

**Ministry of Irrigation
and Water Management
of the Republic of Tajikistan**

**UNDP Office
in the Republic
of Tajikistan**

**Executive Committee
of the International
Fund for saving the Aral Sea**

WATER SECTOR DEVELOPMENT STRATEGY IN TAJIKISTAN

Dushanbe, 2006

**MINISTRY OF IRRIGATION AND WATER MANAGEMENT
REPUBLIC OF TAJIKISTAN**

DECREE # 121

Issued: June 26, 2006

Dushanbe

RE: “Water Sector Development Strategy of the Republic of Tajikistan”

With the purpose of realization of the targets of the International Decade for Action “Water for Life” (2005-2015) and achievement of the Millennium Development Goals,

THE ORDER IS:

1. To approve updated Water Sector Development Strategy of the Republic of Tajikistan.
2. Working Group on Strategy development to provide distribution of the materials to the Ministries, Agencies of Water Management complex of Tajikistan, to the International Financial and other interested organizations for using in the operation.
3. To make an agreement with UNDP office in Tajikistan on assistance in replication of Water Sector Development Strategy of the Republic of Tajikistan both in Russian and English.
4. To impose responsibility on monitoring of present DECREE to the Deputy Minister Mr. Eshmirzoev I.

MINISTER

A. A. NAZIROV

**MINISTRY OF IRRIGATION AND WATER MANAGEMENT
REPUBLIC OF TAJIKISTAN**

DECREE # 262

Issued: October 25, 2005

Dushanbe

RE: Establishing of Working Group for elaboration of
Water Sector Development Strategy of the
Republic of Tajikistan

Following the letter of the UNDP Office in the Republic of Tajikistan of 20.10.2005, the letter No. of the EC IFAS dated 21.10.2005 No. 2-114 and in accordance with provision of the Ministry of Irrigation and Water Management of the Republic of Tajikistan endorsed by decision of the Government of the Republic of Tajikistan from January 15, 2006,

THE ORDER IS:

1. To establish the Working Group on the elaboration of the Water Sector Development Strategy of the Republic of Tajikistan, including:

N. A. Ashurov	First Deputy Minister of Irrigation and Water Management of the Republic of Tajikistan (Head of the Working Group)
A. P. Kholmatov	Technical Director of the EC IFAS (Deputy Head of the Working Group – upon agreement)

Members of the Working Group:

E. E. Eshmirzoev	First Deputy Minister of Irrigation and Water Management of the Republic of Tajikistan
Y. E. Pulatov	General Director of the NGO “Tajik NEEGIM” Professor, Ph. Doctor in Agriculture
Abdullo Yorov	Deputy Minister of Energy of the Republic of Tajikistan
A. Sobitov	Head of Department of the GUP “Zhilkomkhoz”
Kh. Ibodzoda	Representative member of Tajikistan to the EC IFAS (upon an agreement)
B. Samadov	Head of Department on Investments and External Economic Relations of the MIWM of the RT
T. Sharipov	Chief Engineer of the Main Department of “Tajikselkhozvodoprovodstroy”
A. T. Tirandozov	Head of Operation and Irrigation System Department, MIWM of RT

2. To task the Head of the Working Group established by the present Decree, in cooperation with the UNDP Office in the Republic of Tajikistan, to provide elaboration of the Water Sector Development Strategy of the Republic of Tajikistan by December 27, 2005.

MINISTER

A. A. NAZIROV

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List of Abbreviations

UNDP	United Nations Development Program
UN	The United Nations
PASB-2	Program of Measures Aimed at the Improved Environmental and Socio-Economic Situation in the Aral Sea Basin for 2003-2010
HPP	Hydropower Plant
WUA	Water Users Association
GDP	Gross Domestic Product
USA	The United States of America
RJSC IPS	Russian Joint-Stock Company “Integrated Power Systems”
SUE “Khojagee manzili Komunalı”	State Unitary Enterprise of Housing and Communal Services
WHO	World Health Organization
CC	Coefficient of efficiency
m ³ /ha	Cubic meters per hectare
Mln. m ³	Million cubic meters
USSR	The Union of Soviet Socialist Republics
NHO	Nongovernmental organization
ESD	Environmentally sustainable development
km ³	Cubic kilometers
MDG	Millennium Development Goals
SDW	Solid domestic waste
PRS	Poverty Reduction Strategy
GOST	all-Union State Standard
FS	Feasibility study
NDS	National Development Strategy
meq/l	Milligram-equivalent per liter
g/l	Gram per liter
USD/\$	US Dollar
RT	Republic of Tajikistan
%	percentage
USAID	United States Agency for International Development
UNICEF	United Nations Children is Fund
EBRD	European Bank for Reconstruction and Development
OSCE	Organization for Security and Cooperation in Europe
MERLIN	NGO “Medical Relief in Emergencies”
ADB	Asian Development Bank
IDB	Islamic Development Bank
OXFAM	International organization “Oxford Committee Against Hunger”
ACTED	Agency of Technical Cooperation and Development
BOC	Biological oxygen consumption
MCL	Maximum contamination level
HQ	Head-quarters
2-TP (Vodkhoz)	Statistic form of reporting on water consumption
IWRM	Integrated Water Resource Management
CO ₂	Carbon dioxide
KwH	Kilowatt per hour
Bln.	Billion
OSJC	Open Joint-Stock company
HVL	High-voltage line
kV	Kilo volt (voltage)
ODD	Open distribution device
WBDD	Water basin development department
GBAO	Gorno-Badakhshan Autonomous Oblast
RRS	Regions of the Republican Subordination
DCE TSVS	Design and Construction Enterprise “Tajikselkhozvodoprovodstroy”
lm/ha	Linear meter per hectare
Pc.	pieces
Kcal/cm ²	Kcal per square meter

1. INTRODUCTION

1.1 Background

The present Strategy was developed within the framework of the UNDP Office assistance to Tajikistan aimed at the implementation of the “Water for Life” International Decade (2005-2015), Millennium Development Goals, Appeals and Recommendations of the International Conference on Regional Cooperation in the Trans-Boundary River Basins (Dushanbe, Tajikistan, May 30-31, 2005) supported by the United Nations and other international organizations.

The Strategy was elaborated by the Working Group established by Decree #262 of the Ministry of Irrigation and Water Management (MIWM) of the Republic of Tajikistan and Agreement with the UNDP Office in Tajikistan and the Executive Committee of the International Fund for saving Aral Sea (IFAS).

The Strategy was developed on the basis of the Economic Development Program of the Republic of Tajikistan till 2015, the framework on the Rational Use and Protection of Water Resources in the Republic of Tajikistan and Energy Sector Development in the Republic of Tajikistan, the Millennium Development Goals Needs Assessment Report, and other development programs endorsed by the Government of the Republic of Tajikistan with due consideration of the previously implemented international projects and legislation of the Republic of Tajikistan.

The objectives incorporated in the present Strategy have been set with regard to the particular challenges facing the Republic of Tajikistan. Implementation of proposed Strategy will facilitate sustainable development of Tajikistan and achievement of the Millennium Development Goals approved by the world community at the Johannesburg Summit in 2002.

The Republic of Tajikistan is located in the Aral Sea Basin and its transboundary rivers includes the Amu-Darya and the Syr-Darya. Therefore, development and implementation of the Water Sector Strategy will contribute to the Program of Actions aimed at the improvement of environmental and socio-economic situation in the Aral Sea Basin in 2003-2010 (ASBP-2), that is approved by the IFAS Board on 28 August 2003 in Dushanbe.

1.2 Survey of Objectives

Sustainable development in Tajikistan, as in all countries, depends on effective use of its natural and energy resources as well as its human potential. Tajikistan possesses abundant water, hydro-power and recreation resources but has limited land resources, which significantly shapes life in the country and available paths to economic development. Given this context, this document addresses problems related to water resources, their integrated management and water utilization systems with respect to economic development and poverty reduction.

