E4825 V1

The Republic of Uzbekistan

Bukhara and Samarkand Sewerage Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT

of reconstruction of treatment facilities and sewerage systems of Bukhara Phase II

Bukhara
April, 2015

ACRONYMS AND ABBREVIATIONS:

English	Russian	
	МБР	Мировой Банк Развития
	КМ	Кабинет Министров
IBRD	МБРР	Международный банк реконструкции и развития, институт в составе ВБ
IDA	МАР	Международная ассоциация по развитию, институт в составе ВБ
BSSP		Проект МБРР/МАР «Реконструкция очистных сооружений и канализационных систем городов Бухара и Самарканд»
BSWSP		Проект МБРР/МАР "Водоснабжение городов Бухара и Самарканд"
	АБР	Азиатский Банк Развития
	ЮНЕСКО	Организация ООН по вопросам образования, науки и культуры
	ПЭУ	План экологического управления («план экологического менеджмента»)
	ГКП	Группа по координации проекта «Реконструкция очистных сооружений и канализационных систем городов Бухара и Самарканд», финансируемого МБРР/МАР
	ВК	Водоканал
CDW	КДВ	Коллекторно-Дренажные Воды
CIS	СНГ	Содружество Независимых Государств
EA	ЭО	Экологическая оценка
FS	ТЭО	Технико-экономическое обоснование
MAL	ПДУ	Предельно допустимый уровень
MAWR	Минсельводхоз	Министерство Сельского и Водного Хозяйства
GO	ННО	Неправительственная организация
O&M	ЭТО	Эксплуатация и техническое обслуживание
OP	ОП	Операционная Политика (Всемирного Банка)
PIU	ПРП	Подразделение по Реализации Проекта
SA	ОСФ	Оценка социальных факторов
SEE	ГЭЭ	Государственная Экологическая Экспертиза
TOR	ТЗ	Техническое Задание
USD	-	Доллар США
UZS	-	Узбекский сум
WB	ВБ	Всемирный Банк
EIA	ОВОС	Оценка воздействия на окружающую среду
PCR	МКР	Материальный Культурный Ресурс
	Узгидромет	Центр гидрометеорологической службы при Кабинете Министров Республики Узбекистан
	Госкомприрода	Государственный комитет Республики Узбекистан по охране природы
	УГВ	Уровень грунтовых вод
	ГВ	Грунтовые воды
	КК	Канализационный коллектор
	ИЗВ	Индекс загрязненности воды
	ДДТ	4,4 – дихлордифенилтрихлорметилметан-инсектицид
	ГХЦГ	Гексахлорциклогексан
	гамма –ГХЦГ	Гексахлорциклогексан, гамма-изомер – инсектицид
	альфа-ГХЦГ	Гексахлорциклогексан, альфа-изомер-инсектицид
	БПК	Биохимическое потребление кислорода
	ХПК	Химическое потребление кислорода
	ПДК	Предельно-допустимые концентрации загрязняющих веществ
	СПАВ	Синтетические поверхностные активные вещества
	Га	Гектар
	Км	Километр

кВт	Киловатт
М	Метр

TABLE OF CONTENTS

1. INTRODUCTION

1.1. General provisions

The government of Uzbekistan is actively implementing a long-term strategy on improvement of the provision of the population in rural areas and towns of the Republic with quality drinking water and improvement of sanitation conditions of treatment plants and drainage networks under the projects on the basis of preferential loans from international financial institutions and donor countries and their own efforts. In accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.405 dated 17.09.2003, a long-term program for providing the residents of 2323 rural settlements with drinking water was approved and implemented. Due to implementation of this program for the beginning of 2008, 1413 rural settlements were provided. Also, in 2006-2008, drinking water supply system with potable water was reconstructed in 2223 rural areas with 4.4 million people. In regions, where there is poor quality of groundwater and surface water, interregional water pipelines with total length of 1,954 km were laid in order to improve the water supply of clean drinking water.

There is an issue with the state of sewage collection and treatment infrastructure in the cities of the republic along with the drinking water supply of settlements and, accordingly, the negative environmental impacts of dilapidated sewer facilities on the environment and the surrounding areas, which ultimately also affects the quality of drinking water, due to contamination of rivers and groundwater. Currently, according to "Uzkommunkhizmat" Agency, only 69 of 217 cities and urban settlements have sewerage system. This system is used by 51.5% of the population of these cities. 14.1% of the population in the republic uses the services of sewage.

Table 1.1 The degree of chemical and bacteriological contamination by regions in the Republic of Uzbekistan (2010)

Region	Degree of chemical contamination	**Degree of bacteriological contamination**
Surkhandarya	*45,5%*	-
Bukhara	*30,7%*	-
Khorezm	*22,5%*	-
Tashkent city	*36,4%*	*24,1%*
Republic of Karakalpakstan	*47,2%*	*16,9%*
Tashkent	-	*16,6%*
Navoi	-	*18,3%*

In order to address existing problems and to improve the sanitary and epidemiological situation, the Government of Uzbekistan has planned implementation of priority projects for the period of 2009-2012 included by the Decree of the President of the Republic of Uzbekistan dated 12.06.2008, No. PP-890 ":On measures to further improve the provision of the rural population and cities with quality drinking water and economical use of natural gas". In particular, it provides for the implementation of the following projects to improve drinking water quality and upgrade sewage treatment infrastructure in Bukhara and Samarkand regions:

- Water supply of Bukhara and Samarkand (IBRD/IDA 2004-2009);
- Reconstruction of sewage treatment plants and sewage systems of Bukhara and Samarkand (IBRD/IDA 2010-2015);
- Improvement of drinking water supply of Alat and Karakul districts of Bukhara region (IBRD, 2010-2012);
- Modernization of Damkhodja interregional water supply with connection of regional centers and rural settlements of Samarkand, Navoi and Bukhara regions (ADB, 2009-2012);
- Reconstruction of the water supply system of regional centers of Kasan and Mubarak, as well as rural settlements adjacent to the conduit from Kitab-Shakhrisabz deposits of under-ground water (Soft loan of CDR for SCO countries, 2009-2012);
- Water supply of Kushrabot district of Samarkand region (Eximbank of Korea/ EDCF Fund, 2010-2012)

Very strong support for the initiatives of the Government of Uzbekistan has the World Bank and its institutions for more than 10 years of collaboration. In the medium term, Uzbekistan and the World Bank intend to create a basis for further dialogue in the development of the sector in the view of experience and completed projects. In particular, the World Bank has planned to prepare a concept for the development of water and sanitation sector until February of this year and carry out strategic activities at the end of the first quarter of 2009 with the participation of national and international stakeholders actively involved in the process of modernizing the sector.

1.2. The objective of the project

Government of the Republic of Uzbekistan and the Khokimiyat of Bukhara city has requested the World Bank loan to support the project on improvement of sewerage system in order to improve the environment and public health problems associated with inadequate wastewater treatment in the framework of a long-term program on improvement of water supply and sanitation in Bukhara.

Pic. 1.2.1 The map of Bukhara

The main objective of the project is the rehabilitation of the sewer system in order to reduce leaks and expansion of coverage of selected areas of the city by sewerage network and improving the effectiveness of treatment activities. The proposed project is aimed at **reducing the pollution of the environment:**

- Increasing the number of connections to the sewer system;
-
- Improvement of process on WWTP;
- Extension of the life of facilities and equipment by reconstruction/replacement;
- Compliance with quality standards of Uzbekistan on purified wastewater.

1.3. Summary of the project

Sewer network of the city is in desolate condition. Infrastructure is dilapidated; there is a destruction of lines, sewage leaks into the ground water, as well as frequent congestion. All this primarily is associated with the fact that the existing wastewater treatment plants and supply networks were built 30-40 years ago, back when the Soviet Union. 15 years after independence, the whole complex of sewerage infrastructure has reached a critical level, with the result that it has led to moral and physical obsolescence of the existing components of the electromechanical equipment for sewage treatment plants. The consequence of the current state of networks is constant and the high cost of maintenance of infrastructure and the elimination of accidents in different areas, increased power consumption.

In this regard, there is a serious risk of the environmental situation in the city. In Bukhara, about two-thirds of the total volume of accumulated waste water of seeps into the ground, creating a dangerous threat to the ecology of the area and population health. All this leads to imbalance and cause environmental and social problems, prevents normal development of trade and business, creating unsanitary conditions for the local population and the many tourists visiting the historic city each year.

The project will be the first step of a phased approach of improving access and efficiency of sewer systems; it will focus on the most urgent needs of the rehabilitation and expansion of networks. The work will include the replacement of existing sewers with the extension to certain unserviceable areas; rehabilitation of pumping stations; and the restoration of the main sewers and sewage treatment plants. At this stage wastewater treatment plants will not be extended, as they are operated approximately 50% of design capacity.

BSSP project will actively use the experience and achievements of the current project BSWSP. The budget for the implementation of the second phase of the project is limited by the size of the application filed to the World Bank for a loan in the amount of 55 million USD. The amount of co-financing from the Government of the Republic of Uzbekistan is estimated at an additional 20% (11 million USD on taxes and fees). Thus, the total amount of resources available to implement the second phase of the project is **55 + 11 = 66 million USD**. These resources will be used mainly to:

- reconstruction/expansion of sewerage networks (41.04 km);
- reconstruction and installation of more efficient pumps for 2 SPSs;
- Full reconstruction of WWTP.

It is expected that **the implementation of Phase II of the Project** will require 5 years.

Component 1: Physical rehabilitation of sewerage network in Bukhara

- Rehabilitation of existing sewerage network.
- Extension of the sewerage network in the selected areas of the city (extension of existing network by installing additional sewer lines in underserved areas of the city).

- Modernization of treatment facilities (replacement of the electromechanical equipment, modernization of the treatment plant in order to reduce operating costs and energy consumption, to audit vodokanal's work for the subsequent reducing energy consumption).

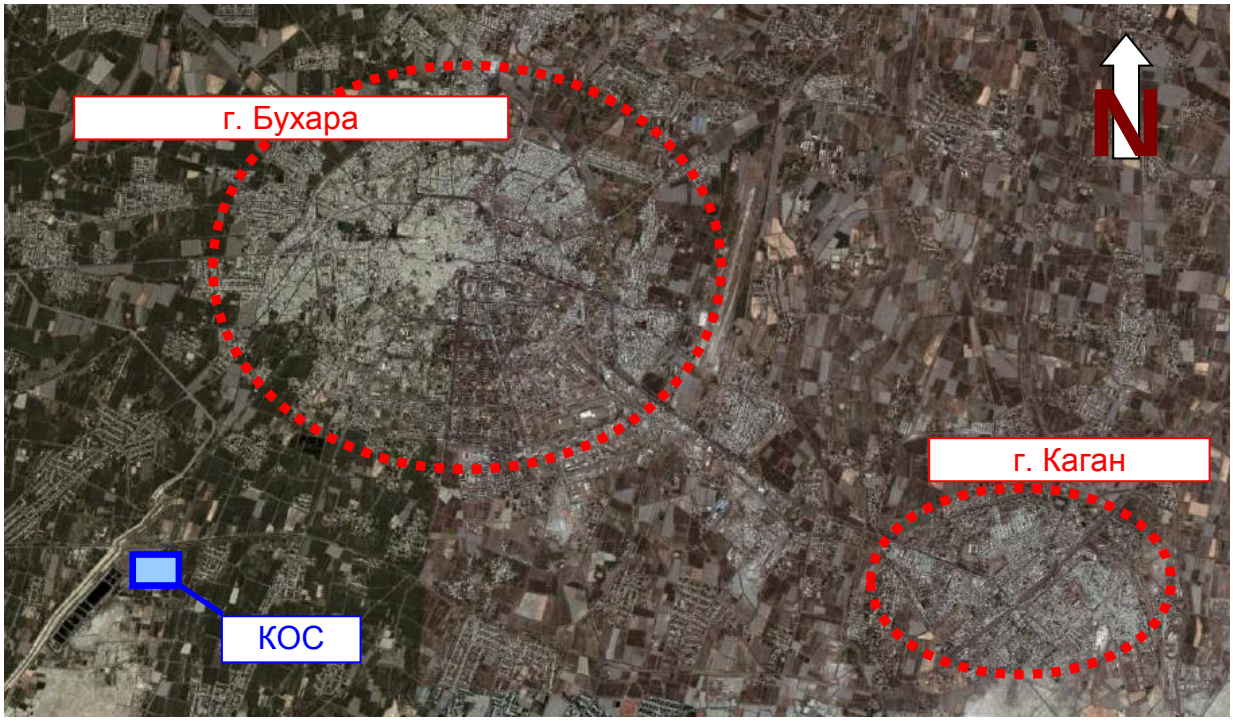
Component 2. Technical assistance and training

The project will finance a limited amount of technical assistance and training of vodokanal's staff in order to continue their activities on institutional strengthening, initiated in the framework of "Bukhara and Samarkand Water Supply Project". Technical assistance and training will focus on improving the operational efficiency of vodokanals and encourage their customer focus. In addition, Sanitation and Hygiene Program is provided.

1.4. The study area

Bukhara is one of the ancient cities of Central Asia. Its 2500 anniversary was celebrated in 1997 which was listed into UNESCO World Heritage Site; it is one of the tourist centers where about 170 monuments have remained. The most important ones of them are: a masterpiece of Central Asian architecture –dynastic tomb of the Samanids (the end of 9th - the beginning of 10th century), the first famous Muslim mausoleums in Central Asia and one of the earliest in the East. Kalyan Minaret occupies a special place in the heart of Bukhara (Great Minaret, 12c.). This is the highest of the famous landmarks of Central Asia - 50 m.
The basic layout of the city established depending on the terrain survived to this day. The population is 300,000 people. The city is located in the Zarafshan Valley, in the lower part of the basin, on the right side of the shore. The territory is about 2.6 thousand hectare. It consists of a one-storey and high-rise buildings: the central part of the city is of Old Town one-storey buildings; new block of houses are in the southern and south-eastern part of well-appointed high-rise buildings.

Figure 1.4.1 Bukhara, aerial photograph



Bukhara is mostly the city of light and food industries. Gold embroidery and silk-weaving production is traditional. Products of local masters - gold embroidered skullcaps, art panels, handbags, and shoes are known far beyond the country. The only in Uzbekistan and one of the largest astrakhan fur industry plant produces astrakhan black, gray and golden colors – the products of this plant are exported to many foreign countries. Large cotton mill, cotton gin, oil mills, silk-spinning factory, construction companies and food industries are functioning.

Water supply in Bukhara covers about 98% of the urban population, but only about half of the total number of consumers uses the services of sewage. Other residents use pit latrines and sanitation services. A centralized system for collecting wastewater with feeding them to the biological treatment plant operates in Bukhara. The existing capacity of treatment facilities is 100 thousand m^3/day. Discharge of treated wastewater is made through the collector with length of 2 km into the collector "Sakovich".

The population not using the services of sewage, as well as collectors laid along the city imposes negative environmental impact on the river Zarafshan through groundwater contamination.

2. EVALUATION METHODOLOGY

General methods for the environmental study include specific steps to assess the impacts on the environment. The most important of these are:

- Identification of the main problems;
- Clarify the extent of the problem;
- Mitigation measures;
- Management and monitoring.

The experts made collection and inventory of the basic data on the present state of environment of Zarafshan River Basin.
The following environmental aspects have been considered:

- Water resources
- Land resources
- Environmental resources
- Social aspects
- Physical cultural heritage.

