигари лоиҳа ҳастем.

Public Consultation Environment Briefing Notes
11-14 March 2015

Environmental Assessment Process

- The Project has been classified by the ADB as Environment Category B, requiring the preparation of an Initial Environmental Examination (IEE).

- This process is currently underway, and will include an:
  - assessment of physical, biological and social impacts;
  - development of appropriate mitigations to eliminate or minimize any identified impacts;
  - consultation with affected stakeholders (e.g. this meeting);
  - development of a Grievance Redress Mechanism to effectively address any complaints; and
  - development of an environmental management and monitoring plan to guide the Project planning, construction and operation.

- Based in initial findings, components (i) КЧН (ТП) KrO “sLШf”l a TCLШt pOвsTMKl a LШksЧKЧН aTTl likely not result in any negative environmental impacts.

- Component (ii) does have physical works, including rehabilitation of existing canal gates, weirs and water meters, and rehabilitation of existing pump stations.
  - This involves minor works on existing long established irrigation system components, and is not expected to result in any significant negative environmental impacts or require resettlement or land acquisition.
  - Minor environmental impacts that may occur during construction can be mitigated through good construction practices.

- Assessment of potential positive and negative impacts from the sedimentation basin are ongoing. This includes:
  - Size of basin
  - Location of basin
  - How to remove sediment from basin (and cost of doing so) and where to stock pile 0.5 million m3 of sediment per year;
  - Practicality of returning sediment to the Pyanj through some sort of flushing mechanism and return channel:
    - How often (once a season; every month; constantly)?
    - Is there sufficient gradient for a return channel?
    - What are the impact on the Pyanj at the return point in terms of sediment deposition, hydrology and flooding, ecology, etc. (although given that the amount of sediment to be returned is very small compared to total sediment load of river, this impact is expected to be localized and minor).

Next Steps

- Finalisation of project conceptual design

- Preparation of IEE and circulation and review

- This meeting is part of the public consultation process. Your comments and questions are on environmental issues or any other aspect of the Project are greatly appreciated.

XV. APPENDIX V: SEDIMENT SAMPLING

A program of sediment sampling and sieve analysis was undertaken to better understand the nature of sediment content in the irrigation system.

A total of six samples were taken on 17 March 2015, while a seventh sample was taken 19 March 2015:

Fine Sediment Samples
Sample 1, Outer limits of Moscow, R9 canal
Sample 2, near Border guard station, R3 canal
Sample 6, along main access road, R1 canal
Sample 7, Kulobdaryo Pump Station 1

Coarse Sediment Samples
Sample 3, just past control gate at first canal off main canal (downstream of settling pond)
Sample 4, main canal in area of settling pond
Sample 5, main canal in area of settling pond

Granulometric analysis of the samples was undertaken by the Soil Laboratory at the Agrarian University in Dushanbe (Table 1).

Figure 1: Overview of sediment sampling locations.

Figure 2: Close-up of sediment sampling locations adjacent to Settling Basin location.

Figure 3: Sediment sampling.

Table 1: Granulometric Analysis of CIS Sediment Samples

		-Sediment particle size distribution (% for each size class) / Содержание механических элементов, %							Sample density g/cm3 / Объемный вес, г/см3
		Particle Size mm / Размер частиц, мм							
		1,0 - 0,25	0,25 - 0,05	0,05 - 0,01	0,01 - 0,005	0,005 - 0,001	< 0,001	Сумма	< 0,001
Sample Number	1 - Moscov, Cenal R-9								
GPS WP#	205 № 370 39 u3 "E 69 38								
Location	Moscov (oo ten 1 mits) Cenal R-9	10	57	24	3	1	5	100	9	2,80
Date	17.03.2015								
Collected	A. Bansgrove								
Sample Number	2 - tine Sede								
GPS WP#	206								
Location	R-3 - upstream of settling basin	29	56	10	1	2	2	100	5	2,76
Date	17.03.2015								
Collected	A. Bansgrove								
Sample Number	3 - coore								
GPS WP#	207								
Location	Gde nain of settling basin	57	30	5	3	3	2	100	8	2,68
Date	17.03.2015								
Collected	A. Bansgrove								
Sample Number	4 - cocru bedlood								
GPS WP#	209 of cooax end settling								
Location	Gde nain of settling basin	64	22	9	1	2	2	100	5	2,76
Date	17.03.2015								
Collected	A. Bansgrove								
Sample Number	5 - coarsQ	30	52	12	3	2	1	100	6	2,79

Sample Number	5 - coarsQ	30	52	12	3	2	1	100	6	2,79
GPS WP#	210									
Location	main canal, oppax middle of sethy dcsn									
Date	17.03.2015									
Collected	A. Bansgrove									
Sample Number	6 - Fine	10	72	12	2	3	1	100	6	2,78
GPS WP#	214									
Location	RI									
Date	17.03.2015									
Collected	A. Bansgrove									
Sample Number	7 -	1	57	30	5	4	3	100	7	2,67
GPS WP#	214									
Location	Suction I tuhe - PS Kulobdary									
Date	17.03.2015									
Collected	Sunil									