The water utilization system in Tajikistan includes:

- water reserves
- in-channel constructions related to watershed management
- territorial stream flow redistribution and renewal of the water resources
- constructions against harmful water impacts
- biological and hygiene facilities, treatment plants and sewage disposal facilities

These components of the water utilization systems are crucial elements for regulating water supply, consumption and use.

The most important consumers of the water resources include the irrigated farming sector and the drinking water supply industry. A key water user is the hydropower sector, which plays a central role in the national development strategy of Tajikistan.

The entire water utilization system, especially irrigated farming, depends to a large extent on water resource management institutions and their compliance with current legislation. The efficiency of these arrangements is largely judged by their ability to foster investment into the annual budget of the water utilization system.

The goal of the present Strategy is not limited to the economic integration of all sectors of the water utilization system. It also promotes cooperation in pursuit of a common policy and the adoption of socially and economically optimal decisions which minimize harm to the environment.

The present Strategy principally addresses the economic sustainability of the water utilization system as current financial mechanisms remain uncertain. Funding from the state budget and self-financing by water economy organizations, farmers and water users associations (WUA) remains limited. The sustainability of financial resources for the agricultural and communal sectors is also a concern, as does the management of water systems.

Given the complexity of the situation, the hydropower sector could allocate funding from water resources fees envisaged in the Water Code or by other forms of service payments to address financing issues. However, this would require a sound energy sector and an integrated approach to state funding. The processing industry is another potential funding source, which may further the development of rural and water management.

Success in resolving these issues will largely depend on effective management. Increasing effectiveness in the water utilization system is the goal of the present Strategy, which includes short-, mid-, and long-term interventions. The main strategic objectives include:

- satisfaction water users and water-consumers' water resource needs with due consideration of inter-state water divisions;
- rehabilitation of the existing water economy infrastructure and its productive base;
- instituting full cost recovery for the water supply sector;
- reclamation of lands suited for irrigation;
- integration of new, economically efficient technologies;
- implementation of an effective water-saving program;
- gradual transfer to a systematic management approach with regard to hydrographic and none administrative units; wide establishment of WUA; water demand management; differentiation of water payment and its water supply depending on context;
- implementation of the restoration, expansion and construction of new water supply, sewage, and water-treatment facilities; integration of updated technical devices and technologies, water meters and quality control;

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- development of energy hydropower; completion of the Rogun, Sangtuda (1&2) HPP and construction of other HPP and water reservoirs;
- phased solution of environmental problems associated with water (including floods, mud-flow prevention, water-logging, rehabilitation of engineering structures, land salination, dam lakes, pulsating glaciers, water contamination, etc.);
- protection of national interests on the basis of the market relations and inter-state agreements.

1.3 Legal and Institutional Framework

The legal framework of the Strategy includes:

- Constitution of the Republic of Tajikistan, which stipulates exclusive state ownership of water and the state's guarantee of its effective use and protection in the interests of citizens;
- Water Code and Law on Nature Protection, which regulates water relations with the goals of rational use, protection of water resources and providing a legal framework to protect the rights of physical and legal persons in water relations;
- Framework for the rational use and protection of water resources in the Republic of Tajikistan;
- Poverty Reduction Strategy Paper;
- Law on Energy;
- Economic Development Program of the Republic of Tajikistan until 2015;
- Framework of Fuel Energy Sector of the Republic of Tajikistan for 2003-2015;
- Program of Priority Measures aimed at improved irrigational land status in Tajikistan for 2005-2009;
- Mid-Term Anti-Crisis Agro-Industrial Program of the Republic of Tajikistan and priority trends of its strategic development till 2005;
- State Environmental Program of the Republic of Tajikistan till 2008;
- Millennium Development Goals (evaluation of financial expenses) in the Republic of Tajikistan;
- Clean Water and Sanitation Program in Tajikistan and etc.

The existing legal framework will guide the implementation of market reforms in the water management sector. However, this framework requires further elaboration, including the development of laws, acts and resolutions, guidelines, rules, recommendations and other legal instruments.

In addition, the water sector's strategy remains fragmented, with different tasks presented in a multitude of the documents. A coherent strategy requires compromise between relevant stakeholders (including the ministries, agencies, organizations, and enterprises), the identification of current strategic problems and the development of a mechanism for improved management of the national water sector.

The final goal of this institutional reform is to establish a flexible system in the water sector and water resource management, including the clear distribution of economic and political responsi-

bilities between the ministries, agencies and local Hukumats for the effective use and protection of the water resources and implementation of the inter-state water treaties.

The Strategy proposes to creation of basin committees and a National Commission as key implementation mechanisms. This will make it possible to harmonize inter-agency interests and find practical solutions for the introduction of integrated water resource management; the creation of WUAs, Channel Management Committees, basin water resource management; the identification of institutional funds; and taking specific decisions in compliance with acting legislation.

2. COUNTRY FEATURES

2.1 Geographical Characteristics

Tajikistan is situated in the southeast of Central Asia between 36°40' and 41°05' of the northern latitude and 67°31' and 75°14' of the eastern longitude. The territory of Tajikistan occupies 143.1 thousand km². The country is landlocked. It extends 700 km from west to east and 350 km from north to south. Characterized by a complex border line, it is located at approximately the same latitude as Greece or southern Italy and Spain.

Tajikistan borders Afghanistan in the south (1,030 km), China in the east (430 km), Kyrgyzstan in the north (630 km) Uzbekistan and in the north and west (910 km).

Tajikistan is a mountainous country, with an elevation varying from 330 to 7,495 m above sea level. About half the country's territory is located above 3,000 m with mountains occupying about 93 percent of its area. One third of the country is occupied by foot hills and prairies. Lowland areas are situated in river valleys.

Tajikistan is situated in active seismic zone characterized by frequent earthquakes.

The climate in Tajikistan is continental, with considerable seasonal and daily temperature variations and air humidity. The average annual length of sunshine varies from 2,097 to 3,166 hours. The average annual amount of the solar radiation varies from 151.1 to 176.1 kcal/cm² and reaches 182.9 to 223.9 kcal/cm² on a clear day.

The average annual air temperature in the foothills and valleys varies from +6° to +17° C and is close to 0° C in the high mountains of the Pamirs. The absolute minimum was registered in the Bulunkul in the Eastern Pamirs (-63° C) and the absolute maximum of +48° C in the Shaartuz, in the southern Khatlon Region. In southern valleys, the average temperature of the hottest month (July) is +31° C. The rugged relief with large amplitudes of high mountains accounts for the diversity of the climates and temperatures.

The average annual amount of precipitation in Tajikistan is 760 mm. However, the distribution of precipitation is highly uneven. In the hot deserts of Southern Tajikistan and cold high-mountain deserts of the Eastern Pamirs, precipitation varies from 7 to 160 mm/year and in some areas of the southern slope of the Gissar Range the amount of precipitation can be as high as 2,000 mm.

In most areas of Tajikistan, the maximum amount of precipitation occurs in the coldest season with an average 65 percent of its annual amount.

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There are 14,509 glaciers in Tajikistan covering total area of 11,146 km² or 8 percent of the country's territory. The total glacier stock amounts to 845km³, 13 times higher than the annual flow of all Tajik rivers and 7 times higher than that of the average annual flow of all rivers within the Aral Sea Basin.

Glaciers with an area of over 1km² form only 20 percent of the total number of the glaciers, which contain 85 percent of total ice volume.

The river flow formation area in Tajikistan covers 90 percent of its territory. Glacier melting comprises up to 25 percent of all water resources, constituting a considerable part of the summer flow and reaching up to 50 percent in dry years.

On the whole, the average annual flow formed in Tajikistan equals 64km³/year, including 62.9km³ in the Amu-Darya River Basin and 1.1km³ in the Syr-Darya River Basin. The rivers of Tajikistan form 55.4 percent of the average annual flow on the Aral Sea Basin. The largest rivers in Tajikistan are the Vakhsh, Pianj, Kafirnigan, Zeravshan and Syr-Darya rivers, with basins occupying over 75 percent of the country territory.