The following is a general environmental assessment of anthropogenic influence under the implementation of "Bukhara and Samarkand Water Supply Project" in Bukhara, Environmental Management Plan is developed.

2.1. World Bank requirements on EA

According to the World Bank Operational Directive, the project as part of the environmental assessment of the project will be evaluated in terms of the impact of area and identify ways to improve project design and implementation by preventing, minimize or compensate for adverse environmental impacts and enhancing positive impacts.

According to the type of environmental analysis of the World Bank, the level of detail of environmental analysis depends on the scale and environmental impacts of the proposed works. Below are the categories selected on the basis of expert assessments:

- Category A: full environmental assessment (EA) is required;
- Category B: if you do not even need a full EA, it is necessary to conduct ecological-sky analysis;
- Category C: EA or an environmental analysis is required

To minimize the possible negative effects the project is categorized as "B" (according to OP/BP/GP 4.01 World Bank). The project requires environmental impact assessment (EIA). Environmental assessment of Category is required due to the use of water resources of construction/reconstruction work at wastewater treatment plants and sewerage networks.

The results of this Environmental Assessment (EA) confirm that the proposed Project activities will have an overall positive impact on the environment. There will occur temporary and local disturbances in connection with construction and rehabilitation works during the project implementation, but it is expected that these impacts can be mitigated in most cases by the necessary construction se-

curity measures. Therefore, the research team EA confirms that the project is classified as Category B.

2.2. Requirements of Uzbekistan on EE

The state ecological expertise is governed by the laws of the Republic of Uzbekistan "On Environmental Protection", "On Environmental Impact Assessment", the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 491 dated 31.12.2001 "On approval of the state environmental expertise in the Republic of Uzbekistan" and other laws and regulations.

The facilities subject to state ecological expertise and category of their impact on the environment have been identified by abovementioned documents. Facilities subject to examination are assigned to four categories of environmental impact.

Activities for each category are detailed in Annex 2 of the Summary. Category 2 environmental impact (medium risk) includes item 16 "Sewage Treatment Plants with capacity from 50 to 200 thousand m^3/day that is applicable to the project (capacity of Bukhara municipal wastewater treatment plants 100 is thousand m^3/day).

Such approach implies a sectoral assessment, preparation of measures to mitigate impacts on the environment and environmental monitoring.

Organization and assessment of environmental impacts is implemented by the enterprise or organization itself, and Glavgosekoekspertiza provides the expertise presented by EIA and gives an opinion on them in due course.

3. ORGANIZATIONAL, LEGAL AND POLITICAL FRAMEWORK FOR THE PROJECT IMPLEMENTATION

3.1. Legal regulation

3.1.1. National environmental legislation

Uzbekistan has established a legal framework for the protection of environment and nature management which is designed to protect rights and duties of citizens in Articles 50 and 55 of the Constitution of Uzbekistan. There are more than 20 laws, 50 decrees of the President and Cabinet of Ministers of the Republic of Uzbekistan and other laws and regulations.

In relation to this project, in Uzbekistan the following main legislative acts aimed at ensuring environmental protection, public health, management issues of the environmental sector, Laws of the Republic of Uzbekistan are in force at the moment:

- "On Environmental Protection" (1992) ;
- "Water and Water Use" (1993);
- "On Environmental Impact Assessment' (2000);
- "On the State Sanitary and Epidemiological Supervision in the Republic of Uzbekistan" (1992);
- "On the protection and use of cultural heritage" (2001)
- "On Specially Protected Areas" as amended (30.08.93)
- "On the Protection and Use of Flora" (December 26, 1997)
- "On the Protection and Use of Animals" (December 26, 1997)

- "On Air Protection" (December 27, 1996)
- "On Waste" dated 05.04.2002
- "On protection of population and territories from emergency situations of natural and tekhnogene character" dated 20.08.1999

The main active bylaws, regulations adopted by the Government of the Republic of Uzbekistan in the field of environmental protection:

- "On Approval of the State Ecological Expertise" (No. 491, 31.12.2001);
- "On approval of the State Environmental Monitoring" (No.49 dated 04.03.2002);
- "On giving the status of specially protected natural territories of republican significance to the zones of formation of fresh groundwater" (No. 302, 26.08.2002);
- "Regulation on water protection zones of reservoirs and other water bodies, rivers and main channels and collectors, as well as sources of drinking water and domestic water supply, medical, cultural and recreational purposes in the Republic of Uzbekistan", 04.07.92.
- "On the introduction of fees for excess emissions (discharges) of pollutants into the environment and waste disposal" 29.06.92
- "On the forecast of key macroeconomic indicators and the State Budget of the Republic of Uzbekistan for 2000", 31.12.1999
- "Procedure for the development and implementation of design standards on maximum permissible emissions of pollutants into water bodies, including drainage water" (RD 118.0027719.5-91);
- "The procedure for issuing permits for special use of water" (RD 118.0027714.6-92);
- "Instructions for determining the damage to the national economy from pollution of groundwater" (RD 118.0027714.47-95);

3.1.2. The State Environmental Policy

The following programs, strategies and action plans relating to the nature of the implementation of activities under this project were developed and implemented by Uzbek government with the support of international organizations, the direct involvement of NGOs:

- Action Program for the Protection of Environment of the Republic of Uzbekistan for 2008-2012
- The program providing the population with rural and urban quality drinking water and economical use of natural gas
- The investment program of the Republic of Uzbekistan for the period 2009-2012.

3.1.3. International agreements on environmental protection and prevention of transboundary impact

Uzbekistan ratified the basic conventions adopted in Rio de Janeiro under cooperation in the field of environmental management: Framework Convention on Climate Change, the Convention on Biological Diversity and the Convention to Combat Desertification, as well as a number of other conventions, agreements and memoranda of understanding in the field of environmental conservation and sustainable development. With regard to this project, Uzbekistan ratified a number of multilateral agreements aimed at ensuring cooperation with neighboring countries in order to reduce the effects of transboundary impacts on waters of regional significance:

- Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Helsinki, March 17, 1992 (Decree of the President of Uzbekistan dated August 9, 2007 No. PP-683, entered into force - December 3, 2007);
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (22.12.1995);

- Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (26.05.1993);
- Convention on the Protection of the World Cultural and Natural Heritage, Paris, November 16 (23), 1972 (ratified by Decree of the Oliy Majlis of the Republic of Uzbekistan dated December 22, 1995 No. 182-I)

Within the framework of the CIS, Uzbekistan is a member of the Interstate Environmental Council on the harmonization of environmental legislation, the development of EE and development of economic instruments for environmental protection, as well as a member of the inter-state environmental funds to finance environmental protection in international and regional programs. The following major agreements have been signed:

- Agreement on cooperation in the field of ecology and natural environment, Moscow, February 8, 1992 (entered into force on February 8, 1992);
- Agreement on Cooperation in the field of environmental monitoring, Saratov, January 13, 1999
- Decision of the Heads of Central Asian states on "Key Program of concrete actions to improve the environmental and socio-economic situation in the Aral Sea basin for the period 2003-2010" was signed on 06.10.2002 in Dushanbe.

3.2 The overall national framework

In accordance with the existing administrative-territorial division of the Republic of Uzbekistan, Bukhara and Samarkand is the regional center of Bukhara and Samarkand regions, respectively.
For the purposes of this environmental assessment addresses three relevant government bodies:

- "Uzkommunkhizmat" Agency is the organizer of the project.
- Khokimiyats of regions and cities, where the proposed project is located.
- Samarkand and Bukhara regional city and regional vodokanals are the contractors of the project.
- The State Committee for Nature Protection (SCNP) is the body responsible for the environmental protection.

"Uzkommunkhizmat" Agency of Uzbekistan

"Uzkommunkhizmat" Agency of Uzbekistan (hereinafter - the Agency) is the body responsible for policy development in the utilities sector, including the coordination of organizational activities, development of standards and guidelines and technical documentation regarding the operation of sewerage networks. Activities of the Agency are governed by the Regulations approved by the Government of Uzbekistan. The Agency is the implementing organization for this project.

State power bodies in the localities (regional khokimiyats)

Khokimiyat is the executive body of state power at the level of regions, districts, cities of the country. Khokim is a leader of the executive and representative government in the territory and ensures the implementation of legislative acts, including, with respect to matters relating to the sector of water supply and sanitation. Khokim is appointed by the President of Uzbekistan and approved by the Regional Council of deputies.

State Committee of the Republic of Uzbekistan for Nature Protection

The State Committee for Nature Protection (SCNP) is the main executive body for the protection of the environment and natural resources. Committee is directly subordinated to the Oliy Majlis (bicameral parliament) of the Republic of Uzbekistan and responsible for the coordination of envi-

ronmental protection and natural resources of other national government agencies at the central, regional and district levels.

Other relevant government bodies:

- **Ministry of Health of the Republic of Uzbekistan** as part of the system of state sanitary epidemiological surveillance authorized to exercise state sanitary supervision over compliance with sanitary norms, rules and hygienic standards by all organizations in the country. SSES centers provide the organization and conduct of complex sanitary and anti-epidemic measures.
- **Republican Emergency Antiepidemic Commission** is authorised to coordinate the activities of ministries and departments, khokimiyats, economic entities directed to localize outbreaks of infectious diseases. The Commission is responsible for monitoring activities for sewerage settlements, effective cleaning and disinfection of wastewater discharged into surface waters. The Commission has the right to prohibit or temporarily suspend operation of water supply, sewerage, waterworks and other public facilities.

- **The Ministry of Culture and Sports of Uzbekistan** (Central Research and Production Department for the Protection and Use of Cultural Heritage). The Ministry of Culture and Sports of Uzbekistan provides state protection of cultural heritage, by means of, among other things, issue permit for excavation, construction, reclamation, economical and other works in the locations of cultural heritage and works on conservation of cultural heritage, as well as to conduct research on the objects of cultural heritage (Article 10 of the Law of the Republic of Uzbekistan "On protection of cultural heritage").
- When carrying out work on the construction of new facilities, reconstruction of existing in Bukhara and Samarkand, it is necessary to obtain the corresponding permit and coordination of the boundaries of the object under construction with the boundaries of historical and cultural reserve determined by the Ministry of Culture and Sports of Uzbekistan on the basis of approved historical and cultural plans (Article 31).

3.3. Ecological structure

The system of state power involved in the management and regulation of the environmental sphere, defined by the Law 'On environmental protection" are as follows:

- **Legislative Chamber and the Senate of the Oliy Majlis of the Republic of Uzbekistan** (Parliament) under the joint jurisdiction in the sphere of nature protection.
- **Cabinet of Ministers of the Republic of Uzbekistan**, conducting a single environmental protection policy.
- Local state power and management authorities (khokimiyats), the definition of the main tendency of nature protection on its territory, the approval of regional (territorial) environmental programs.
- **State Committee of the Republic of Uzbekistan for Nature Protection.** (SCNP of Uzbekistan) is a specially authorized supradepartmental and coordinating body exercising state control and intersectoral management in the field of environmental protection, use and reproduction of natural resources. SCNP Uzbekistan is subordinate and accountable to the Oliy Majlis of the Republic of Uzbekistan. The system of the bodies comprises: SCNP of the Republic of Karakalpakstan, regional and Tashkent City Committee for Nature Protection, inter-district, district and city committees (inspections) on nature protection, as well as their subordinate enterprises, institutions and organizations. In dealing with international and regional issues, including pollution of transboundary rivers and reservoirs, SCNP interacts with environmental authorities of other state.

3.4. The structure of the water supply and sewerage sector

"Uzkommunkhizmat" Agency of Uzbekistan

"Uzkommunkhizmat" Agency of Uzbekistan is regulated by the Decree of the President of the Republic of Uzbekistan dated 17.08.2006, No. PP-445 "On measures to improve the activity of the "Uzkommunkhizmat" Agency of Uzbekistan and the financial restructuring of public utilities" which also determines the reformed system of governance of municipal services in the country.

Regional vodokanals

Management issues of water supply and sanitation are directly administered by economically independent entities "vodokanals" specially educated with decisions of public authorities under the territorial jurisdiction. In particular, with respect to this project, Bukhara RPSE "Suvokova" is in the form of unitary enterprise acting on the basis of operational management. Activities of vodokanal is governed by general law applicable to the regulation of business entities of different ownership forms, but this organization has the status of natural monopolies and subject to the Law "On natural monopolies". Foundation documents – the Articles of Association of vodokanals are approved by the relevant khokimiyats.

3.5 The legal framework for the participation of NGOs and the community

At present, the interaction of the state environmental NGOs carried out within the framework of cooperation and collaboration with the Environmental Forum of NGOs in Uzbekistan. Environmental Forum of NGOs of Uzbekistan (Eco-Forum) is an association of environmental and ecological-oriented NGOs and initiative groups. Its activity is aimed at consolidating the efforts of environmental organizations in solving environmental problems. The tasks of Eco-forum in the sphere of environmental activities:

- A model of joint activities in the framework of targeted programs;
- Preparation and implementation of joint projects;
- Involvement of the community and the public in the implementation of targeted programs;
- monitoring.

Eco-Forum of NGOs in Uzbekistan was registered on April of 2007 by the Ministry of Justice of the Republic of Uzbekistan and united the Republican Association of environmental NGOs functioning in the country. The main purpose of creating Eco-forum of NGOs in Uzbekistan was to unite the efforts of NGOs to increase the effectiveness of public participation in environmental protection and joint actions in solving environmental problems. In its actions to address environmental problems and promote sustainable development, Eco-Forum cooperates with governmental, international and regional organizations, NGOs and the media. Currently Eco-forum has signed the memoranda of cooperation with the SCNP of Uzbekistan and other regional organizations such as REC of Central Asia.

3.5.1. Legal regulation of the participation of NGOs

In general, the basis of the participation of citizens and public associations in the fields of nature conservation management, first of all, is laid by the Constitution of the Republic of Uzbekistan (Art. 50.55). Law of the Republic of Uzbekistan dated 09.12.1992, "On Nature Protection" in Art. 12-13 regulates the right of citizens to unite in public organizations for the protection of nature, to request and receive information on the condition of the environment and the measures taken to protect it, as well as the powers created by NGOs. Legislation in ecology and the environment provides for public participation as a) an individual citizen or group of citizens; b) by the bodies of self-government of citizens) through non-profit organizations.

Directly, the participation of non-profit environmental organizations is provided in the environmental impact assessment documentation for the construction of new and reconstruction of existing facilities for the purpose of management. In particular, Art. 27 of the Law of Uzbekistan "On Environmental Protection', as well as Art. 23 of the Law of the Republic of Uzbekistan dated 25.05.2000, "On Environmental Impact Assessment" provide an opportunity to NGOs and citizens to carry out public ecological expertise in any business that needs environmental justification by independent groups of experts on the initiative of NGOs and at the expense of their own funds or volunteer. Conducting public examination can be carried out regardless of the state ecological expertise. It is forbidden to interfere with the public environmental review. With that, it is established that the conclusion of PEA is a recommendation.

In addition, during the state ecological expertise the organization-customers are obliged to publish the announcement of The state environmental impact assessment and information on the results to the media information, in cases where the competent authorities include the construction project into the list of important objects.

3.5.2. Legal regulation of participation of self-government of citizens

In accordance with Art. 7 of the Act, institutions for self-government of citizens are not included in the system of public authorities, therefore, they are one of the forms of social organization. Law of the Republic of Uzbekistan "On institutions for self-government of citizens" dated April 14, 1999 provides opportunities for the development and implementation of local initiatives, including on environmental issues.