There are around 1,300 lakes in Tajikistan with total area of 705 km². Seventy-three percent are situated in Pamir-Alay Mountains at an elevation of 3,500-5,000 m above sea level. Lakes in Tajikistan contain over 46.3 km³ of water, including 20 km³ of fresh water. Most mountain lakes are hard to access and therefore are not well-studied - these remain an important area for further research.

There are currently 9 operational water reservoirs containing 15.34 km³ of water, equal to 13 percent of the average annual flow of the Aral Sea Basin.

Underground water resources of Tajikistan are estimated at 18.7km³/year, 25.6 percent of which are in the Sogd Region, 21.8 percent in the Khatlon Region, 21.4 percent in the Gorno-Badakhshan Autonomous Region and 31.2 percent in the Regions of Republican Subordination.

The environment and anthropogenic landscapes of the area that form and transit water flows are prone to harmful water impacts. These include snow avalanches, disastrous movements of pulsating glaciers which form glacier or choked lakes, potential outbursts from high-mountain lakes, heavy showers, debris flows and floods, and water erosion.

There is an average of 25 mudflow events per year in Tajikistan. Some are truly disastrous, moving at 60-80 km/h and causing considerable damage. To eliminate or reduce negative water impacts, it is necessary to organize continuous monitoring combined with elaboration and implementation of the preventive measures.

The territory of Tajikistan has great recreation capacities (over 5 percent), 2 percent of which (2,567 km²) are related to water.

Tajikistan is famous for its 162 natural landscape monuments, 200 mineral springs, 18 mud and salty lakes. These resources are potential basis for the future development of recreation base in Tajikistan, whose capacity to generate revenue and create employment may be greater than that of the agricultural sector.

2.2 Social Factors

The total population of Tajikistan is 6,438,000 people. The average population density is 44.9 per 1 km². Twenty-eight percent of the population lives in urban areas, with the remaining 72 percent residing in rural areas. Agricultural production is based on irrigated farming which provides up to 90 percent of all agricultural products. Irrigated agrarian land provides employment and plays an important role for 72 percent of the population, not only in economic terms but also in terms of the environment. Tajikistan has the lowest arable lands per capita in the whole Aral Sea Basin with only 0.116 ha per capita, including 0.08 ha per capita of the irrigated arable lands. Given rapid of the growth population, this level is gradually decreasing and the lack of financial means prevents reclaiming new arable land. Given current demographic trends, the total area of the arable lands per capita will be reduced to 0.08 ha and the area of irrigated lands to 0.06 ha per capita by 2015, at the same time severely affecting food security.

According to the UN, 80 percent of Tajikistan's population lives below the poverty line. In the Poverty Reduction Strategy Paper, 60 percent of the respondents have identified themselves as currently in poverty.

Given official annual statistics, Gross Domestic Product (GDP) per capita equals \$159.6 with 24-30 percent unemployment among able-bodied citizens.

While the number of employees has increased by 26 percent from 1990-2001, the share of the population participating in the labor force has decreased by 9 percent and employment has fallen by 11.5 percent. During the past ten years, the number of employees in industry has been reduced by 2.6 times while the number of agricultural employees has increased by 28.6 percent. At the same time, the volume of agricultural products decreased by 35 percent due to decreased labour productivity.

Poverty also contributes to large-scale labor migration aggravating the current shortage of qualified labor resources.

Tajikistan faces a complicated situation in regard to both its reserves of fuel and energy resources as well as their availability to citizens. Tajikistan has poor natural gas and oil deposits, although it possesses rich hydropower resources (4 percent of the world deposits) and coal. However, these resources are not sufficiently developed and the country suffers from an annual energy consumption deficit of 3.0 to 3.5 billion of kW/h, resulting in reduced electrical power consumption from October to April.

The water supply and sewage system are important facilities for everyday life and the economy, with considerable strategic, political and social significance. Around 30 percent of the water supply networks are not functioning and only 61 percent of the population has access to piped water. The remainder of citizens consume water directly from the rivers, channels, small irrigation networks and other water sources of doubtful sanitary condition. The efficiency of the sewage systems does not exceed 40 percent, which is accessible to only 15 percent of the country population.

High population growth (1.5 percent per year) and current problems with sewage systems result in rapid urbanization through urban and rural construction on farm lands (this practice doubled from 1991-2000), which in turn increases pressure on water resources. The need to encourage the use of lands unsuitable for agriculture was thus highlighted following the implementation of the Decree of President of the Republic of Tajikistan # 335 issued in 3 July 2000 "On protection

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and rational use of the irrigated lands” and the Resolution of the Government of the Republic of Tajikistan # 387 issued in 21 September 2000.

It is also necessary to adopt normative acts to increase the stories in buildings, even in rural areas. Preventing the negative impact of urbanization on water resources involves rehabilitating and expanding new water supply and sewage capacities with regulated effluent discharge, processing of rainfall discharge, utilization of solid wastes, integration of updated technical water measurement devices and fostering public awareness on water saving practices.

Geodynamic processes in Tajikistan considerably impact the population, economy and environment. To date, there are over 50 thousand registered landslide sites, 1,200 of which are threatening residential areas, roads, irrigation and other facilities.

Inadequate study of the high mountainous lakes, especially those threatening potential outbursts (such as Lake Sarez) may result in inadequate prevention and preparedness for natural disasters of a regional scale, covering a territory of over 55,000 km² and a population of over 6 million people. To date, around 700 families are in need of immediate relocation from disaster-prone areas related to water factors and in the next few years the number of the potential ecological migrants may increase to 10,037 families.

In 18 areas of Tajikistan (4 on Sogd Region, 11 in Khatlon, and 3 in the RRS), there are 142 settlements suffering from constant flooding and 490 settlements suffering seasonal flooding during the irrigation season.

Machine-irrigated lands comprise almost 300 thousand ha, forming habitat for 2 million people. In some areas pumping stations serve the entire district.

Hydro-technical facilities are of great importance for the national economy and public welfare. However, several facilities are vulnerable points with respect to sustainable water supply for hydropower production, protection of the population, facilities and lands against floods, mudflows and water-logging and from the point of view of economy and vital population activity of vast areas of Tajikistan. These facilities include water reservoir dams, particularly the largest ones of integrated use (Nurek, Kairakkum and others), large pipe channels, aqueducts, dams, pumping stations, irrigation channels, main channels on subsiding soils and slopes, damless water intakes, closed drains, main and group pipelines, stock-water development systems, etc.

The well-being of the poor depends very much on natural resources and many of them continue to suffer because of degradation, environmental contamination of water sources and natural disasters, including draughts and floods. Protecting both the environment, sustainable hydropower production and disaster mitigation are thus indispensable parts of any poverty reduction strategy. Advancement of events have demonstrated the significance of water and especially irrigated farming as a safety system in crisis situations and as the most obvious hope for the economic growth and poverty reduction.

2.3 Economy

Tajikistan needs substantial improvement in economic security, which would greatly enhance national security and ensure genuine sovereignty.

The economy of Tajikistan is based on the production of hydropower, cotton, and aluminum. Lack of investment prevents from the development of the country's current hydropower capacity (317 billion kW/h/year), as production amounts to only 5 percent of potential output. Potential capacity for energy consumption is almost three times higher in Central Asia.

Tajikistan currently depends on the oil and natural gas imports for its energy needs.

Tajikistan was the third largest cotton producer in the former USSR with 1 million tons per year or 11 percent of total production volume. In past years, cotton production has not exceeded 60 percent of the previous amount.

Aluminum production constitutes 40 percent of the total industrial production. The minimum value of the Gross Domestic Product (GDP) was registered in 1996 (30 percent of its level in 1990) that has been growing by the end of the civil conflict. Following 2001, GDP has grown at 10 percent per year, reaching 47.7 percent of 1990 levels.

Around 80 percent of total export revenues comes from aluminum and cotton, making Tajikistan highly dependent on price fluctuations in world primary products markets.