Meeting of citizens of the settlement, the village and the makhallas of the city of quarterly hear reports of heads of district, city and regional khokimiyats on matters within the scope of self-government; and, within their competence, the reports of heads of enterprises, institutions and organizations located in the relevant territory on the protection of the environment, development and others. In addition, meetings of citizens exercise social control over the execution of laws and other legislative acts, as well as their decisions; make decisions about the use of, on a contractual basis, enterprises and organizations located in the related territory, aimed at landscaping, gardening and sanitation; carry out activities aimed at promoting environmental protection.

4. THE CURRENT STATE OF THE ENVIRONMENT

4.1. Physical resources

In geomorphological respect Bukhara is located in the southern part of Bukhara oasis within the ancient cone-removal of Zarafshan River on the surface of the 3rd floodplain terraces and it is confined to the major Bukhara-Khiva depression.

Zarafshan River flows in the eastern part of the depression in 20 km to the west of the city in the meridian direction. The Valley is mainly formed in quaternary sediments.

The relief of the territory is flat with a general slope 0,0003-0,0004 in the south-west, with partial slope to the southeast towards the periphery of the oasis, with an altitude - 218-230m.

Shared flat terrain is broken by separate hills of anthropogenic origin and slightly undulating. The formation of wavy forms of relief in conditions of irrigated agriculture due to the erosion-accumulation processes and accumulation of silt irrigation precipitation.

Location of the city of Bukhara in the ancient oasis that arose in the desert, on the open plain bordering on the west by deserts Kyzylkum and on the other directions by Karshi and Karnapchul steppes causes sharply continental and arid nature of the climate.

The study area is characterized by high solar radiation that reaches 150 kcal and more. The average annual air temperature is 16,0°C, the average temperature of the coldest month - -3,0°C and the hottest month - 37,2°C. The absolute maximum was observed in July +46,2°C, and the absolute minimum - in January -17,0°C.

The city is dominated by the winds of the northern and north-western areas (23.6 and 19.8%, respectively). Most often the winds blow with speed of 2-3 m/s and 4.5 m/s and their frequency reaches 37.6% and 33.1%. Recurrence of weak winds (0-1 m/s) is 11.5%. Weak winds contribute to the accumulation of pollutants around the low emission sources. Higher and higher wind speeds promote the transfer of contaminants over long distances. The average wind speed in the area - 3.6 m/s.

On the state of the atmosphere is significantly affected by the amount of precipitation that performs the cleaning function. The city is characterized by low rainfall, the annual amount of which in average makes up 138 mm.

4.2. Water resources

The city is located in the Basin of Zarafshan River which originates from the glacier, located at the junction of the Turkestan and Zarafshan ranges in Tajikistan. The total length of the river is 781 km, in the territory of Bukhara region it has a length of 18.5 km from the right bank side and ends at Kharkur waterworks. Flow of the river is 150-300 mln. m^3/year with feed from Amu-Darya River which improves water quality in the river; average annual consumption is 165 m^3/s. Zarafshan River is now fully regulated Kattakurgan Reservoir.

Zarafshan River is mostly susceptible to cross-border impact. In the upper watershed of the river the objects of mining and processing plant of the Republic of Tajikistan is located which pollutes the river with toxic metals, antimony, mercury.

In the territory of Uzbekistan the river receives wastewater of industrial enterprises in Samarkand, Kattakurgan, Navoi and runoff from farmland.

This influence is evident in the fact that the river water salinity increases from the river source 305.0 mg/dm^3 (0.3 MAC) to the outfall 1364.1 mg/dm^3 (1.4 MAC) with a mean of 658.7 mg/dm^3 (0.7 MAC). As compared to previous years data, the river mineralization has not changed significantly.

The oxygen regime of the river in 2007 was satisfactory, the dissolved oxygen concentration at 9.90 mgO_2/dm^3.

To the territory of Uzbekistan the water of Zarafshan River comes in with the content of organic substances (according to COD) at the level of 3.32 mgO_2/dm^3. Along the river course the organic concentration gradually increases to 24.23 mgO_2/dm^3 in the cross-section below the city of Navoi. On average, their content in the river was 10.20 mgO_2/dm^3.

The water below the city of Navoi is the most polluted, the maximum concentration of pollutants in the cross=section is as follows: phenols - 0.004 mg/dm^3 (4 MPC), mineralization - 1616.5 mg/dm^3 (1.6 MAC), chromium VI-1,4 mg/dm^3 (1.4 MAC), copper - 3.5 mg/dm^3 (3.5 MAC), nitrites-0.124 mg/dm^3 (6.2 MAC), for ammonia nitrogen-0.06 mg/dm^3 (0.1 MAC). The presence of isomers of HCH, DDT and its metabolites were not observed.

Through recent years, according to the water pollution index (WPI), Zarafshan River on the territory of Bukhara region refers to moderately polluted waters (WPI ranges from 1.0 to 2.5).

Surface water and groundwater in the lower course of Zarafshan River is characterized by increased mineralization (0.6-2.0 g/l), stiffness, phenol content, organic matter due to the reduction of releases of fresh water into Bukhara region through Zarafshan River. After increasing of the water extraction

for irrigation in Samarkand, Jizzakh and Kashkadarya regions and with the increase of discharge of drainage water into the river, the concentration of mineralization has been steadily increasing.

Water supply of Bukhara city is based on surface waters of Kuyumazar reservoir (Kuyumazar intake -145 m^3/day), Djuyzar Canal (Zaravshan intake 50 thousand m^3/day) and Shakhrud (Beshariq intake). Since 1994 water into the city of Bukhara comes from groundwater deposits of Zarafshan of Samarkand region (Damhodja conduit 110 m^3/day). Only the quality of the water of Damhodja intake meets GOST standards for the drinking water.

Water from the intakes is treated in sedimentation tanks and filters and further is pumped into the tanks of clean water which receives the water from Damhodja intake. After disinfection in the reservoirs water is pumped into the annular water supply network of the city. Total power intake is 300 m^3/day, in fact, 260 m^3/day.

Irrigation source of Bukhara is Shakhrud Canal which originates from Zarafshan River. In the coastal strip of the canal near-canal lens of fresh water feeding Besharik compactor intake are marked.

In addition to the irrigation network within the city, drainage network is developed water discharge of which is carried out outside the city.

There is a centralized sewerage system in Bukhara (50% coverage) with sewage treatment in the treatment plants of full biological treatment in artificially created conditions for aeration tanks. Discharge of waste water after purification is carried out by the collector with length of 2 km into the Sakovich collector and further into Dengizkul Lake. The chemical composition of the water in the Sakowich reservoir is shown in Table 4.2.1.

Table 4.2.1. The chemical composition of the water of Sakovich collector

Indicators of pollution	Mean concentration	MPC for water of fishery management
Oxygen, mgO_2/l	6,41	4-6
BOD_5, mgO/l	24,0	3-6
COD, mgO/l	19,0	
Ammonia nitrogen, mg/l	4,3	0,5
Nitrite, mg/l	0,048	0,02
Nitrates, mg/l	7,3	9,1
Iron, mg/l	0,41	0,5
Chlorides, mg/l	350,0	300,0
Sulfates, mg/l	410,0	100,0
Suspended solids, mg/l	28,0	15,0
Phosphates, mg/l	0,51	
Mineralization, mg/l	1900,0	1000,0

As the table shows, excess of maximum permissible concentrations of salinity and suspended solids for the water of fishery in the reservoir is observed in 1.9 times, sulphates - 4.1 times, chlorides - 1.17 times, nitrites - 2.4 times, nitrogen ammonium - 8.6 times. The water of this quality comes from the collector into Dengizkul Lake.

Groundwater is disclosed at depth, mostly 1.0-3.5 m above the ground. Notably, the area with the depth of the groundwater level from 1.0 to 2.0 takes about 70% of the study area. Within the remaining area (southern part of the city), they lie at a depth of 2.0 to 5.0 m. The site of the Old part of Bukhara and Arc Palace, they lie at a depth of more than 5 m. As a rule, high groundwater level is observed in March-April with the amplitude of the seasonal fluctuations of 1.0-1.4 m. Ground water

in Bukhara moderately saline. Groundwater salinity varies from 644 mg/l to 5382 mg/l with a predominance of sulphate (200 to 2614 mg/l) and potassium sodium (from 107 to 1037 mg/l). The chlorine ion content is 110-1329 mg/l. The highest salinity of water is found in the wells in the area of the Arc Palace and the Buhorzy madrassa. Ground water is chemically aggressive to concrete on Portland cement.

In the city, in order to reclamation of the area, 57 drainage wells were built and 17of which are functioning (including Kagan town). Drainage wells drilled in the city in order to lower the groundwater level is not achieved a certain effect, as they work irregularly.

Thus, the hydrogeological conditions of the city cause some problem for deep foundation and underground metallic structures.

A significant impact on groundwater and ecological state of the city is influenced by waste water of not canalized section of the population, the collectors collecting these effluents and polluted drainage water.

4.3. Land resources

The whole area of the city on the basis of geological and geomorphological indication refers to the same district (I) which is dedicated to the ancient cone-removal of Zarafshan River (of the surface of 3rd floodplain terraces).

From the surface to a depth of 6,0-25,0 m, it is composed of quaternary water-saturated clay and sand and gravel deposits which are commonly underlain by dissimilar weathered soils of Neogene.

Bulk soils have wide development. Their thickness near Ark Fortress is to 10-15 m, in the old town area to 2-5 and 0-2 m within the periphery of the old city. Water-saturated clay soils are with poor bearing capacity.

The mineralization of soil to a depth of 2.0 m in the range 0,16-2,25% by weight of dry soil, with the content of chloride and sulfate ions, respectively made up 0,011-0,097)% and 0,072-1,428%. Soils are characterized as low-saline. Aggression degree varies from slightly aggressive towards the concrete of normal permeability on portland cement to moderately aggressive to concrete of normal density of sulfate cement, and also relates to slightly aggressive towards the reinforcement of concrete structures.

The total area of the city of Bukhara is 7587 hectares, including irrigated - 2626 ha. In the city of perennial crops 640 hectares of land plots of land, collective gardens - 638 ha, park - 23 hectares are occupied.

The soil cover is represented by irrigated and meadow-oasis alluvial soils of the desert zone, slightly saline. Soil significantly changed by irrigated agriculture. The humus content in the arable horizon is 0.8-1.4%. Soil desalinates by systematic washing. Soil contamination by organochlorine pesticides and heavy metals does not exceed the background and maximum allowable concentrations. The level of soil contamination is permitted.

4.4. Biological resources

Main mass of green space are located in the northern and western parts of the city: in the area of the former park – "Komsomolsk Lake" - an area of about 20 hectares and the City Park in the west with area of about 15 hectares. Today, the lake has lost its existence. The remaining green areas are scattered in different areas of the city in the form of small squares and some green spaces. The largest are: the tracts near the building of regional Khokimiyat, square in front of Ark Fortress and square at Labi Khauz.

The vegetation of the city and suburbs combines artificial tree planting, flower beds and lawns, as well as everlasting weed groups of mesophytic and halophytic species. Along the banks of collectors the groups of hydrophytes - cattail, reed, rare tamarisk bushes occur.

The lack of green areas in the southern part of the city somehow smoothes over landscaping along some main streets. The central streets of the city planted with new breeds of trees: Japanese Sophora, chestnuts, pines and junipers. Old trees preserved on the outskirts of the city: eastern sycamore, elm thick Platycladus oriental, willow, ash, white mulberry, and apricot, apple tree, plums and grapes. In home gardens, among fruit trees, vegetables are planted which are combined with planting herbs and berry bushes.

Single mulberry trees grow between sites fields on the outskirts of the city. In the context of regular watering, feeding the condition of tree species and shrubs is satisfactory and only in case of lack of moisture and care, the plants begin to experience a negative impact from dusty dry air, soil salinity and more prone to disease, marginal or interveinal chlorotic spots appear on the leaves.

Houses with private farms are located in the city. The fauna includes those representatives who live in close proximity with humans. These include domestic animals, insects, birds, rodents. On the outskirts of the city burrows of small rodents can be found: gophers, field mice. Earth rat, house mouse, and others inhabit in the melon fields and gardens. Toads and frogs settle in ditches.

Laughing dove, sparrow, common starling, Lane, rook, black crow, magpie most commonly found among the birds. During the war in Iraq have changed the migration path of some birds has changed, in particular, pink starlings are currently migrating through Bukhara.

Zarafshan River is a home to about 30 species of fish, with a predominance of the carp family, and rare and endangered species included in the Red Book of Uzbekistan: large and small Amudarya shovelnose sturgeon, Aral barbel.

4.5 Social Resources

The impact of environmental factors of different nature and nature (social, economic, biological, climatic, chemical, physical, etc.) lead to the development of adverse effects in health status. The quality of drinking water is one of these factors and is determined by: the nature of the sources of water, regional characteristics of ground rocks and minerals, effective cleaning and disinfection, anthropogenic load, mode of water supply to the population and others. Since 2000, the country has a National Standard GOST 951 sources: 2000 "Sources of centralized drinking water supply". The standard establishes the hygienic and sanitary requirements to choose the source of centralized water supply. Given the multiplicity of factors that determine the quality of drinking water, it can be summarized as five key words "safe" water quality, quantity, continuity, coverage and cost.

The Government of the Republic of Uzbekistan and local authorities in Bukhara pay particular importance to improve the environmental situation and health related to non-conforming sewer system and wastewater treatment in this historic tourist center, located on the Silk Road.

The population of Bukhara makes up 300 000 inhabitants, of whom 133,300 are men and 130200 are women. The number of households in the city is 56,000 people. There are 63 makhallas in the city, the number of settlements is 29. 1554 people are born and 662 die a year. The increase in population, the growth of housing construction calls for the creation of new and refitting of existing communication links.

The city has 11 hotels of Uzbektourism and 45 private hotels.

For 2007, the gross inflow to the city budget was 7.3 bln. UZS, spent 7.2 bln. soums, including: education - 62.9%, health care - 15.8%, culture - 0.8%.

At present, the coverage of Bukhara with centralized water supply is 98%, centralized sewerage - 50%. Centralized sewerage in Bukhara exists since 1966. There are such places in the city where

pipes are located directly on the surface, leading to unsanitary conditions conducive to the spread of diseases. However, most of the inhabitants of the new areas have sewer: Most households do not have a sewage system, use pit latrines, while about 44% of liquid waste is thrown directly on the street or courtyard.

When using steel pipes for sewage and concrete flumes for irrigation systems, there is a big problem because of their destruction coming in most cases sooner than 10 years. This is especially true in areas with high levels of abundance and aggressiveness of groundwater. At the same time transported water leaking through the damaged areas causes pollution of soils, groundwater, increasing their level of occurrence, leading to flooding of the territory, increased soil salinity, suppression of vegetation, causing a threat to the health of the population, using water from shallow wells nearby. This also leads to the accumulation of fecal contamination and disease-causing organisms in open irrigation and drainage ditches, which ultimately degrades the quality of surface water and cause diseases associated with the use of water resources for irrigation purposes, and also has a negative impact on any other potential the use of such water resources.

Most households have expressed their dissatisfaction with the activity of vodokanal. Their dissatisfaction is due to the following reasons: low efficiency of vodokanal in the provision of quality services; passive response, or complete lack thereof on the application of the repair work; and "pressure" on the part of service providers, based on the receipt of informal payments for repair work that must be done to the public free of charge.

In the Republic of Uzbekistan GOST 950: "Drinking Water" was introduced in 2000, which establishes the composition of controlled indicators of drinking water quality, and the rules of procedure of the conformity of these indicators with the established requirements in the production and supply of drinking water to consumers. Guided by the Union State Standard, Sanitary and Epidemiological Service of the Republic constantly monitors the quality of drinking water supplied to the population as municipal and departmental running water. According to the Ministry of Health in recent years the quality of drinking-water Eve in Bukhara microbiological indicators deteriorated and ranges from 13.57% in 2000 to 15.69% in 2004, and the region from 5.6% in 1999, to 9.9% in 2006.

The share of drinking water samples from public water taps not meeting hygienic requirements for chemical indicators in Bukhara region amounted to 43.3% (2006) and 50.7% (1997). Major deviations from the national standard are marked by the level of mineralization and total hardness (chemical parameters).
Hourly supply of drinking water, it helps to change the quality of microbiological indicators. In addition, the case of accidents on the water supply systems impacts them as well.

Surveillance of foodborne diseases and monitoring of food contamination is major in the activities of sanitary-epidemiological service of food hygiene.

The share of food samples in the area not meeting hygienic standards for the period 2000 -2006 make up 5.2% - 8.7% for microbiological indicators, 6.38% -7.0% for chemical indicators, respectively. an increase in the proportion of samples not meeting hygienic requirements is also observed in Samarkand.

Deviations from the hygiene standards marked organoleptic (acidity, clarity, sediment) 10%, and the content of toxic elements (lead, cadmium, zinc) -0.2%, the energy value of food product to-34%, the content of iodine in dietary salt -30% of organic impurities in the beverages 10%, the content of nitrate in crop production -3.0% -12.8% other indicators.

Total mortality in the area has stabilized and is respectively 4.5 cases per 1,000 people/year, and the child death fell from 19 (2000) to 14 (2004) per 1,000 people/year. But there is a tendency to an increase in morbidity from 463.7 to 613.7 appeals per 1,000 people/year.

4.6. Physical cultural heritage

Bukhara is one of the oldest cities in the Republic of Uzbekistan. Its 2,500 anniversary was celebrated in 1996.

The most ancient monuments are: ARK Fortress -5th-7th century, Kalyan minaret-12th-century mausoleum Sayfitdin Bukhari Mausoleum 13th-century, Buyan Kalikhon Mausoleum – 14th-century, trade domes – 14th- century, canals- 16th-century, baths-15th-16th-century and others.

The restoration works on the restoration and preservation of ancient monuments are carried out systematically.

Presence of monuments largely conditioned visiting the city of Bukhara by number of tourists.

Only Buyan Kalihon and Sayfitdin Bukhari mausoleums fall under the area of design works. It should be noted that in the historical center there is no sewerage system and sufficient network of observation wells for groundwater levels.

4.7. Determination of the main environmental problems

The main problems in the city of Bukhara are:

- High level of groundwater in some areas;
- Poor state of the drainage network, leading to rising groundwater;
- Tensions with centralized sewerage network coverage of the population;
- Flooding of the territory;
- Contamination of soils and soil, groundwater due to unorganized wastewater dis charge without treatment;
- High seismicity in the city and subsidence.

High level of groundwater (1,0-2,0m) is marked in large territory with the exception of south of the city of old Bukhara. Irrigation watering of green spaces, gardens, irrigated land, with failed antifiltering screens on the part of the irrigation network, capital stations equipped with automatic regulation for water supply at water intake and ineffective drainage (there are 11 vertical wells in Bukhara and 6 in Kagan) lead to an increase in the level of groundwater flooding of individual sections of the urban area (within the maximum lifting groundwater). In some areas of this part of the city, in areas where the Ark Fortress, Bukhoriy madrasas, groundwater salinity increases to 4282-5382 mg/l, with a predominance of chloride ions to 1329mg/l and sulfates to 2614 mg/l. Because of the high level of groundwater in some areas of the city, their aggressiveness in areas of high mineralization requires to conduct drainage, waterproofing of underground parts of buildings and concrete protection against aggressive impact.

The lack of urban sewerage network in large parts of the territory, the failure of local treatment facilities in enterprises or lack thereof, inefficient work of municipal wastewater treatment plants, lead to contamination of groundwater and ground and soil by nitrogen compounds, oils, suspended solids, organic compounds.

Active pollutants of groundwater and soils and subsoils are the objects of household purpose, schools, gardens, hospitals, and businesses, in particular, poultry, dairy farms that discharge wastewater to the terrain without purification. Sewage water contains impurities insoluble mineral wool, fodder residues, blood, ammonia nitrogen, phosphate, and organic compounds (proteins, fats, carbohydrates).

In the city (mainly in the southern part), where the groundwater level lies over 3-5m, there are sagging phenomenon under additional stress. It is caused by leakage of water and sewer networks, precipitation, leading to wetting soil, subsidence, which in turn causes deformation of buildings.

Of modern geodynamic processes, seismicity, flooding, corrosion and human manifestation process take place in the city.

Refined seismicity of the territory of Bukhara is 8 points.
Human manifestation process is expressed in the accumulation of bulk soils and is marked everywhere. The maximum power of the soil in the area of Ark fortress and is 10-15 m, in the old city of Bukhara 2-5m and 0-2m at an adjacent territory.

Currently, only about 50% of Bukhara (including the nearby city of Kagan) connected to the sewerage system.
The sewer system is a split system with a total length of sewer network with total network length of 189.1 km (172.7 km in Bukhara + 16.4 km at the nearby Kagan). Most often, the pipes were made of reinforced concrete and a smaller diameter pipe portion was usually cast iron. The diameter of the sewer ranges from 200 to 400 mm for the secondary (street) networks, and for collectors it makes up from 600 to 1500 mm. In some places, wastewater is transported by gravity, but the topography of the locality requires the need for frequent pumping the wastewater.

There are 16 sewage pumping stations (SPS), two of which are considered major SPSs. Control of all SPSs is manually. A characteristic feature of all SPSs is high energy consumption due to the use of inefficient and/or old pumps. Most of the facilities of the sewage system was built in 1960 and operated for the past 30-40 years. As a result, the system is heavily worn. Often there are blockages and sewer networks accident. (Fig. 4.7.1).

Figure 4.7.1. Main SPSs

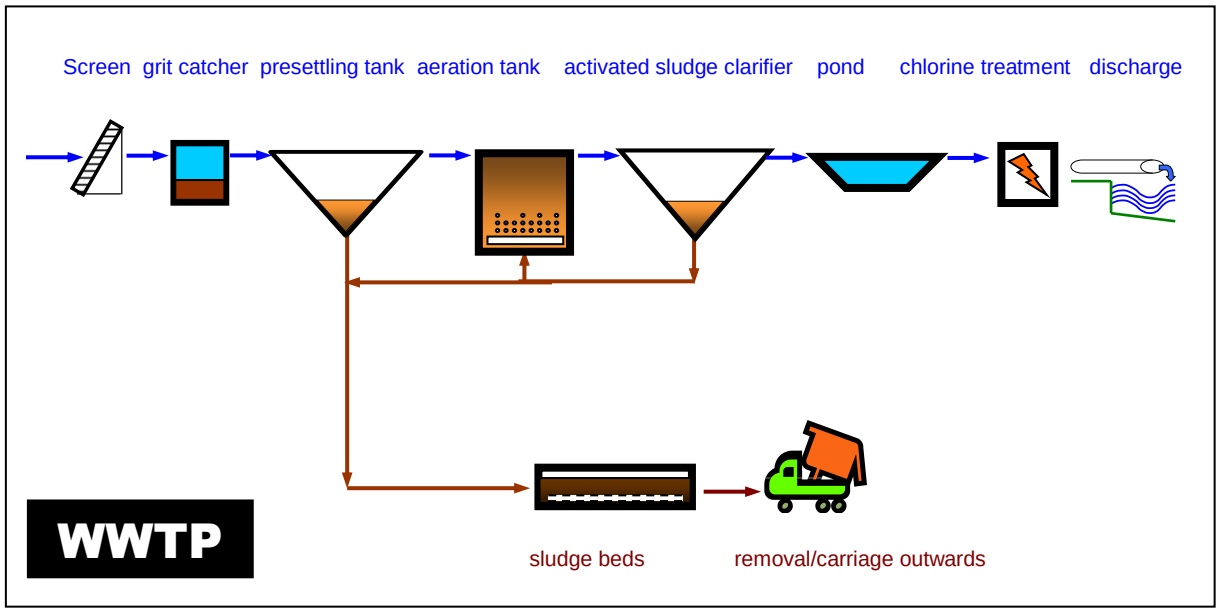
Ground water is usually found at depths of 1-2 m from the ground surface. Since the collectors are laid at a depth of up to 8 m, the volume of wastewater losses due to their leakage into groundwater, as well as the amount of infiltration of groundwater into the sewer network is unknown. In addition to the negative impact on the environment and sanitary conditions, this leads to a significant dilution of untreated sewage and degrades the cleaning results.

The urban drainage system collects wastewater from enterprises and household wastewater from the population. Sewage covers 10 enterprises: “Shokhrud” JSC (winery), “Bukhara Ipagi” JSC, “Bukhoro-Yog” JSC (oil extraction), “Ziёbakhsh-unitrading” JSC (brewery), “Bukhoro-gusht” JSC (meat processing plant), “Bukhoro-Don” JSC (Flour), “Bukhoro-Non” JSC (bakery), “Bukhoro-Gips” JSC, “Bukhoro-Sut” JSC (Dairy Plant), “Bukhoro-Ozick-ovkat savdo” JSC (food production). The maximum amount of wastewater comes from “Bukhoro-yog” JSC, “Bukhoro-Gips” JSC, “Shokhrud” JSC.

All the collected wastewater is fed to only in Bukhara city **wastewater treatment plant (WWTP)**. The construction of WWTP began in 1966 after which they were expanded several times. Recent significant investments were made about 25 years ago.

Sewage treatment technology is based on the traditional concept of using activated sludge, which is characterized by the presence of lattices, sand traps, primary sedimentation tanks, aeration tanks and secondary clarifiers. Post-treatment occurs in two biological ponds, after which the waste water is chlorinated and discharged. Il stored on sludge beds. (Fig. 4.7.2).

Figure 4.7.2. The overall process flow diagram on WWTP of Bukhara



Average fuel consumption at the entrance to WWTP in 2007 was 43 300 m^3/d., i.e. 290 l/pers./day; the average pollution load of the incoming wastewater on BOD_5 - 5500 kg/d., i.e. 37 g/pers./day. The design capacity of the WWTP is 100 000 m^3/day. In addition, there is no information on the design characteristics of WWTP (except for data on wastewater flow), such as the concentration of contaminants in the incoming wastewater, design temperature, etc. As shown by preliminary analysis, the volume of available capacities is enough to provide treatment at the moment as well as in the medium term, given the projected costs of wastewater and pollution loads.
The actual efficiency of treatment facilities on ingredients is presented in Table 4.7.3.

Table 4.7.3. Characteristics of wastewater treatment plants

Name and composition of sewage treatment plants and treatment method	Capacity, factual, m^3/day	Эффективность очистки		
		ингредиенты	фактическая концентрация, мг/л	
			поступило	сброшено
Sewage treatment plant (WWTP) in the village of "Kozi-Said" of Bukhara district, Bukhara region. Treatment by	43 thousand	1. suspended matter	70	22
		2. BOD	40,8	20,4
		3.COD	45	19
		4. Solid residual	1800	880
		5. Chlorides	550	365
		6. Sulfates	560	410
		7. Phosphates	0,85	0,45
		8. Nitrogen	7,3	4

biological methods		9. Nitrogen nitrites	0,065	0,031
		10. Nitrogen nitrates	11,1	6,4

Like buildings and facilities, the electro-mechanical equipment on WWTP of Bukhara is in a very poor physical condition and has low efficiency. A particular problem is the existing aeration system for biological treatment stage which, if it worked approximately as long as it is necessary, it would take about 2-3 times more energy than it is consumed in comparable power of well-operated European WWTP for wastewater of similar quality.

Power supply of WWTP is unstable and existing electricity is often insufficient for the proper treatment of wastewater. As a result, the effluent does not reach the established maximum permissible discharge (MPD). Improvement of the efficiency of the cleaning process, especially the aeration system is required. Some equipment, such as wastewater samplers, flow meters, screens, grit chambers, as well as laboratory building are subject to be immediately reconstructed or replaced. Reconstruction of the rest of the equipment and the reorganization of the existing process is planned for the second phase of the project. In the near future there is no need to build new tanks/settlers.

Table 4.7.4. Data on the supply and quality of discharge wastewater on WWTP of Bukhara

CONCENTRATION							
Incoming flow	[mg/l]	126,6	183	10,7	---	28,7	3,0
Effluent	[mg/l]	26	-43	5,3	---	16,5	2,5
Discharge criteria	[mg/l]	20	---	2,5	10,1	---	0,7
POLLUTANT LOAD							
Incoming flow load	[kg/day]	5 480	7 906	464	---	1 242	130
In equivalence to population	[PE60]			91 334			
In equivalence to population	[PE 120]			65 883			
Население, подкл. к канализации	[чел.]			150 000			
Nominal pressure on human	[g/man/]	37	53	3,1	---	8,3	0,9
Typical indicator in Europe	[g/man/d]	60	120	---	---	11,0	1,8

The above data brings to the following results:

- Very low concentration in effluent wastewater. This indicates to high water consumption, and problems associated with infiltration of groundwater.
- Wastewater is easily biodegradable $COD/BOD_5 = 1.5$.
- Relationships between different parameters: BOD_5/Total N/PO_4-P = 100/23 / 2.3. This corresponds to the normal content in wastewater: BOD_5/Total N/Total R = 100/18/3 in Germany [4], and 100/25/4 - in average in European countries (Note: Total nitrogen is not directly measured in Bukhara but rather estimated based on the available data for nitrogen).
- The load on BOD_5 in effluent wastewater is 37g/pers./day. In Europe, this figure is typically 60 g/pers./day.

Sanitation facilities available in the areas of the city allow to remove human wastes in the amount of 90%. The quality of wastewater is below any acceptable hygienic standards. Most of these drains eventually seep into the soil and/or groundwater, causing a threat to public health. Much of these effluents/waste either pours into the sewer system or reused as fertilizer or simply taken out and poured onto the terrain. The first option leads to operational problems in the sewer system (block-

ages, sludge) and in WWTP (peak overload), and the last two - to environmental and sanitation problems.

Residents of Bukhara, not connected to the sewerage system (i.e. about 150 000 people) use pit latrines in their areas and septic tanks of questionable standards. Cesspools mostly in the city made without filtration screen that facilitates filter wastewater into the soil and groundwater, contaminating them. In addition, the human waste is often disposed by sewage truck at the request of residents and transported to farms where they are used as fertilizer. It is also, as in the case of inadequately treated water after sewage treatment plants described above, leads to environmental and sanitation problems. To change this situation, Bukhara RPSE "Suvokova" needs to expand the existing sewer system, reduce the number of "facilities" at the households and connect additional number of residents to the sewer system.