The setback in industrial production has made agriculture has become increasingly important for Tajikistan's economy. At the same time, the largest water user in Tajikistan is the hydropower industry. The signed agreement with the "Russian Aluminum" Company (RUSAL) and OJSC IPS foresees the completion of construction for Sangtuda-1 and Rogun HPP.

Direct losses from the civil war in Tajikistan amounted to \$7 billion with severe setbacks in industrial output and capacity. The GDP loss during 1990-2000 amounts to 26.9 billion somonis. The deterioration of the main production assets reached over 90 percent. Therefore, depreciation has almost stopped and the country lacks the resources to renovate its existing productive capacities.

The monetary reform in 1995 resulted in great economic losses caused by defaulting on loan payments and high enterprise debt. External migration from 1990-1994 drained Tajikistan of an estimated 90,000 highly-qualified workers and specialists. The costs of the irreparable losses in human capital are estimated at 2.4 billion somonis. Up to 25 percent of able-bodied population are working as the labor migrants in the countries abroad, mainly highly-qualified workers aged 20-50. The cost of human capacity losses from labor migration are estimated at \$8.25 billion per year.

The huge losses are also associated with an inefficient use of raw and material resources. Cotton production declined by 32-33 percent in the early 1990s to the present 27 percent of GDP with a total loss of 20.6 tons of cotton fiber valued at over 36 million somonis. Productivity decreased from 27.7 centner per ha in 1990 to 19.8 in 2004. Agricultural losses at all reprocessing stages (harvesting, transportation, storage and processing) vary from 30 percent to 40 percent. Similar situations exist in other primary resource sectors.

During the past ten years labor productivity has been reduced by 2.7 times while the capital-output and material-output ratios have doubled.

By 2015 the country population will increase by 38.6 percent to a total of 8.7 million people. By 2015 the number of employees will increase by 40.9 percent and will amount to 4.5 million people or 51.8 percent of the total population.

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National income remains as a key of economic development and increased from 1,536 million somonis in 2000 to 2,483 million somonis in 2005.

The Economic Development Program of Tajikistan envisages average annual real GDP growth of 13 percent until 2015, increasing the scale of the economy by 4.4 times. Given population growth projections, GDP per capita would increase by 3.1 times over that period.

Price stabilization foresees decreasing inflation from 9.6 percent in 2001-2005 to 7.4 percent in 2005-2010 and 5.8 percent in 2010-2015.

The Economic Development Program in Tajikistan till 2015 endorsed by the Government Resolution # 86 issued March 2004, envisages an increase of income per capita by 5 times. Such high economic growth rates may reduce poverty from 83.5 percent in 2000 to 11.6 percent in 2015.

The Program includes plans for modernization, technical re-equipment, reconstruction, full use of industrial capacities and the establishment of new enterprises with foreign investment.

The real industrial product will increase in 2001-2015 by 4.2 times and will amount to 5.8 billion somonis. The reclamation of 20 thousand hectares of new irrigated lands are expected as well as the improved irrigational status of 55.51 thousand ha of land in 2005-2009. The agricultural production volume will increase by 2.2 times and by 2015 will reach 1.5 billion somonis.

The priority task for the future is to achieve food security by increasing grain productivity by 1.2 million tons (in 2004 this figure constituted 891.600 tons). The objective is to achieve pre-depression volumes of the cotton production, with targets of 750,000 tons in 2010 and 850,000 tons in 2015 from 558,000 tons in 2004. The potato production is targeted to increase to 573,000 tons in 2015, production of vegetables to 650,000 tons, fruit and berries to 270 tons, vine crops to 200 tons, grapes to 150 tons, citrus cultures to 4.5 tons and tobacco to 3,000 tons.

The cattle stock numbers will increase by 11.2 percent and by 2015 will total 1.2 million with total number of livestock reaching 2.6 million. If targeted agricultural development is achieved, by 2015 food production will allow Tajikistan's population to approach the recommended consumption norms. Retail trade will increase by 4.4 times and paid market services by 9.6 times. Achieving these high targets will required significant internal and external investments. From 2006-2010, the volume of internal investments will increase by 21.2 percent and in 2011-2015 by 13.9 percent. The volume of the external investments will increase respectively by 38.8 percent and 1.2 percent. By 2015, exports will exceed import by 1.8 times and the trade surplus will amount to \$594 million.

Achieving this large-scale economic growth is not possible without strong water sector and decisive action for protection of environment. The main outputs in the water supply and sanitation sectors required for the achievement of Millennium Development Goals are as follows: 83 percent of the population will have access to safe drinking water and 58 percent of the population will get access to improved sanitary facilities. The total costs of achieving environmental sustainability in 2005-2015 will estimate \$258.13 million.

2.4 Administration

According to the Constitution, Tajikistan is a democratic, legal, secular and unitary state. The Government of Tajikistan is represented by legislative, executive, and judicial powers. The President of the Republic of Tajikistan is the Head of State and at the same time the Chairman of the Government. The President appoints the Prime Minister and members of the Government who are then should be approved by the legislative body.

The Majlisi Oli is two-chamber legislative body. The lower chamber, Majlisi Namoyondagon, consists of 63 delegates elected by the people of Tajikistan for five years who works on permanent basis. The upper chamber, Majlisi Milli, consists of 33 members, of whom 25 are elected delegates of local assemblies and 8 are appointed by President of the Republic of Tajikistan. The delegates of Majlisi Milli serve 5 years.

The Constitution of the Republic of Tajikistan envisages an independent judicial system. The Supreme Court is the court of superior jurisdiction. Other courts of superior jurisdiction include the Supreme Economic Court and Constitutional Court. The other courts include the Military Court, the courts of Gorno-Badakhshan Autonomous Region and local courts.

Tajikistan is administratively divided between the Sogd Region, Khatlon Region, Gorno-Badakhshan Autonomous Region (Oblast) and Regions of the Republican Subordination as well as the capital Dushanbe. These administrative units have representative bodies (majlis) elected for 5 years.

The Parliament of Tajikistan plays a key role in determining policies, strategies and norms of the water sector through the adoption of relevant laws. The Executive authority represented by the President and the Government also plays a significant role in the formation of the water and nature protective legislation through adoption of decrees, resolutions and provisions on enforcement or implementation of normative acts with special requirements. The role of the Government is very important in the local enforcement of the water and related nature protective legislation.

State management of the use and protection of water is performed by the Government of the Republic of Tajikistan, local executive bodies and specially authorized government bodies regulating the use and protection of water as well as by a number of agencies responsible for the specific uses and institutional protection of water (for details see section 5).

Local self-governance bodies (community meetings, street or house committees) can also influence the sustainable and efficient use of water and although they cannot impose sanctions, they can exercise public influence and report violations to the government bodies.

Tariff regulation associated with the use of water and other resources is carried out by the Anti-Monopoly Agency of Entrepreneurships Support.

Coordination of planning and analysis on the rational use and protection of the water resources is performed by the Ministry of Economy and Trade of the Republic of Tajikistan.

2.5 Current Situation in Water Sector

Actual water intake in Tajikistan constitutes around 20 percent of the national flow and 11 percent of the average annual flow of the Aral Sea Basin. Over 37 percent of the withdrawn water returns to receiving basins in the form of the discharged and drainage waters.

The structure of water consumption (water intake) is dominated by irrigated farming (comprising 84 percent) with lesser shares for the domestic drinking and agricultural water supply (8.5 percent), industry (4.5 percent) and fishery (3 percent). During 1990-2004 water consumption in Tajikistan was drastically reduced from 13.7 km³ to 12.6 km³. This was caused by reduced productivity, shifting structures for farming, deterioration of irrigated lands, the availability of vacant unused irrigated lands, poor condition of the irrigation systems and the introduction of water payments.

Per capita water consumption in Tajikistan constituted 1,972 m³ in 2004, below the average world value of 2,600 m³.¹ Discharge of the sewage and drainage waters constituted 4.6 km³ in 1990, which dropped to 3.6 km³ in 2000 before returning to the previous levels in 2004 (4.7 km³). Due to the crisis, industrial sewage water discharge has been reduced from 138.6 million m³ in 1990 to 108.2 million m³ in 2004, while discharge of untreated water in 2004 constituted 2.86 million m³, a reduction of 59 percent from 1990.