As an emergency measure it is necessary to organize the process of liquid waste, removed by a special transport from the households, into special containers, which should be located in the territory of the sewage treatment plants before receiving chamber. Next adopted wastewater should be dosed and sent to treatment process. This practice has existed in previous years in BVK, it is only needed to renew contacts with the municipal authorities and solve organizational problems.

Thus, the analysis of the current state of the environment has shown that many of the problems associated with sewage of the city which can be eliminated and reduced by means of reconstruction of sewerage system.

5. ПРОЕКТА ENVIRONMENTAL ANALYSIS OF THE PROJECT

Under Component of reconstruction/expansion of sewerage networks, pumping stations and WWTP

On the sewerage network repair-restoration works of collectors with the total length of 41.04 km that are in poor condition (replacement of sewer pipes) on sites shown in Table 5.1. and Figure 5.1 will be provided under the project.

On sewer systems, silted in some areas, with destroyed or silted manholes the reconstruction of pipes and their flushing is provided.

Table. 5.1. Events for the reconstruction and development of the sewerage system of Bukhara with coverage of Kagan

No.	Description of measures	Phase II of the project, (km)
	Reconstruction of networks (rehabilitation)	
1	Reconstruction of sewage treatment plants	
2	Reconstruction of MSPS-1	
3	Reconstruction of PS-8 and PS-9	
4	Gravity collector from PS-2 to microdistrict Shark-1, PS-6 - diameter 1000mm	2,2
5	Pressure line from MSPS to WWTP with diameter 2x1000mm	8,2
6	Gravity collector from railway T.Farogi St. to the crossing of Mustakillik St. (Khuja Mushkin St.), diameter - 1200mm (Southern collector)	0,75

No.	Description of measures	Phase II of the project, (km)
7	Pressure line from the PS-2 up to closing dike, diameter - 800mm, along Piridasgir St. diameter 700mm	0,80
8	Gravity collector along Mustakillik St. from the intersection with Khuja Mushkin St. to the intersection with Piridasgir St.	1,50
9	Gravity collector from Hospital of along Gazli Highway up to Okmasjid St., diameter 600-1000mm	1,20
10	Gravity collector from railway post No.16/3 to A.Jomiy St. along Navoi Prospect. up to ASC building further along Piridastgir St. up to Sport center "Semurg", diameter - 800mm	0,70
11	Gravity collector along Alpomish St. from Sports College up to intersection of Farogi St. and along Farogi St. up to Southern Collector, diameter 800mm	1,40
12	Pressure Line along Alpomish St. from Sports College up to intersection with Farogi St. and along Farogi St. up to Southern Collector, diameter - 800mm	0,80
13	Gravity collector from railway post No.31 to Alpomish St. along farogi St. up to Alpomish St., diameter - 600mm	0,85
14	Gravity collector from Nakshbandi St. up to J. Ikromiy further along J. Ikromiy up to Khamza St. further along Khamza St. up to intersection with Muminov St., diameter-600mm	0,82
15	Gravity collector on M.Ikbol St. up to intersection of M.Ikbol with Namozgokh St. up to intersection with Jubor St. diameter -600 mm	0,75
16	Gravity collector from intersection of Mustakillik St. with Piridastgir St. along Piri-dastgir St. up to Sports center "Yoshlik", diameter -500 mm	0,55
17	Gravity collector from railway post No.5 along Murtazayev St. up to Murtazayev St., diameter-400 mm	0,40
18	Gravity collector from Piridastgir mosque up to Piridastgir St. (Sports Center "Sem-urg"), diameter-400 mm	0,40
19	Gravity collector from House No.3 in shark-1 up to Eastern Collector ("Fregat" Res-taurant), diameter-400 mm	0,95
20	Gravity collector from railway post No.11/3 along Alpomish St. up to Alpomish St. and further up to Mustakillik, diameter-400 mm	0,50
21	Gravity collector from Agrokhimlaboratory up to Eastern Collector, diameter-400 mm	0,60
22	Gravity collector from Gulchorbog settlement up to Southern Collector, diameter-400 mm	0,50
23	Gravity collector from ps-3 up to railway post No.17 along Zulfiya St. diameter-400 mm	0,80
24	Gravity collector from Sports Center "Yoshlik" through block of houses No. 14-14/4, further through scholl No.23 up to raiway post No.48 in Mustakillik St., diametyer-400 mm	0,70
25	Gravity collector from Gazli Highway intersection with Okmasjid St. further along Okmasjid up to Fayzobod St., diameter-400 mm	0,75
26	Gravity collector from railway post No.9/3 along Piridastgir St. further between schools No.8 and no.345, further uo to Alpomish St., diameter-400 mm	0,55
27	Gravity sewer from PS-4 up to railway post No.5/2 in Ikbol St., diameter-300 mm	0,30
28	Gravity collector from Southern Collector in Farogi St. further along Farogi St. up to School No.32, diameter-300 mm	0,35
29	Gravity sewer from railway post No.58 in Mustakillik St. further to Café "Asad mus-lim", further up to Mustakillik St. ("Melodiya" shop), diameter-300 mm	0,40
30	Gravity sewer from railway post No.6/3 in Alpomish St. up to last bus-stop, diameter-300 mm	0,30
	New construction of sewerage networks	

No.	Description of measures	Phase II of the project, (km)
1	Gravity collector from the North-west collector by-pass road to MSPS (with installation of local pumping), diameter - 1000mm	1,30
2	Gravity collector from the village “Vodnik "to the East Collector, diameter - 400mm	0,50
3	Gravity sewer from Khuja Nurobod St. along Nakshbandi St. further along M.Anbar St. to Magoki Kurpa Mosque –dome 2, diameter - 200-300 mm	0,80
4	Gravity sewer from Northwestern Collector up to Sulton Jura St. with passages of S.Jura St. to Narshakhi St., diameter - 200-300 mm	2,00
5	Gravity sewer from school №2 in Ikromiy St. to the building of Medical Institute, diameter - 300mm	0,20
6	Gravity sewer from Khamza st. along Ikromiy St. to its intersection with Mustakillik St., diameter 300mm	0,20
7	Gravity collector from Northernwest collector along Mirdustim St. to its intersection with Shaftolizor St., further to cinema “Akhmad Donish”, diameter 400mm	1,00
8	Gravity sewer from the intersection of Mirdustim St. with Shaftolizor St. further along Mirdustim St. up to Khavzi Bodom St. turning-2, diameter 300mm	0,35
9	Gravity sewer from the cinema “Akhmad Donish” in Shaftolizor St. further along Beruniy St. up to Khavzi Zhilovkhona St., diameter 300mm	0,30
10	Gravity sewer from the cinema “Akhmad Donish” on ul.Shaftolizor further along Mukimiy St., diameter 300mm	0,30
11	Gravity sewer from Shaftolizor St. further along Toki Kala up to Eshoni Imlo St., diameter 300mm	0,35
12	Gravity sewer from the intersection of M.Ikbol St. with Mirakon St. further along Mirakon St. through Maschidi Baland St. to Usto Sharif St., diameter 400mm	1,00
13	Gravity sewer from Kosagaron St. along Maschidi Baland St. to intersection with Kamolot St., diameter 300mm	0,30
	Total in Bukhara	41,27
	Kagan town	
14	Reconstruction of PS ‘Beklar”	
15	Reconstruction of the pressure line from thePS ‘Beklar” to the collector on Farogi St. in Bukhara, diameter 500mm	11,00
16	Gravity collector from the PS “Beklar” up to Khorezmskaya St., diameter -1000mm	5,00
17	Gravity collector in Buhoroshokh St. up to Tarobiy St., diameter - 700mm	2,00
	Total in Kagan	18,00
	Total on networks	59,27
	Other activities	

No.	Description of measures	Phase II of the project, (km)
20	Strengthening the material-technical base of the enterprise	
21	Public Awareness	
22	Engineers Consultants	
23	PCU Consultants, audit	

Repair works provided on 2 pumping stations, which are in emergency condition. Restoration works on pumping stations are mainly consist of the complete replacement of pumps and their installation and repair of electric motors, replacing substations, control cabinets and power cables, repair of concrete structures. Metal waste will be formed during carrying out these works which is to be collected in a separate box, and they shall be deposited in the appropriate collection point for recycling.

To execute design solutions on expansion/construction of sewer collectors the following operations will be performed:

- excavation;
- Embankment and backfill;
- Installation of steel structures and processing;
- Laying sewer pipes.

This will eliminate the problem in the most tense areas and will lead to improvement of ecological environment and improve public health.
Proposed works at WWTP of Bukhara are aimed at addressing the most pressing needs:
Flowmeters for incoming waste and discharge wastewater:

- Currently sampling of incoming and discharged wastewater analysis is carried by scoop method. Installation of 2 new of automatic probe samplers, one at the entrance and one at the output of WWTP of Bukhara is provided because consumption data of discharged wastewater is important.

- Flow measurement: Currently consumption data is calculated only on the basis of the number of hours of operation and capacity of pumping stations. On one hand, the data flow is required for measuring pollution load, which in turn is required for environmental assessment. On the other hand, consumption data allows us to estimate the physical condition of the sewer network as well as WWTP equipment. Comparison of the wastewater flow data allows water to withdraw water balance, indicating infiltration of ground water into the sewer system, and vice versa, as well as the storm water seepage. Minimum flow rate at night can also be used to assess the amount of groundwater infiltration. It is also important that only the exact data can reliably allow to design all stages of the process of sewage treatment.

- Screens have two main purposes: (1) to protect the equipment placed behind them from increased wear, (2) prevent the accumulation of materials to be sorted out in the mud. Currently, none of these tasks are not performed because the existing screens remove only a small amount of debris. The project provides for the installation of new screens with small crevice.

- Currently, there are two types of grit catchers: the “new” grit catchers that are no longer work, and the “old” grit catchers which are currently functioning. None of them are modern and allow effectively remove sand and fat. The project envisages the construction of new effective grit catchers.

- The laboratory is very important to monitor the activities of WWTP, as correctly done analysis can eliminate the problems associated with water consumption and environmental pollution. Since the physical condition of the laboratory is bad, it is planned to reconstruct it.

The new aeration system: Total electricity consumption for WWTP of Bukhara in 2010 was about 20 kWh/PE60/year. This figure is not representative for normal operating conditions, as this period was characterized by prolonged power outages. Also it should be noted that the number of hours of the blowers (and thus energy consumption) was sometimes insufficient even to maintain appropriate standards on the quality of treated wastewater. After installing a new aeration system (new blowers + new aerators) it will be possible to reduce electricity consumption by aeration to about 20 kWh/PE60/year and thus significantly improve the quality of cleaning. The following is needed to install for new aeration systems: (1) new small blowers with frequency converters; (2) new fine aerators in the aeration tanks; (3) to reconstruct the ducts so that each blower is separately connected to one of the existing four aeration tanks to facilitate automation (i.e., all four blowers + 4 + 1 backup duct); (4) sensors/probes O2- and NH4-, operating in real time, in the aeration tanks (5) automated control system.

Pumps for return sludge. Currently, the pumps for return sludge take the second place on energy consumption at WWTP of Bukhara. According to conservative estimates, replacement of existing inefficient pumps allow for more efficient ones will allow to save about 30% of electricity.

Since the current consumption is artificially reduced due to long-term power failures, even after the implementation of activities on increase of energy efficiency is assumed that energy consumption will increase on WWTP (assuming that electricity will be supplied smoothly in the future)).

Implementation of the project on the component of reconstruction/expansion of sewerage networks, pumping stations, and WWTP will improve the quality of wastewater treatment that have a positive impact on the environment and human health.

Figure 5.1. Bukhara, the scheme of sewerage networks and BVK strategy on their reconstruction

….. Existing networks

….. Networks to be replaced and laying of new networks

….. Networks needing urgent replacement

Increased capacity of Bukhara Vodokanal (BVK) on the Component

BVK potential is limited due to the lack of modern equipment and know-how. The project will include the purchase of equipment specifically designed for improving further maintenance of the reconstructed sewage system. This means, firstly, prevent operational problems, as well as increased service life and sewerage system. Both of them will facilitate to change people's attitude to the sewer service for the better. All these activities will reduce the negative impact of wastewater on the environment.

Increasing of public awareness on the Component

This component will include the development of an information strategy and an increase in capacity for the campaign in the media, as well as training programs for communities and civil society. The proposed measures will include a wide range of components from booklets, posters and campaigns in local schools to disseminate information on radio and television.

5.1 Impacts by the type of activities (physical options)

The analysis of the technical state of sewage treatment plants, pumping stations and sewage network in the project area led to the following conclusions:

- Technical condition of the sewer system provides the necessary removal of wastewater from the households and industrial enterprises and organizations; In whole, the network is in poor condition and needs repairing;
- Rehabilitation of pumping stations for smooth supply of wastewater to wastewater treatment facilities;
- Restoration of the effectiveness of the treatment facilities, their modernization, replacement of the part of electromechanical equipment, etc.

Impact analysis of the types of works included in the project are presented in Table 5.1.1.

Table 5.1.1 Summary table for the Project components

No.	Sewerage needs	Q-TY	O&M costs		Environmental protection			
			Reducing costs on electricity	Reducing the number of accidents in the sewerage network	Increase in the number of connections to the sewerage network / decrease in unorganized discharge	Improvement of WWTP technological process	Longer service life facilities and equipment	Observance of quality standards of treated wastewater
	I. INVESTMENT COMPONENTS							
1	**Reconstruction of the existing sewerage network**	59,27 km		X			X	
2	**Reconstruction of SPS**	2 pcs	X				X	
3	**Samplers of coming and effluent water**	2 pcs				X		X
4	**Flowmeters**	1 pcs				X		
5	**Screens with small crevice**	3 pcs				X		
6	**Grit catchers**	2 pcs				X		
7	**Reduction of energy consumption of blowers**	1 total amount	X			X		X
8	**Reduction of energy consumption for re-pumping of return silt**	1 total amount	X					
9	**Reconstruction of existing buildings and facilities**	1 total amount				X	X	X
10	**Strengthening the material-technical base of BVK**	1 total amount		X			X	
	II – INSTITUTION DEVELOPMENT							
14	**Public awareness**	1 total amount		X			X	

As it can be seen from the table, after the reconstruction of sewer networks, pumping stations, the improvement in withdrawal of wastewater, elimination of leaks is expected that have a positive impact on the environment and human health, because it eliminates infiltration not treated waste water from the sewage pipes into the ground/groundwater. It is also important that preventing dilution of untreated sewage inside the sewer networks with groundwater, infiltrating into the sewer network as a result of infiltration, can improve the outcome of treatment of wastewater. Extension of the sewerage system will increase the number of connections to the public sewer system, which will reduce the unorganized discharge of effluent into the environment and reduce the negative impact on soil and groundwater. This result is expected from the reconstruction of treatment facilities and reducing the discharge of pollutants into the Sakovich collector and then to Dengizkul Lake located in the south of Bukhara region.

5.2. Проекта Impacts associated with the Project location

Almost all project activities will be carried out in the city, around the existing sewerage infrastructure and wastewater treatment plants. A combination of activities (physical options) will be used in most part of the project area.

The improvement of wastewater withdrawal and elimination of leakage mainly will be positive environmental impact throughout the Project that reduces the pollution of soil, groundwater and surface water. Mostly, negative environmental impact has temporary and local nature and is associated with the construction works. It is expected that the negative environmental impact can be significantly mitigated through appropriate construction security measures.

There are historical monuments and cultural sites in the project area. Location of new facilities will be selected in such a way as to minimize any distortion of the surrounding landscape and the existing urban architecture. The area of design works will only cover Buyan Kalikhon and Sayfitdin Bukhari mausoleums. It should be noted that there is no sewerage system and sufficient network of observation wells for groundwater levels in the historical center.

5.3. Impacts during project implementation and mitigation measures

Rehabilitation and construction works, both on the sewage network and wastewater treatment facilities are in fact environmental protection measures, but they cause little environmental impact during implementation, leading to both positive and negative consequences.

The potential impact of the project would bring to:

Improvement of public health: the project will increase the reliability of the regular removal of waste from the population, industrial enterprises and organizations, its regulatory treatment at wastewater treatment plants, will eliminate leakage of sewer networks, which helps to improve the quality of groundwater and surface water (physical and microbiological parameters), and lead to reduce the incidence of waterborne diseases.

Water and land resources

During the construction or rehabilitation of sewerage systems, water may be contaminated with cleaning and construction of sewers and waste from construction sites. Protection measures should be taken against possible sources of pollution to prevent contamination of surface and groundwater:

- Compliance with the rules of the repair work and the use of modern technologies during the performance of works;
- Diversion of surface and drains outside construction projects;
- Development and implementation of wastewater withdrawal during reconstruction;
- Timely cleaning of construction sites from construction wastes and their disposal.

Measures on protection of all types of water resources from possible sources of contamination should be taken during the rehabilitation and construction works. Inadvertently leaked fuel and oil from the tanks at construction sites, as well as improper handling lubricants during maintenance, are the most likely sources of contamination of surface and groundwater in the project sites.

Pollution will be temporary, would have little impact on the soil and groundwater. Construction works will be carried out within a short time and dry weather conditions in Bukhara will help to reduce their impact on water facilities.

The main environmental impacts on land resources during the rehabilitation and construction is soil pollution with construction waste and lubricants as well as flooding the surrounding land with pos-

sible damage to the buildings. Relevant areas should be prepared to collect and storage of construction waste and sediment to reduce the negative environmental impact.

Soil may be susceptible to contamination by the same sources of pollution which have been mentioned in relation to water resources, namely mishandling with hard and liquid waste and improper maintenance of equipment, particularly when replacing the oil and refueling equipment.

The use of lubricants is planned limited in scope and duration and therefore its impact on the environment will be insignificant. However, the practice of construction works requires the provision of measures to prevent pollution of soil and water.

Measures on protection of soil should be involved in accordance with the rules and regulations of the Republic of Uzbekistan. During the construction of new collectors the organic topsoil suitable for further use should be removed and temporarily stored separately from the rest of earth materials. After completion of construction/renovation collectors, the organic layer of soil by backfill will be placed on top, properly sealed and restored to its original condition.

Ambient air

Temporary environmental impacts of rehabilitation and construction works on the sewerage system, the topic is related to the use of technology for repair and restoration, and includes: dust, noise at trenching, the occurrence of vibration in nearby old buildings, restricting access to the buildings, the closure of certain sections of roads and disturbance traffic on them, these effects during the restoration work on the sewer network and distribution sites will be short-lived and affected neighboring communities at different times. The impact will also be moderately to operating personnel and the environment. Measures would be taken to mitigate and control technology of repair work.

To reduce the impact on air transport should be taken to the strict observance of safety rules at major intersections, main roads and streets in the makhallas and near working facilities. The temporary or permanent traffic lights at the busiest intersections shall be installed by Contractors under the supervision of PIU. During the rehabilitation / construction period will be enhanced traffic police in the communities, as well as relevant measures of prevention and safety among schoolchildren.

Suppression of dust formation during operation and transportation should be carried out by irrigation the area of working facilities and roads. All construction projects and passages should be cleaned after completion of works.

Terrestrial vegetation

Damage to trees and vegetation will be insignificant. Rehabilitation/construction works on sewer collectors usually mean that the part of the vegetation will be removed and stockpiled along the work site. They can be mitigated by appropriate measures taken, namely, the restoration of disturbed vegetation.

The formation of solid and liquid waste

During the repair work construction waste will be generated at WWTP, distribution sites and sewer collectors which require strict system of collection, disposal and minimizing.

Waste from grit catchers and silt produced in the wastewater treatment process can be a source of contamination of soil and water (surface and groundwater) while it is removed. The following wastes will form during the repair work of sewer network:

- Waste of mechanical cleaning of collectors from sediment, consisting of debris, a mineral salts and organic matter;
- Excavation waste from the preparation of sites for the construction of reservoirs;
- Waste materials after repair damaged pipelines.

Use and storage of these wastes must be provided in the working draft. various types of solid waste, including timber, oil filters, plastic and cardboard boxes from the packaging equipment will be at work sites. Mitigation measures will include the provision of waste containers and containers for the collection of used oil with the further utilization them at specially designated for this purpose, places.

Excavation waste from the preparation of sites for the construction of collectors will be used for backfilling the trenches.

Waste after replacement of damaged reinforced concrete and cast iron pipes it is provided to take into Vtorchermet or recycle to the metallurgical plant.

Maintenance of equipment will be made exclusively at gas stations, used oil and other liquid pollutants are stored in specially equipped places for them. No maintenance of machinery on the job site will be permitted.

Upon completion of works all facilities must be cleaned and returned to its natural state.

Population and workers

Methods of work on rehabilitated and constructed facilities can create dangerous situations for workers and the population of nearby settlements. Healthy working environment must be created in compliance with the provisions of safety. The protection of working facilities and bridges over the trench shall be provided. Traffic control, alarms and lighting shall be in accordance with local regulations. If necessary, safe bypass roads and crossings for pedestrians must be installed.

Control over the content of chlorine in the air and residual chlorine in the water For safe chlorination of wastewater is provided for safe chlorination of wastewater. The chlorination process that is used for disinfection of sewage will be carried out with the established measures of protection and control of its submission.

Replacement of old sewer networks entail interruptions in receiving effluent from subscribers may damage other communications (telephone, electricity). It is equired to take the necessary measures in the design of reconstruction and mandatory coordination with the relevant agencies and enterprises.

Chance finds of cultural value

There are archeological and cultural findings, because construction work on the expansion of the sewer network affects the territory of the old city. In case of archaeological finds, the Plan provides for the requirement to publish special notices, termination of operations and compliance with the order of their excavation.

5.4. Long-term impact and mitigation measures

Improving of maintenance of reconstructed sewer system and wastewater treatment plants will significantly contribute to the reduction of pollution, groundwater and surface water, soil and vegetation and consequently decrease shit-morbidity, improve sanitary and epidemiological situation in the city. All of this is provided to reach by a combination of capacity building of vodokanal and physical impact.

Effective improvement of means of water treatment plant is only achieved by understanding and cooperation system operators with the local population. Involvement of the operational and maintenance staff is not as important as the involvement of high-level policy makers and budget management.

Issues affecting the management and operation will be addressed during the detailed design and execution of the project. They include:

- Improved access to connect to the public sewerage system.
- Providing regular supply of electricity for the efficient operation of the pumping stations and sewage treatment plants.
- Identifying measures that Vodocanal can take to improve interaction with customers and promoting public participation in the design, monitoring and evaluation to increase the efficiency of the system.
- Provision of input to determine the best strategy to increase rates within acceptable limits for the sustainability of the system.
- Carrying out programs to increase institutional capacity and training relevant personnel of Bukhara vodokanal.

6. ALTERNATIVE DESIGN SOLUTIONS

The project envisages the development of the existing infrastructure of the sewer system through the construction of new and reconstruction of existing sewer networks. In the construction of new and replacement of old sewer systems may be used both metal pipes and pipes made of plastic or fiberglass. Metal pipes corrode easily, not resistant to corrosive groundwater is not convenient for transportation and assembly. Plastic and fiberglass tube light, produced with different diameters and lengths, equipped with couplers and fittings; convenient for transport and assembly are not subject to corrosion, durable - their life is 50 years.

The great advantage and ease of use is the use of fiberglass pipes to upgrade water mains and sewer lines by dragging in the old pipeline. After dragging the space between the old and new pipes is filled with fast setting mortar. Update sewer pipes can be done without interrupting their work during the low flow in the area between the two wells. long-term storage of pipes in the open air is possible due to a high stability to ultraviolet light. Scratches on the external surface of pipes are allowed.

.

The use of these pipes will significantly reduce the time and labor for repair work, as well as eliminate the annual overhaul, improve the environment during the reconstruction.

7. THE ANALYSIS OF POSSIBLE EMERGENCY SITUATIONS

Possible emergency situations in the city may involve a violation of the integrity of irrigation canals and drainage systems and sanitation facilities crossing the track channels. Such accidents may occur as a result of corrosion of pipes, as well as natural disasters (earthquake, etc.), while it is possible ingress of contaminants in soil, ground water, soil, land reclamation system in the collector and then to surface waters. At the same time in the field of pipe breakage will be flooding area. All this will be reflected not only in the state of vegetation, but also can cause an outbreak of infectious diseases in animals, and at a number of the resident population. Therefore, to ensure reliable operation of irrigation, sewerage and drainage pipes must be laid of the corresponding corrosion-resistant material. In the event of such accidents the population should be informed and to provide it with delivered water.

8. FORECAST OF BENEFITS AND ENVIRONMENTAL CONDITION AFTER PROJECT IMPLEMENTATION

It is expected that the impact of the project on the environment will be mostly positive; and negative effects will be temporary.

The impact on the environment during rehabilitation works and after their completion will vary.

During the period of work inorganic dust and combustion products from the construction and mobile equipment will be brought into the air. The condition of soil and soil-vegetable cover will be disturbed. The impact will be temporary for these components of the environment with reversible consequences.

Repair and construction of sewer collectors, their cleaning will cause the change of operating mode of sewage collectors that the sanitary conditions of adjacent territories may become worse. The impact will not be for a long period but with reversible effects.

The analysis shows that the implementation of project activities will reduce: (1) the costs of operation and maintenance (O&M) for the elimination of accidents (2) loss of wastewater /groundwater infiltration, (3) the amount of care "facilities" in areas (4) power consumption of the equipment and the total power consumption of BVK. After installing a new aeration system (new blower+new aerators) is planned to reduce energy consumption by aeration to about 20 kWh /PE60/year and thus significantly improve the quality of wastewater treatment.

Initially, the benefits will occur in connection with the cleaning and restoration of the sewage network and discharge their wastewater treatment facilities. At the moment the capacity of the reservoir is significantly reduced due to sediment contamination and leaks. Construction of new collectors, washing and repair of the existing network, pumping stations and sewage treatment plants will allow time to collect wastewater and clean them up to standard indicators on the quality of wastewater.

Ambient air
After the completion of planned works the air quality will improve due to eliminating temporary sources of exposure - construction machinery and motor transport.

Surface water and groundwater

As a result, rehabilitation/construction of sewerage network, facilities, the coverage of population connected to the sewerage network increases, efficiency of sewer collector reduces, flow losses decrease due to the guaranteed and timely collection of sewage and their regulatory cleaning, helping to reduce wastewater discharge into surface and ground water. The condition of water of Sakovich collector and Dengizkul Lake changes for the better as good quality water will come into them after purification.

Soil and ground
By increasing the capacity of the reconstructed network, the outflow of wastewater will increase and the likelihood of contamination of soils will reduce. After the rehabilitation of sewer collectors, the salinity process of land is suspended.

Vegetation
After rehabilitation of sewer collectors, reducing contamination of soil and groundwater, the condition of vegetation will change to better.

Fauna
During the works, the birds move to the more remote distance, then, they will return to their former places.

Physical cultural heritage
Repair of leaks in the sewer collectors and pumping stations will reduce groundwater levels and their negative impact on cultural heritage.

Socio-economic aspects and public health
Rehabilitation and expansion of sewer collectors, improvement of management of sewerage infrastructure will reduce the unorganized wastewater discharge from the population, will reduce the pollution of ground and surface waters, and as a consequence, will reduce morbidity, improve sanitary and epidemiological situation in the city.

Thus, the implementation of this project covering the rehabilitation of the facilities, reconstruction and construction of sewer collectors, improving the management and operation of vodokanal services, will lead to a change in the water regime of the territory which will have a positive effect on the entire range of environmental conditions, cultural heritage sites and public health.

9. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The overall objectives of environmental management are:
- Implementation of activities to prevent or reduce any negative impacts to acceptable levels;
- Implementation of activities that contribute to environmental measures, falling out by phase with the technical and other project activities during the implementation;
- Implementation of activities to address the risks during the construction and O&M;
- Control and monitoring of significant problems during the rehabilitation/construction and operation.

To ensure its effectiveness and practicality, EMP takes into account the requirements of the World Bank, the "Uzkommunkhizmat" Agency, Bukhara RPSE "Suvokova" contractors, hydrogeologists, Territorial Committee for Nature Protection, Inspectorate for Protection of Cultural Heritage.

The plan provides for the solution of issues related to the construction and operation of the structure of sewer collectors, as well as with a description of the possible negative effects includes measures to effectively reduce the negative impact on the environment. Consolidated EMP is prepared on the basis of the experience gained during the implementation of Bukhara and Samarkand Water Supply Project (IBRD/IDA 2004-2009). Annex 1.

9.1. Mitigation measures

Temporary use of land
It is assumed that the displacement of people due to the implementation of the project will not be necessary. To minimize the impact, all Project facilities will be designed along linear structures such as roads. Construction infrastructure provided by the project will not conflict with other types of existing infrastructure, such as roads, urban infrastructure, either during construction or in the future.

Historical, cultural sites and landscapes
In the project area, there are will be found historical monuments and cultural sites during construction work. Constant control over the site works of location of cultural objects of the representative of Bukhara Regional Inspectorate for Protection of Cultural Heritage is provided.

Measures to mitigate the negative environmental impacts of the Project is temporary and localized violation of construction and reconstruction. It is assumed that most of the identified measures to mitigate negative impacts on the environment should be part of normal working practice of the Builders during project implementation.

As expected, most of the costs to mitigate the negative environmental impacts of the Project will be included in the tender documents which will be prepared by Feasibility Study Group.

Impacts caused by the operation of the infrastructure project
In general, the operation of sewer collectors of the infrastructure does not imply significant risks. The project provides anticorrosion measures to mitigate the negative impact on groundwater. The project will be provided with anti-seismic measures aimed at reducing the seismic load and increase resistance to seismic impact.

To prevent adverse effects on the environment arising in the process of reconstruction and construction of sewer collectors the following are provided:

To reduce air pollution in the area of rehabilitation, excavation and transportation of the earth provides for measures to:

- dust suppression during the construction period;
- • No assumption of excess number of vehicles in the territory, in order to reduce gas pollution and dust;
- Incineration of debris and other materials.

To protect the soil and groundwater and surface water the following is planned:

- Provide construction sites with trenches to drain surface effluent and drainage water, their surface after the completion of the work is subject to be restored;
- Take appropriate measures to prevent leakage of fuel lubricants, all ground tanks of fuel and lubricants will be placed above the earth's surface and the integrity of the walls will be under constant supervision. Collection and disposal of waste oil is carried out in accordance with environmental requirements;
- Development and implementation of the plan for wastewater drainage during reconstruction, pumping or bypassing them through gravity flume;
- Timely cleaning of construction sites from construction waste and storing them only in places designated by regulatory agencies;
- Soils after excavation and other works on the site must be placed in such manner that not to impede the flow of water and be a source of contamination.