The current use of mineral fertilizers and toxic chemicals was reduced by 5 times since 1990, which made a positive impact on the quality of sewage and drainage waters.

The efficiency of irrigation systems in the republic is currently 55.2 percent, with preference given to furrow irrigation. The level of irrigation varies from 12 to 17 thousand/m³/ha (with an average of 14.6 thousand m³) depending on the environment and regional economic context. Gravity irrigation systems have deteriorated by over 50 percent and the pumping stations by 65 percent. Out of 737.7 thousand ha of irrigated lands in the republic, 55.5 thousand ha are absolutely inadequate. Water payments amount to only 60 percent of the established tariff, with only one third made in cash and the rest covered by agricultural and other products. In 1992-2004, maintenance of the irrigation systems used no more than 10 percent of normative means.

Tajikistan currently uses a single tariff of 0.6 diram per m³ (\$2 per 1,000 m³ of water) which is below operational cost, without differentiation across regions or between different means of water supply.

According to the World Bank, daily domestic water consumption in Dushanbe is 550 liters per person though 60 percent of this amount is lost through leakages. 96 percent of urban and 40 percent of rural residents currently have access to piped water. There is also a shortage of chlorine. Electrical energy is delivered following a strict schedule. According to the World Health Organization (WHO), up to 60 percent of intestinal diseases in Tajikistan are water-borne.

The actual capacity of the sewage systems in the republic is 87.08 million m³/year, a reduction compared to 158.92 million m³ in 1990.

There are no water meters at all in households and 23,000 dekhkan farms. The overall number of water delivery points (to former kolkhozes and sovkhoses) in the country totals 5,192, of which only 1,972 are equipped with water-measuring devices. The establishment of water users associations still remains limited. With the support of World Bank, Asian Development Bank and

¹ Data from ACVASTAT – UN Food and Agricultural Organization.

other international organizations, roughly 40 WUA were created. In general, irrigation reforms are falling behind with respect to broader agricultural reforms.

Tajikistan produces an average electrical output of 15 billion kW/h, 98 percent of which is produced by hydropower plants. There are 17 large and 69 small hydropower plants. Hydropower is a clean and renewable source of energy. Tajikistan has the capacity to construct water reservoirs with a total volume of 67 km³. At present, the water reservoirs control 15.3 km³ of the water flow formed in Tajikistan (22.8 percent) and 17.5 percent of the water flow when neighboring states are included. However, the water reservoir bottoms are subject to silting in the long-term. The intensity of silting in small reservoirs is around 2 percent of their initial volume and in the larger reservoirs is around 1 percent. The regionally significant, large valley water reservoir in Kairakum suffers from silting of 12,000 ha caused by a groundwater dam. Many dams are in need of rehabilitation, which otherwise aggravate water shortages that reach 700 million m³ during the irrigation season.

In 1990, the value of the main irrigational and drainage assets was \$1517 million. The deterioration of these assets is already estimated at \$746 million or \$1,036 per hectare and the rehabilitation required to achieve the EC of year 1990 will require approximately the same level of investment. Given the current tariff (\$2 per 1,000 m³) and with the average irrigational norm of 14,600 m³/ha, potential water supply fees constitute \$28.6 per 1 ha, 60 percent of which are covered by farmers. Government supported rehabilitation of the irrigational and collection-drainage systems in 2000-2004 amounts to approximately \$1.7 million in a year.

Given an annual GDP growth of 10.3 percent until 2015 envisaged by the Economic Development Program of Tajikistan, if the government investments in infrastructure remain proportionate they will total to \$30.2 million. In addition, the country expects foreign investments of \$41.7 million. With regard to full coverage of the water fees starting in 2006, the potential budget until 2015 allocated for the rehabilitation of the irrigational and collection-drainage systems may amount to \$174.9 million or \$243 per 1 hectare. The required difference is \$793 per 1 ha. Given these estimates, it will be possible to rehabilitate 169 thousand hectares of the irrigational systems by 2015.

Integration of updated technologies (rain-drop, underground) in all 737,700 ha of irrigated lands will cost from \$2.20 billion to \$2.95 billion that, considering the abundance of water in Tajikistan and economic position of farmers, is hardly possible. The most probable and preferable alternative is the integration of new technologies in the existing 70,000 ha of the rocky irrigated lands where actual irrigation levels are over 20,000 m³/ha. This will require investments in \$210 million and will save over 700 million m³ of water (up to 7 percent of irrigational water intake).

In accordance with Article 8 of the Water Code of the Republic of Tajikistan, the Government is considering state support for drinking water supply, including the adoption and implementation of the national and local programs for subsidies, low-interest loans and customs benefits. Unfortunately, these programs have still not been developed.

The inter-state water relations problem issues include:

- inter-state water distribution is performed on the basis of agreements adopted in the post-Soviet period. However, they continue to use technical and economic justifications developed in the USSR. At the same time, the mechanism for compensation used for smoothing unequal water distribution and covering the costs of water utilization system at

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the regional level is no longer in force. These circumstances do not meet the national interests of Tajikistan;

- water supply and meliorative status of irrigated lands depends on the water sources located in neighboring countries (Kyrgyzstan, Uzbekistan) and water-logging from their side;
- lost incomes of the Nurek and Kairakkum water reservoirs under existing the irrigation regime, as well as problems associated with the excessive use of electrical power in the summer;
- water distribution issues in dry years;
- growing demographic pressure on water consumption;
- lack of adequate coordination in the solution of water and energy problems.

There is no coordination or unified planning in the water utilization system activity at the national level. Current practices are independently pursued at the administrative and territorial level, despite the principle of basin and inter-district management enshrined in the Water Code of Tajikistan.

2.6 Conclusions

- Tajikistan has abundant water and associated recreation resources, as well as hydropower resources of regional significance. Therefore, it is advisable to develop cooperation between the Central Asian countries in the reclamation of these resources;
- Natural and geographic characteristics of Tajikistan create the need for monitoring, research, surveys, as well as planning and implementation of activities aimed at prevention and elimination of harmful water impacts and other dangerous geodynamic processes;
- The construction of integrated water reservoirs play an important role in guaranteeing water and power supply for all economic sectors according to regional needs, population pressures and facility protection against draughts, floods and mudflows;
- Water management is an integral part of poverty reduction and increasing employment. It is therefore advisable to promote public awareness on this issue.
- The solution of food security problems requires the reclamation of 835 300 ha of land suitable for irrigation;
- The solution of the energy security problems requires expansion and construction of hydropower plants for dealing with electrical power shortages and increasing the export of hydropower;
- It is important to improve economic mechanism regulating water use, power use, state support and attraction of investments for rehabilitation of the water supply systems and sewage facilities;
- It is important to improve the population's access to clean drinking water and sanitation in compliance with the Millennium Development Goals;
- Development of agro services and farmers' access to loan resources will help increase their revenues and contribute to sustainable functioning of the irrigational systems;

- Integration of water metering and stimulation of water and energy savings will considerably improve the environmental situation and reduce anthropogenic pressure on water resources;
- It is important to pay due attention to dam safety, as well as the safety of other hydro-technical facilities;
- The zone of machine irrigation with its 2 million residents needs to maintain its exemptions for power supply;
- Continued urbanization, industrialization and general economic development of the country should be accompanied by proportionate development of the water supply, sewage and waste disposal capabilities;
- The management of the water utilization system requires a faster transition to principles of basin management on the basis of hydro-geographical units, the creation of the water users associations, water supply councils and clear division of the responsibilities between economic, political and coordinating authorities aimed at integrated approach to planning and use of the water resources;
- At regional level, it is necessary to create a framework (water-energy consortium) with the authority to manage the water-energy resources in the interests of all economic sectors and with due consideration to the needs of highlands and valleys, as well as environment protection.