To mitigate the impact of the repair work on the ground the following is assumed:

- To carry out land reclamation after completion of works and the removal of temporary crossings, canals, trenches, structures and construction waste;
- To prevent leakage during filling and transportation of fuels and lubricants, to provide collection of fuel and lubricants, and disposal of debris;
- Organize collection of construction, as well as other waste (cut trees, paper, glass, plastic, sediments from cleaning sewer collectors, etc.) in a waterproof (cemented) site in separate containers (special containers) before recycling and send them to specialized enterprises for processing or storage.

After the completion of rehabilitation and construction works all working areas will be cleaned and greened.

For the protection of flora and fauna the use of only specified roads and temporary sites is provided. To restore the lost vegetation, the works will be carried out to restore them. Significant impact on the terrestrial fauna in the process of implementation of the project is expected.

Preventive measures, related to health of personnel operating the Project facilities, provide for strict adherence to safety rules and regulations for the operation of treatment plants and sewer infrastructure. Personnel involved in the O&M will be specially trained.

Methods of work on rehabilitated and constructed sites can create dangerous situations for workers and the population of nearby settlements. The provision of protections of working facilities and bridges over the trench will be provided. Traffic control, alarms and lighting will be fitted in accordance with local regulations. If necessary, safe bypass roads and crossings for pedestrians and vehicles will be installed.

9.2. Monitoring activities

Flexible monitoring will be carried out in order to check whether the activities of the project established national environmental standards and procedures, the impact the project has on the environment. Monitoring will focus on the construction and rehabilitation works, pipeline cleaning, compliance schedule and plan the work. In order to ensure smooth implementation of the repair and rehabilitation operations in the contract with the contractor must provide the following clause:

- Promote new efficient materials and construction, conducting work in the construction industry.
- Provide a safe and healthy environment that facilitates work and precluding accidents.
- Commissioning of the restored objects that do not meet environmental requirements, is prohibited.
- Determine the sequence of restoration work on pipelines, taking into account local information inconvenience to a minimum.
- Identify construction techniques with the use of fencing work sites and provide catwalks through separate trenches. Maximum ensure appropriate access to places of work and residence.
- Require that the contractor to guarantee the safe replacement and installation of machinery.
- Require that the contractor used a redistribution of traffic in the work area. Traffic management, alarms and lighting must be installed in accordance with local regulations. If necessary, provide safe detours and crossings for pedestrians and vehicles.

Responsibility for the implementation of mitigation measures by the contractor. Activities on the first and second sections of EMP services will be carried out by BVK during the repair work and maintenance of facilities. Coordinate these activities will be the operator, as part of the service contract. PCU at "Uzkommunkhizmat" Agency will coordinate their activities, will manage, coordinate, monitor and evaluate the impact of the project, as well as to enforce fiduciary measures. Procedure for conducting monitoring and responsible staff for its maintenance is defined in Appendix 1

Works on the third section of the EMP including the establishment of water security zones; removal of water protection zones potentially environmentally - dangerous objects for-pollutants; conduct monitoring of surface (Sakovich collector), groundwater and pollution sources (which would require equipping of laboratories); increase monitoring wells for groundwater level, the responsibility of the local authorities and specially authorized state bodies (Goskompriroda, Ministry of Agriculture, Ministry of Geology, Uzkommunkhizmat etc.).

9.3. Environmental Monitoring Plan (EMP)

Monitoring the state of the environment will be organized by a single scheme to meet the requirements of environmental protection.

The specific objectives of the EMP are: (i) sampling and data collection for the project area; (Ii) collection and processing of additional data needed to create a system of analysis and transparent, effective information reporting, which will determine the impact of the project.

Environmental monitoring during project implementation will involve observation for:

- Quality of groundwater and surface water in the areas above and below the project area;
- Quality of air (dust, exhaust gases) in the vicinity of the work site;
- Movement of vehicles and operational safety;
- Impact on flora and fauna;
- Monitoring of treated wastewater.

The main organizations responsible for state monitoring in the Republic of Uzbekistan are:

- UZGIDROINGEO SE and its territorial units (monitoring of groundwater levels, groundwater salinity;
- Uzglavgidromet of the Cabinet of Ministers (monitoring of surface water quality of main rivers, air, soil and meteorological monitoring);
- State Committee for Nature (Environmental monitoring by: fauna, flora, control for monitoring pollution sources).

Monitoring of groundwater level is conducted by the regional division of hydrogeological station, the laboratory which carries out measurements from wells located in the city every month. In addition to measuring the depth of the groundwater samples were taken samples from these wells to determine the salinity of groundwater. Hydrogeological station (HGS) conducts regular monitoring of salinity on the main ions (chlorides, sulphates, calcium, magnesium, and others.).

Environmental monitoring conducted by State Specialized Inspection of Analytical Control (SSIAC), Goskompriroda of the Republic of Uzbekistan and its affiliates. Monitoring is conducted by: fauna, flora, air quality at the sources of pollution, surface water sources and their pollution, soils.

To assess the potential impact of the project on the environmental condition it is necessary to monitor the level of occurrence, salinization of groundwater, water quality in the Sakovich collector and others watercourses of the city.

The monitoring plan includes:

Monitoring of the level and salinity of groundwater is conducted in the area of the city on a regular basis, monthly basis. Determined ingredients: pH, suspended solids, conductivity, salt ions (sulphates, bicarbonates, chlorides, sodium, potassium, calcium, magnesium), salinity, hardness.
Monitoring of water quality in the river Zarafshan (monthly sampling) will continue by Uzglavgidromet. Information about the quality of water will be used to assess the impact of project activities on the water quality of the river.
Monitoring of water quality in Sakovich collector and treated wastewater discharged into it will be continued at the Central Laboratory of BVK every ten days. Determined ingredients: pH, suspended solids, salt ions (sulphates, chlorides), salinity, hardness, biological oxygen demand (BOD), chemical oxygen demand (COD), nutrients (nitrate, nitrite, ammonium phosphate), and others.

9.4. Institutional capacity building and training

It is planned to increase the capacity of vodokanal in the sphere of operation and maintenance of sewerage systems in the implementation of the Project through the sewers in Bukhara.

Measures to strengthen the institutional capacity entail a series of reforms of the sector policies and conducting trainings, such as:

- Review of existing tariffs and financial sector policy to enable Vodokanal achieve financial independence, ie, be able to rely on a combination of income from operations and proceeds

from the budget sufficient to cover all costs of operation and maintenance, as well as debt service costs on the proposed project in the sewerage;

- To increase the capacity of Vodokanal for the coordinated tariff policy effective and sustainable manner. In essence, this increase in capacity will include: a complete inventory of the property within the service area of Bukhara Vodokanal for identifying unregistered connections and evaluation requirements for the installation of metering devices (meters); installation of meters; continuous improvement of the capacity of Vodokanal for accounting, billing and collection of payments for water and sanitation services; and training of each of the fields.
- To increase the capacity of Vodokanal for the coordinated tariff policy effective and sustainable manner. In essence, this increase in capacity will include: a complete inventory of the property within the service area of Bukhara Vodokanal for identifying unregistered connections and evaluation requirements for the installation of metering devices (meters); installation of meters; continuous improvement of the capacity of Vodokanal for accounting, billing and collection of payments for water and sanitation services; and training of each of the fields.

10. ESTIMATED COST FOR MONITORING AND EMP

Estimated Project costs and including EMP include:

Reconstruction/replacement of existing sewer networks	59,27 km	37,28 mln.USD
Reconstruction of existing sewage pumping stations (SPS)	2 pcs	1,50 mln.USD
Wastewater treatment plant (WWTP): reconstruction of some equipment and facilities/structures, improving the energy efficiency	- Sampling on the inlet and outlet of WWTP - Flowmeters - New screens with small crevice - New grit chamber - The new aeration system - New pumps for pumping return sludge - Reconstruction of laboratories	14,50 mln.USD
TOTAL		**53,28** mln.USD
Raising public awareness		0,03 mln.USD
Engineer Consultant		1,11 mln.USD
PCU Consultants and auditing		0,65 mln.USD
Unallocated funds		
TOTAL		**55,067** mln.USD

Estimated costs of implementing EMP include:

The costs of monitoring the work of WWTP and discharged treated effluent makes up in average 50.8 million sum per year, including the cost of purchasing chemicals 5.1 million sum. Predictive value of the cost of developing new techniques for chemical analysis and acquisition of chemical reagents will be about 12 million sum.

Monitoring of groundwater level requires an increase in the number of wells to monitor the status on the territory of historical and cultural monuments. Projected costs of drilling exploratory wells 5 is about 15 million sum.

It is recommended that the development of a working project for sewage of Bukhara to provide *costs of fencing the area of WWTP* since they are located in the Bukhara region in the territory of Kozi Said, access to the territory of the WWTP is not limited to, the area is not protected. According to the existing norms of sanitary protection zone of purification plants with capacity of over 50 thousand. m^3/day to residential buildings should be located not less than 500 m, the area should be fenced WWTP.

Predictive value of costs *for the prevention and elimination of accidents on sewerage networks and WWTP* listed below in Table 10.1.

Table 10.1. The costs of prevention and emergency response for sewer networks and WWTP

N	Name of costs	Q-ty	Cost forecast for expenses In mln. sum
1.	Acquisition of compressor units for air injection	2 pcs	70,0
2.	Acquisition of pumping equipment with automation equipment, including installation	12 pcs	150,0
3.	Acquisition of cables of different sections	12 km	
4.	Reconstruction and replacement of pipes on the most damaged sections of the network The pressure part Gravity collectors	7,2 km 12,7 km	3162,0 11740,0
5.	Overhaul of facilities at wastewater treatment plants and sewerage networks	2 pcs	230,0
6.	Organization of the dispatch services at WWTP provision of automation the process of wastewater treatment.	1pc	350,0
9	Monitoring the increase of the level of expertise of all personnel servicing the sewage system of the city	6 times a year	1,8
	Total overall costs:		15 703,80

Expenses for the dissemination of knowledge and experience

The contribution of the Project on the sewerage of Bukhara in the conference for the dissemination of knowledge and experience, which is scheduled in the conference room on the main WWTP of Samarkand approximately estimated at 50 thousand USD.

The costs of the campaign to raise public awareness

For this purpose, approximately 30 thousand USD is required.

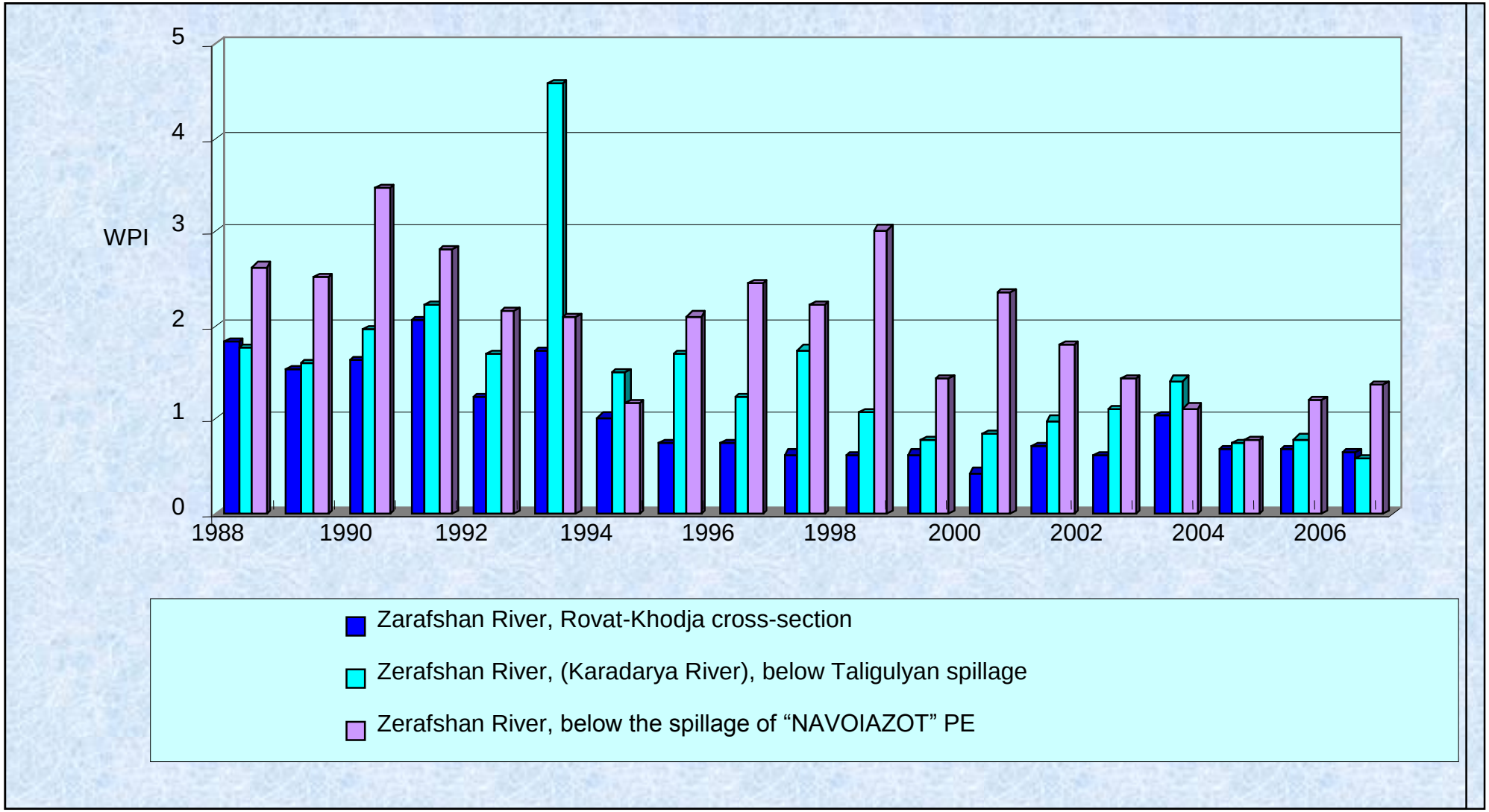
The cost of training personnel of *WWTP* abroad is estimated at around 50 thousand USD.

Estimated cost of the work on monitoring and EMP will be specified in the process of preparing feasibility study and work projects.

11. COORDINATION AND PUBLICATION OF EMP

12. CONCLUSION

ANNEXES:
ANNEX 1. WATER QUALITY OF ZARAFSHAN RIVER



ANNEX 2. ENVIRONMENTAL MANAGEMENT PLAN

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
A. Repair and rehabilitation /construction works	**Environment**				
Repair and rehabilitation of pumping stations, treatment plants, equipment, distribution units and pipelines	***1. Water resources***				
	1.1. Change of reception mode of waste waters into the sewer system and wastewater treatment plants	Development of reception mode of waste water and withdrawing it into the sewer system for the implementation period	Contractor	Current technical control and supervision of repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate for Protection of Cultural Heritage, local environmental protection, geology.
	1.2. Water pollution (surface or ground) by fallout from treatment plants, pipe cleaning and distribution centers.	• Development of components of the project works; • Introduction of new effective materials and designs, technologies of work; • Observance of repair standards and regulations; • Storage of residues/waste only in permitted areas.	Contractor	Current technical control and supervision over repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate for Protection of Cultural Heritage, local environmental protection, geology.
	1.3. Water pollution from construction sites	• Provision of drainage in surface and drainage flow from the work sites; • Timely cleaning them from construction waste; • Conducting of rehabilitation work in disturbed areas.	Contractor	Periodically in the progress of the repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, Inspectorate for Protection of Cultural Heritage, local environmental protection, geology.