3. MAIN APPROACHES TO STRATEGY DEVELOPMENT

The development of the present Strategy involves a sectoral approach to the water utilization system. The Strategy includes different objectives and ways to address them in the sphere of governance and development of industrial, urban and rural water supply and sanitation, water supply and pollution control, irrigation and drainage, hydropower, water environment, flood prevention and preparedness.

Each of these sectors implies significant institution-building, including the enhancement of legal framework, economic mechanisms, tariff regulation, rehabilitation and prospective development.

The Water Sector Strategy is viewed as the guiding principle and action plan aimed at the achievement of this set of objectives and specific financial capacities in the context of the goals, concepts and development programs adopted by the Government of Tajikistan.

Phased implementation of the Water Sector Strategy requires special coordinating agencies both within each of the sub-sectors and at the level of the water sector. This role can be best managed by National Water Strategy Commission to ensure the transition to integrated water resource management in the river basins and associated hydro-geographic units.

To ensure balanced decisions, this Commission led by the Government of Tajikistan may include representatives of the water utilization system, environmental organizations, regions and districts, NGOs and water users associations.

The Commission may include working group on planning and monitoring and initiation of decision-making within the framework of the Water Sector Strategy.

4. KEY STRATEGIC PRINCIPLES

The Water Sector Strategy creates a reliable basis for the provision of rational and effective use of water resources with the maximum balanced benefits for all water users with the least possible negative impact on environment. The key Strategic principles are aimed at promoting economic and social development and environment protection characteristic of integrated water resource management. At the same time, the Water Sector Strategy of Tajikistan is based not only on national legislation but also on international law on use of available water resources with due consideration of the interests of the neighboring states in the area of the Aral Sea Basin. The previous concept on the integrated use of the water resources is reviewed by this Strategy within the framework of the contemporary framework proposed by the Global, Water Partnership (2000) and the Johannesburg Summit on Sustainable Development (2002). This document envisages changes in priorities and transfer from the use of the water resources exclusively for economic development to their use for environmentally sustainable development (ESD). Integrated water resource management is the key principle of the Water Sector Strategy of Tajikistan and is mechanism for implementing these approaches.

5. DEVELOPMENT OF WATER RESOURCE MANAGEMENT

5.1 Current Situation

The state water sector management is based on combined principles of basin and administrative-territorial management and is performed by the Government of the Republic of Tajikistan, local executive bodies (khukumats) and the following authorized bodies on the regulation and protection of the water resources:

- The Ministry of Irrigation and Water Management: national management body responsible for land irrigation, agricultural water supply and stock water development;
- The State Committee on Environment Protection and Forestry, which is responsible for state control over the use and protection of the water resources;
- The State Geological Survey, which addresses underground water issues;
- The State Committee on the safe industrial works and mountain control, which regulates the rational use of healing, mineral, thermal and industrial waters and therapeutic mud.

There are also a number of the ministries and institutions that carry out specific functions:

- The Ministry of Energy is responsible for energy policy (particularly hydropower);
- OSHC “Barki Tojik” for accumulation and evacuation of water in water reservoirs for hydropower and irrigation purposes and other economy sectors;
- The Ministry of Emergencies and Civil Defense, in terms of prevention and response to harmful water impacts;
- The construction enterprise “Tajikselkhozvodoprovodstroy” which is involved in designing, construction and operation of the rural water supply systems, including stock-water development;

- State Unitary Enterprise “Khojagee Manzili va Kommunalni” – water supply and sewage systems in the cities and district centers;
- Khukumats of Dushanbe, Khudjand, Rogun and other cities – water supply and sewage systems;
- “Tajikstandart” – control over enforced standards and meteorological regulations in water supply and canalization (sanitation);
- The State Agency of Anti-Monopoly Control and Entrepreneurship Support – tariff policy in the water sector;
- The Hydro-Meteorological Service – analysis and records of the water resources in the water objects and facilities;
- The Ministry of Economy and Trade, responsible for planning of use and protection of the water resources;
- Local executive bodies, responsible for coordination of water resource use in their respective areas, development of water use regulation, conservation and improved status of water objects, prevention and elimination of harmful impacts and water contamination;
- Sanitary and epidemiological control section of the Ministry of Health of the Republic of Tajikistan, responsible for monitoring of the drinking water and drinking water sources;
- The Ministry of Agriculture, The Association of Dekhkan Farms and Agricultural Cooperatives, and Water Users Associations are responsible for use of water at the internal economy level.

Tajikistan has a complex, hierarchical, multifunctional system for the use and protection of the water resources (regulation, prognosis, use and protection, planning, analysis, policies, tactics and strategy) as well as a multi-sector framework of water-use and requirements for water resources to be broken down by quantity, quality and regime. Therefore, national level institutions require serious improvement in water sector management.

The state management system has maintained its administrative resources and state property to water supply systems. However, it has lost economic management levers, including financial and material resources. At the same time, economic actors who acquired relative freedom failed to take advantage of economic opportunities. Creation of new forms of management has just begun, including Water Users Associations, Channel Committees, Water supply Committees, Water Commissions, Basin Management Systems within the limits of hydro-geographic units. The market mechanisms such as payment for water supply or privatization are not yet functioning.

Tajikistan has still not fully developed the sectoral control system for monitoring water and hydro-power infrastructure: annual publications of the State Water Cadastre and hydrological year books are not regular and water balance is not recorded. Water use plans are suffering from serious deficiencies due to unqualified staff and unreliable data. There is effectively no system of inter-agency cooperation in place as there is no central coordinating body exists. The issues relating to the shifting property framework and transfer of the water assets to the responsibility of local and foreign legal persons are within the Government terms of reference. However, they lack defined procedures. Denationalization and transfer of the drinking water supply systems to private companies are prohibited by the Water Code. As a result, drinking water supply system is in unsatisfactory condition. The reservoir beds are held under the MIWM, dams under the OSHC “Barki Tojik”, and

the Vakhsh Main Channel also divided between these two. The lack of coordination and financial responsibilities with regard to these facilities exacerbates their poor condition.

The financial mechanisms for water resource management are also far from being perfect.

The irrigation sector uses a single tariff for water supply with no consideration of economic factors (including gravity irrigation, machine irrigation, valleys or mountain areas) and does not ensure normative content and operation of the irrigation and collection-drainage systems. Similar situation can be observed in hydropower, domestic drinking water supply and stock water development.

The inter-state level is characterized by poor regulation of water relations, including economic mechanisms for water use that govern the operation of water reservoirs with international significance. At present, the states are using the USSR principles of water sharing. However, a mechanism of compensation from which Tajikistan previously received its fuel and energy resources no longer meets its needs, such that this former distribution of water no longer reflects current conditions and has turned into source of tension.

5.2 Needs and Capacities for the Development of New Reservoirs

Tajikistan has 9 operational water reservoirs with a volume of 20.0–20.5 km³. The total groundwater level is 664 km³, which equals 13 percent of the average annual river flow in the Aral Sea Basin.

Prospective reclamation of all lands suitable for irrigation (880 thousand ha), improved water supply and further development of the other economic sectors requires increasing water reservoirs by 15.7 km³ to a total volume of 31.0 km³.

The main water reservoir capacity is located in the Amu-Darys River Basin, comprising the Vakhsh, Pianj, Zeravshan, and Kafirnigan rivers. In the Pianj River alone, there are over 10 reservoir sites for HPP with a total volume of 36.1 km³. According to the approved Concept, Tajikistan may increase total volume of its reservoirs to 67.0 km³, or 58 percent of the average annual flow in the Aral Sea Basin. This will make it possible to provide reliable water management and produce hydropower for the Central Asia region and beyond its boundaries.²

5.3 Goals and Constraints

The main goal of water reservoir construction is to enhance the use of the water resources for electrical power production, irrigation, flood protection, fishery, recreation, technical and domestic water supply for mutual benefit of the both national and regional interests.

The key constraints associated with reservoir construction are as follows:

- fund-raising difficulties;
- technical issues concerning dam safety in seismically active areas and other challenging geological conditions;
- potential trans-boundary effects on environment and communities;

² General data on the existing and perspective reservoirs is contained in Table 1. For further data on water reservoirs in Tajikistan, consult Section 2.5.

- creating public support at the national and regional levels;
- need for highly qualified professionals.

5.4 Proposed Strategy

Provided that fund-raising efforts are successful, construction of water reservoirs should be carried out in places with the greatest reclamation potential and the best possible economic, social and environmental effects.

The construction strategy of the complex reservoirs is explained in Section 10.1.

Considering the importance of hydropower water use in Tajikistan, it is important to give preference to the reservoirs that jointly contribute to energy and irrigation over those used only for irrigation purposes.

5.5 Estimated Value

The estimated value of water reservoirs that integrate both energy and irrigation outputs is provided in Section 10.1.

6. WATER SUPPLY AND SANITATION

6.1 Current Situation

One of the key objectives of Millennium Development Goals in Tajikistan is to increase by half the number of people who have access to drinking water and sanitation services by 2015.

In Tajikistan 4.24 million or 61 percent of the residents have access to drinking water. While drinking water reaches 93 percent of the citizens in the large cities and towns, only half of the rural residents enjoy this benefit. Only 52 of the 62 cities, district centers and towns have centralized water supply systems and only 28 percent have sewage systems. While 87 percent of urban residents receive their water from centralized water supply systems, this is true for only 20 percent of the rural residents.

In addition, current water supply and sewage facilities are degrading and will not be able to maintain existing capacities due to insufficient or delayed payments for service. The breakup of a unified system, decentralization, lack of coordinated operation and the transition period had a devastating effect on the financial situation for all social services in Tajikistan, including water supply and sanitation.

In particular, the system of unified reporting for water supply and sanitation broke down, such that management became the *de facto* responsibility of the local authorities who pay little regard to the system's overall efficiency. Central institutions distribute subsidies, capital investments and other resources to maintain tariffs and salaries at an unjustifiably low level. The result is severe financial limitations and little or no service for local residents.

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The water supply and sanitation infrastructure has deteriorated by an estimated 70%, while water losses amount in it equals average 50 to 60 percent.

Most infectious water-borne diseases are observed in rural areas and small towns. The rural water conduits operate with gross violations of technical norms. Due to frequent power cuts and other difficulties, most people have access to water only in the morning and evening. This creates favorable conditions for water pollution through loose joints. Operating conditions are similar or worse for sanitary facilities.

Table A - Access to improved water and sanitation sources in 2004-2005

	Tajikistan		Urban areas		Rural areas	
	2004	2005	2004	2005	2004	2005
Safe access percent	60	61	92	93	47	49
Water supply: Thousand people	4020	4240	1543	1714	2021	2526
Safe access percent	14	15	43	44	3	5
Sanitation (sewage) Thousand people	1047	1068	795	811	207	257,0

The Poverty Reduction Strategy Paper (PRSP) plans to increase the share of the population with access to drinking water to 97 percent in the urban areas and 74 percent in the rural areas, accounting for additional 2 million residents due to the population growth. With respect to sanitation access, it envisions an increase to 65 and 50 percent in urban and rural areas respectively, including access to pit latrines and backyard toilets.

The main problems of water supply and sanitation

- Poor legal framework - The Water Code does not sufficiently deal with the issues of water supply and sanitation. It is necessary to elaborate a specific law concerning water supply, to develop drinking water standards and to allow the privatization of water supply and canalization facilities;
- Inconsistent power supply and high depreciation of capital assets, as well as a deficit of hydro-power equipment;
- Deterioration of centralized heating systems in urban areas complicates the operation of water supply and sanitation systems;
- Absence of water meters and limited ability for users to make service payments;
- Absence of a body which could coordinate technical policy, design, rehabilitation, construction and operation of water supply and sanitation systems;
- Lack of coordinated, targeted use of internal and external investments, integration of effective technologies, equipment, measuring and control devices and management tools;
- Practical inaction or full absence of centralized canalization and utilization of solid domestic wastes (SDW), individual and public toilets;
- Low public awareness about proper water use and sanitation practices.

The baseline data for development of Matrix of Action in the National Development Strategy sub-sector for water supply and canalization is provided in Table 2.

6.2 Water and Sanitation Sector Development Priorities

For 2006-2008:

Reliable drinking water supply in rural areas through water pumps in the streets and yards will help women and children save time and effort fetching water from distant water sources. In addition, it will reduce health expenses which currently constitute over 30 percent of the average household budget. It will also increase labor activity and present additional opportunities for poverty reduction.

According to the Poverty Reduction Strategy Paper for 2006-2008, priorities for the water and sanitation sector are as follows:

- construction of water intake facilities in the rural areas;
- improved quality of water and water treatment (in compliance with the GOST);
- establishment of sanitation protection zones and head water intake facilities;
- assessment of existing water resources;
- rehabilitation of existing water supply systems in urban and rural areas, including agricultural water supply systems, internal water supply systems of condominiums and guaranteed supply to consumers through current systems;
- rehabilitation of public and individual toilets, collection and utilization of solid domestic wastes (SDW);
- development and adoption of the Law of the Republic of Tajikistan “On Drinking Water and Water Supply”;
- elaboration of norms and standards for drinking water quality.

For 2006-2015:

The implementation of the National Strategy for Water Supply and Sanitation Development will be an important factor in improving living standards and will require considerably increased funding.

It is also important to provide training to technical and managerial staff, to foster appropriate water and sanitation culture, and to integrate public and private investments in the water and sanitation sector.

To achieve the goals of the National Strategy in the development of water and sanitation, it is important to ensure:

- rapid construction of the local water supply systems in the rural areas;
- rehabilitation, reconstruction and expansion of the existing centralized water supply and sewage systems (through projects, feasibility studies) in the urban and rural settlements;

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- reduced water leakage throughout the water supply systems, including residential systems;
- reform of the water supply and sanitation systems, promotion of a strong tariff policy, the reorganization of current institutional structures, including the redistribution of authority between local executive bodies, water supply and sewage enterprises and the public;
- training of experts, technical and managerial personnel in the water and sewage systems;
- increased public awareness of the norms and regulations regarding water use, sanitation and hygiene.

6.3 Measures aimed at achievement of the national goals and priorities in the Water and Sanitation Sector for development of the NDS (2006-2015) and PRS (2006-2008)

Feasibility studies (FS) must guide the rehabilitation, reconstruction and expansion of the existing and construction of new centralized small, medium and local water supply systems, water-intake wells of individual and group use, and sewage facilities. In addition, relevant project decisions should direct the application and procurement of updated equipment, materials, measuring devices, decontamination facilities, automation and management, creation of laboratories for water quality examination, design and productive facilities, and staff training.

In Tajikistan, water sources include principally surface and underground waters. Half of the consumed water that is excessively hard (15-22 mg/l) and mineralized (10mg/l) comes from the Sogd Region and the Kurgan-Tube zone of the Khatlon Region. Therefore, water supply in the Vakhsh Valley can be only addressed through the construction of second and third components of the Vakhsh group water conduit with side channels to residential areas.

In the mountainous areas of the republic with an abundance of high quality water, residential water supply can be achieved through the construction of local systems.

With regard to water supply systems with excessive hardness and turbidity, it is advisable to introduce new technologies aimed at water clarification and softening.

To resolve water supply and canalization problems, it is necessary to:

- adopt the Law of the Republic of Tajikistan “On Drinking Water and Water Supply”;
- carry out reforms aimed at improved management, technical operation optimization of tariffs in water supply and canalization sector;
- eliminate leakages in the water supply system and install water meters for consumption outlet;

In addition, it is necessary to establish a National Group consisting of decision-makers, qualified water supply specialists and other stakeholders authorized to address the following issues:

- provision of targeted and effective use of budget funds, loans, grants and other resources allocated to water supply and canalization needs;
- development of justified technical projects by using effective treatment and decontamination methods for drinking and sewage waters;

- elaboration of investment proposals ordered by priority and timeframe designed to maximum public access to drinking water with minimal capital investments
- development and integration of new technologies for water supply and canalization;
- improved water resource management in the domestic drinking and canalization sectors;
- provision of constant power supply;
- establishment of a progressive system of social protection that allows the poor to make payments for drinking water and sanitation services;
- privatization of water supply and canalization facilities;
- introduction of changes and amendments to Article 57 of the Water Code of Tajikistan prohibiting privatization of the water supply systems.