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
	2. Land resources				
	2.1. Soil pollution by construction waste and residue	• Organization of timely collection of repair and rehabilitation wastes, sludge from cleaning, shipping and storing them at designated locations. Disposal of sludge as a fertilizer for cotton.	Contractor	Periodically in the progress of the repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	2.2. Leakage of fuel and lubricants	• Containers for fuels and lubricants shall be filled in accordance with established norms; • Avoid discharges of used oil to the relief; • Observe the rules of filling and transportation.	Contractor, working mechanisms	Current control during repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	2.3. Outbreak of sewer pipes and flooding of adjacent land	Urgent rehabilitation works of pipes and reclamation.	Contractor	Periodically in the progress of the repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3. Ambient air				
	3.1. Dusting from excavation	Watering roads, repair work sites and related covering for transport during transporting waste	Contractor, drivers of corresponding cars.	Periodically in the progress of the repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3.2. Pollution from pop-gases from the working aggregates and vehicles	Supervision of physical states of machines. Observance of refueling regulations.	Contractor, drivers of corresponding cars.	Periodically in the progress of the repair and rehabilitation works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local bodies of SES, local environmental protection.
	3.3. Noise, vibration from working machines	Compliance with the requirements of operation.	Contractors	Periodically in the progress of the	Operator, BVK, PCU, local agency on supervision over

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
				repair and rehabilitation works	the repair and rehabilitation works, local bodies of SES, local environmental protection.
	4. Flora				
	Damaging trees and vegetation	All destroyed vegetation is subject to be restored. Ornamental trees damaged during the repair works will be replaced.	Contractor	After the completion of works	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works, local environmental protection.
	5. Physical cultural heritage				
	Chance finds of cultural significance	Stop working, informing of interested organizations, extract them according to the established rules.	Contractor	Constantly, due to the extraction	Operator of the project, BVK, PCU, Regional Inspectorate for Protection of Cultural Heritage.
	Flooding the territory and negative impacts on the cultural heritage	Eliminating leaks and accidents on sewer collector	Contractor	Periodically in the progress of the repair and rehabilitation works	Operator of the project, BVK, PCU, Regional Inspectorate for Protection of Cultural Heritage
	6. Socio-economic aspects				
	Safe and healthy working conditions, excluding accidents	Ensuring safety regulations, occupational safety and health through proper selection and technically sound dimensions of workplaces and their organization	Contractor	Constantly	Operator, BVK, PCU, local agency on supervision over the repair and rehabilitation works.
B. Operation and Maintenance	***Environment***				
Treatment facilities for wastewaters	Contamination of soil and water by sludge	Strictly regulated collection and disposal of sediments to established places, their disposal.	The workers of treatment plant, BVK.	Regularly, on a fixed schedule.	Operator, local staff of BVK, local environmental protection, SES

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
Sewage leakage during transportation.	Flooding, pollution of water and soil.	Timely detection of faults on the network, eliminating leaks in the short time, monitoring the observance of wastewater discharge.	Local personnel of BVK	Periodic monitoring	Operator, local staff of BVK, local environmental protection, SES
Operation of treatment facilities of wastewater and sewer networks	Pollution of water resources, soils, environmental degradation and health	• Timely develop environmental and other criteria governing the maximum permitted load on the environment; • Observe the reset mode of treated wastewater and establishing their quality standards, protection of water facilities from pollution; • Conduct technological, forest reclamation, hydrotechnical, sanitary and technical measures in agreement with the state control; Reset the municipal and domestic, drainage and other wastewater with permit of nature conservation agencies in the prescribed manner; • Observe the sanitary zone of protection for WWTP; • Implement non-waste and low-waste technology, reduce generation of production and domestic waste, disinfection their decontamination, treatment, follow the rules of their sorting, storage, burial and recycling.	Local personnel of BVK	Periodic monitoring the collection of treated wastewater Periodic control of conditions of wastewater discharge by agencies for the Conservation of Nature co-observance conditions of wastewater discharge	Operator, local staff of BVK, local environmental protection, SES.
	Socio-economic aspects				
Operation of treatment facilities	Condition of safety methods and labor	Develop integrated programs to improve the condition of safety	Local personnel of BVK	Periodic monitoring	Operator, local staff of BVK, SES.

Stage	Problem	Mitigation measures	Responsible organizations	Monitoring	Responsible organizations on monitoring of work performance (in order of participation)
of wastewater and sewer networks	health.	and health for staff			
Disinfection of treated wastewater	Health risks of the personnel	Operation disinfection of the equipment with respect to the established norms.	Local personnel of BVK	Ten-day control	Operator, local staff of BVK, SES bodies.
C. Additional measures	***Environment***				
Establishing water conservation zone of Sakovich collector;	Pollution of water resources	• Preparing the Decision on the establishment of the Water Protection Zone (WHO) of Sakovich collector; • Removal sources of pollution identified by the Decree of the WHO.	Khokimiyat, Nature preservation agencies, State Land Committee, Regional Agricultural water Economy, business executives.	Periodic monitoring	environmental protection agencies
Re-equipping hydrochemical monitoring laboratory of BVK.	Insufficient monitoring for specific ingredients in the wastewater	Equipping laboratories with equipment devices and techniques to identify specific.	Uzkommunkhizmat, PCU, BVK	Regularly	PCU, BVK, environmental protection agencies
Expanding supervisory network for groundwater levels in the area of historical and architectural monuments	Flooding of territories and destruction of cultural monuments of cultural heritage	Insufficient monitoring of groundwater levels. Increasing the number of monitoring wells and monitoring of groundwater quality	Uzkommunkhizmat, PCU, Bukhara Hydrogeological Station, BVK	Regularly	Hydrogeology agencies, PCU, BVK

ANNEX 3. MINUTES OF DISCUSSION OF EIA PROJECT

ANNEX 4. REFERENCES:

1. The Constitution of the Republic of Uzbekistan.
2. The Law of the Republic of Uzbekistan "On nature protection".
3. The Law of the Republic of Uzbekistan "On Specially Protected Areas with amendments and additions dated 30.08.93"
4. The Decision of the Cabinet of Ministers "Provisions on the water protection zones of reservoirs and other water bodies, rivers and main canals and collectors, as well as sources of drinking water and domestic water supply, medical, cultural and recreational purposes in the Republic of Uzbekistan", 07.04.92.
5. The Decision of the Cabinet of Ministers No.491 dated 31.12.2001 'On approval of the State Environmental Expertise in the Republic of Uzbekistan".
6. Sanitary rules and norms for the protection of surface waters from pollutants (SanPiN No.0056-96)
7. Generalized list of maximum permissible concentrations and the occupational exposure limits (OEL) of harmful substances for fishery watercourses. Glavrybvod, Moscow, 1990.
8. Problems of protection and sustainable use of biological resources of water basins of Uzbekistan. Materials of the Republican Scientific and Practical meeting. Tashkent, March 29, 2001. Decision of the Cabinet of Ministers No.469 dated 31.12.2001.
9. D.S. Aliyev. Novelty in the application of biological method to prevent overgrown-silting of canals and drainage network. In the collection "Hydrobiology of canals of USSR and biological interference in their operation". Kiev, 'Naukova dumka", 1976.
10. Fauna and ecology of birds in Uzbekistan. Collection of articles dedicated to the 70th anniversary of prof. A.K. Sagitov. Samarkand, Publishing House the Academy of Science of Uz-SSR, 1989
11. The annual book of surface water quality within the area of Glavgidromet 2006-2008. Tashkent, Glavgidromet.
12. Scheme of complex use and protection of fresh groundwater of the Republic of Uzbekistan for the period up to 2010. Book 20. Sources of water pollution in Uzbekistan. "Waterproject" Association, 1997.
13. O.P. Bogdanov. Rare and endangered animals of Uzbekistan. Encyclopaedic guide.- Tashkent: Main Publishing house of Encyclopedias, 1992.-400p.

"Тасдиқлайман"
Бухоро шаҳар ҳокими ўринбосари
_____ А. Қараев

Таклиф қилинаётган Халқаро Ривожланиш Уюшмаси иштирокидаги "Бухоро ва Самарқанд шаҳарларини окова тизимини яхшилаш" инвестиция лойихаси асосидаги кўчиришнинг рамкавий сиёсати бўйича йиғилиш

ҚАРОРИ

14 апрель 2015 йил Бухоро шаҳри

Раислик этувчи В. Ўринов – Бухоро шаҳар ҳокими

Қатнашдилар Ф. Тўхтаев – Бухоро вилоят "Сувокова" ишлаб чиқариш давлат корхонаси бошлиги
Нуров Ш. – Бухоро вилоят "Сувокова" капитал қурилиш бўлими бошлиғи, Жўраев М. ЛМГ Бухоро бўлими бошлиги, Ширкатлар уюшмаси бошлиғи, Ободонлаштириш бошкармаси бошлиғи, Архитектура бошкармаси, Кадастр бошкармаси, Ёнғиндан қўриқлаш бошкармаси, Маҳалла жамгармаси, Электр тармоқлари корхонаси ва мутасадди ташкилотлар вакиллари (Рўйхат буйича).

КУН ТАРТИБИ:

1. Таклиф қилинаётган Халқаро Ривожланиш Уюшмаси иштирокидаги " Бухоро ва Самарқанд шаҳарларини окова тизимини яхшилаш" инвестиция лойихаси асосидаги кўчиришнинг рамкавий сиёсати.

В. Ўринов, Ф. Тўхтаев, Ш. Нуров, М. Жўраев, В. Ўринов
Раислик этувчи кун тартибидаги масалалар бўйича йиғилишни очди.

Хурматли йиғилиш қатнашчилари!

"Бугунги йиғилиш кун тартибида таклиф қилинаётган Халқаро Ривожланиш Уюшмаси иштирокидаги " Бухоро ва Самарқанд шаҳарларини окова тизимини яхшилаш" инвестиция лойихаси асосидаги амалга ошириладиган ишлар, чора тадбирлар, Лойиханинг атроф мухитга таъсири, аҳолининг лойихага нисбатан муносабати ва Лойихани амалга ошириш даврида бўладиган кўчиришнинг рамкавий сиёсати кўриб чиқилади."

Бухоро вилояти "Сувокова" ИЧДК бошлиги Ф. Тўхтаев йиғилишни давом эттириб, йиғилиш қатнашчиларини таклиф қилинаётган Халқаро Ривожланиш Уюшмаси (Жаҳон Банки) иштирокидаги " Бухоро ва Самарқанд шаҳарларини окова тизимини яхшилаш" инвестиция лойихасининг асосий максадини ва Лойихани амалга ошириш чора-тадбирлари тўғрисида таништириб чикди. Лойиханинг асосий максади аҳоли турмуш тарзини яхшилаш, шаҳарда окова тизимини узлуксиз ишлашини таъминлаш ва экологик мухитни яхшилаш, бу борада Ўзбекистон ҳукумати ҳамда Жаҳон Банки ҳамкорлигида аҳолига хизмат кўрсатиш сифатини ошириш бўйича йирик инвестицияларнинг ажратилиши ва ушбу максадларни амалга оширишда ушбу лойиханинг ўрни хусусида фикр юритилар экан, мазкур лойихани атроф мухитга таъсир доирасини камайтириш масалалари хам бирламчи вазифа қилиб олинди.

Бундан ташқари лойихани амалга ошириш давомида бўладиган кўчиришнинг рамкавий сиёсати ишлаб чиқариш тўғрисидаги музокаралар олиб борилди. Йиғилиш сўнгида иштирокчилар томонидан керакли таклиф ва мулохазалар ўрганиб чикилди, йиғилиш

ҚАРОР ҚИЛАДИ

1. Бухоро вилоят "Сувокова" ИЧДК бошлиғи Ф.Тўхтаевга лойихани амалга ошириш даврида кўрсатиб ўтилсинки Лойихани бажариш учун ширкат хужалиги раислари, ободонлаштириш бошкармаси бошлиги ва бошқа ташкилотлар рахбарлари Ўзбекистон Республикаси конунида кўрсатилган коидаларга катъий амал килсинлар.
2. Бухоро шаҳар бош меъмори, шаҳар кадастр бўлими бошлиги Лойихани амалга ошириш учун техник хужжатларни йиғишда масъул этиб тайинлансин.
3. Бухоро вилояти "Сувокова" ИЧДК си хар ой ахборот бериб борсин.
4. Қарорни бажарилишини назорат қилишни Ободонлаштириш доимий коммисияси зиммасига юклатилсин.

Протоколни ёзиб борди: Қорёгдиев С.

Unofficial translation into English

"Approved by"
Deputy Khokim of Bukhara city
Signed **A. Karayev**
(round seal)

MINUTES

Of Meeting on proposed Resettlement Policy Framework on the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association

April 14, 2015 **Bukhara city**

V. Urinov – Khokim of Bukhara city

Chaiperson F. Tukhtayev – Director of Bukhara Regional Production State Enterprise "Suvokova"

In attendance Sh. Nurov – Head of Capital Construction Department of Bukhara Regional State Production Enterprise "Suvokova", M. Jurayev - Head of PCU Bukhara Branch, the Heads of the Association of Partnertships, Head of the Department of Accomplishments, Department of Architecture, Inventory Department, Fire Protection Department, Fund of Makhalla, Electricity Supply Enterprise and representatives of authorized agencies (listed).

AGENDA:

1. Proposed Resettlement Policy Framework on the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association

---

V. Urinov, F. Tukhtayev, Sh. Nurov, M. Jurayev, V. Urinov

The Chairperson opened the meeting of the issues on the agenda.

Dear attendees of the meeting!

"On the basis of Bukhara and Samarkand Sewerage Project with participation of International Development Association, the Agenda of today's meeting will review proposed works, measures, the impact of the Project on environment, the attitude of the population to the project and Resettlement Policy Framework which will be carried out during the implementation of the Project".

The director of Bukhara RPSE "Suvokova" continued the meeting and introduced the attendees to the main proposed objective of the Bukhara and Samarkand Sewerage Project with participation of International Development Association and activities for the implementation of the Project. The main objective of the Project is to improve living conditions of the population, provide uninterrupted operation of sewerage system in the city and improve environmental condition. While discussing the allocation of huge investments on improvement of public services in collaboration with the Government of Uzbekistan and the World Bank and the role of the project in accomplishing of these tasks, the solutions for reducing the impact of the project on the environment were assumed as a priority task. In addition, the issues of working out the resettlement policy framework which will be carried out during project implementation were negotiated. Necessary proposals and considerations were reviewed by the meeting attendees at the end of the meeting. The meeting

DECIDED

1. To remind the director of Bukhara RPSE "Suvokova" F. Tukhtayev during the implementation of the project that the chairmen of partnerships, Head of Accomplishment Department and the heads of other organizations are to observe the regulations stated in the Law of the Republic of Uzbekistan for Project implementation.
2. To appoint the Principal Architect of Bukhara city and the Head of Inventory Department to be responsible for collecting technical documents for Project implementation.
3. Bukhara RPSE "Suvokova" is to submit monthly progress report.
4. To impose the control over the execution of the decision on Permanent Commission for Improvements.

Secretary of the meeting: S. Koryogdiyev