For more details, see the matrix of measures for the Water & Sanitation Sector for 2006-2008 – 2006-2015 in Tables 3, 4, 5.

6.4 Financial Costs Associated with the Water and Sanitation Sector

The financial costs of improving the water and sanitation sector are presented in the tables below and account for inflation. The total planned expenses until 2015 amount to \$998,237 million, \$607,264 million of which are required.

The effective implementation of these set objectives will provide sustainable access to drinking water for 653,500 people in urban areas and 445,500 people in rural areas.

Table B - Estimated Costs in Water & Sanitation Sector in 2006-2015

	2006 (thousand USD)	2006-2008 (thousand USD)	2006-2010 (thousand USD)	2006-2015 (thousand USD)
Water supply:	43605,0	159084.0	352376.0	636309.0
- urban	36810.0	134484.0	297699.0	511309.0
- rural	6795.0	24600.0	54677.0	125000.0
Sanitation (canalization):	30819.0	89724.0	157656.0	361964.0
- urban	27519.0	87624.0	155156.0	324464.0
- rural	3300.0	2100.0	2500.0	37500.0
Total:	74424.0	248967.0	510032.0	998273.0

Table C - Funding Costs in Water & Sanitation Sector in 2006-2015

Funding sources	2006	2006-2008	2006-2010	2006-2015
Total in USD thousand	74424.0	248967.0	510032.0	998273.0
- urban households	2786.0	8582.0	11802.0	35832.0
- rural households	80.0	656.0	2292.0	7264.0

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- Government of the RT	4121.0	10915.0	16702.0	31028.0
- External investments	36618.0	78931.0	121580.0	232185.0
- International donors	7700.0	7700.0	7700.0	84700.0
- Funding deficit	23119.0	142183.0	349956.0	607264.0
- Funding deficit percent	31.6	57.1	68.6	60.8

The distribution of funding costs between institutions and enterprises for the NDS and PRS in the Water and Sanitation Sector for 2006-2008 and 2006-2015 are provided in tables 6, 7, and 23 below.

6.5 Partnership and Participation

The goals and objectives of the NDS cannot be achieved without foreign investment. International partners to date include: UNDP, USAID, UNICEF, MERLIN, Mercy Corps, European Union, GTZ, Government of Japan, EBRD, Switzerland, OSCE, OXFAM (Great Britain), ADB, ACTED, IDB, and the World Bank.

Expanded cooperation with international organizations and donors will support increased access to drinking water and sanitation, achievement of the Millennium Development Goals and overall poverty reduction in Tajikistan.

6.6 Indicators, Monitoring and Evaluation

The National Development Strategy and the Poverty Reduction Strategy are aimed at improving living standards in Tajikistan. The indicators presented allow for the assessment of interim and final outcomes and comprise both physical and chemical measures, including:

- daily amount of the consumed water per person.
- biological oxygen consumption (BOC) and maximum contamination level (MCL) (estimates the treatment and discharge of sewage waters.)
- electrical power consumption per 1 m³ of the supplied water
- payment collection for provided services also serve as indicators.

Social indicators include access to drinking water, sanitation, collection and utilization of solid domestic wastes. This set of the indicators make it possible to summarize, analyze and evaluate integrated objectives needed to achieve the water and sanitation goals.

Table D - Main target socio-economic NDS indicators aimed at achievement of the MDG

Millennium Development Goals	NDS Indicator	2004	2006	2007	2008	2010	2015
		Water supply					
Environmental sustainability	Access of the urban population to safe water (percent)	92	93	94	95	96	97

	Access of the rural population to safe water (percent)	45	47	49	51	64	74
	Access to the main sanitary-technical facilities in the urban areas (percent)	Sanitation					
		42	43	44	45	47	50
	Access to the main sanitary-technical facilities in the rural areas (percent)	3	5	7	8,6	37	65

7. INDUSTRIAL WATER SUPPLY AND POLLUTION CONTROL

7.1 Current Situation

The industrial water supply in Tajikistan includes surface and underground sources, mine waters, systems of reversible and repeated-successive, communal and technical water supply.

Industry consumes water for:

- production needs;
- domestic drinking needs;
- irrigation of household plots;
- agricultural water supply;
- other needs.

Criteria	1991 (million m ³)	2003 (million m ³)	2003 (% of 1991)
Industrial needs	487.8	343.9	70.5
Total consumption	488.0	274.3	56.2
Industrial use	266.6	150.6	56.5
Use of drinking water for industrial needs	141.9	46.7	32.9
Capacities for reversible and repeated-successive water supply	523.5	37.7	7.2
Water treatment capacities	25.9	16.4	63.5
Discharge of untreated waters	8.4	6.3	75.6
normative treatment of sewage waters	14.9	6.6	44.3
Discharge of contaminated sewage waters into rivers and lakes	7.1	7.3	103.4
Consumptive water use	319.6	158.2	49.5

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The fact that the discharge of contaminated sewage waters into rivers and lakes increased despite lower consumption attests to the inefficiency of existing water treatment facilities.

In addition, the amount of contamination in discharged waters has also reduced in the following areas: biological oxygen consumption (37.9 percent), suspended matter (19.7 times), dry residues (6.3 times), sulfates (21 times) and ammonia nitrogen (2.6 times.) Data on the industrial use on water and contaminated substances is provided in Tables 8 and 9.

Contamination control is carried out by six laboratories of the State Committee on Environmental Protection and Forestry situated in the Sogd Region, Kurgan-Tube, Kuliab, Dushanbe, Tursun-Zade, and Penjikent cities. Their annual budget amounts to 6,000 USD and appropriate contamination control requires doubling the number of the laboratories and tripling current funding.

According to acting legislation, contamination record and control are responsibility of the water users. This is confirmed by statistical reports 2-TP (VODKHOZ) which include the following values:

- water intake from natural water sources;
- use of water for various needs;
- volume of reversible and repeated-successive water supply;
- discharge of polluted sewage waters;
- loss of water during transportation;
- other quantitative and qualitative indicators of water consumption.

Based on the 2-TP data (VODKHOZ), the MIWM keeps the State Water Cadastre on the use of the water resources. In addition, the Meteorological Service of Tajikistan keeps the State Cadastre of the surface waters and the State Geological Survey keeps cadastre on underground waters. Collection, storage and dissemination of all government statistics on the use and protection of the water resources is conducted by the State Statistics Committee.

7.2 Goals and Constraints

The main goals of the industrial water supply and pollution control are as follows:

- rehabilitation, reconstruction and construction of water supply systems, water treatment facilities for processing of sewage waters, and organization of filtration fields with regard to local hydrological and geological conditions;
- rehabilitation, reconstruction and installation of reversible and repeated-successive water supply;
- integration of shallow and dry technologies for water saving;
- creating technical water supply systems for reduced industrial use of drinking water;
- rehabilitation and strengthening monitoring systems and the legal framework;
- integration of advanced technologies on sewage water treatment and utilization;
- elimination of discharged untreated industrial sewage waters;

- creation of effective economic incentives for industrial water use through regulation (prohibition, limitations, stimulation, tariff regulation, sanctions).

Constraints in the development of industrial water supply and pollution controls are rooted in the industrial development program itself. In particular, rehabilitation and development of industrial water supply and the system of sewage water treatment and utilization will depend on the functioning of current industrial enterprises and the development of new enterprises.

7.3 Sub-Sector Strategy

The program of industrial development envisages a set of measures aimed at changing the line structure given considerable development of the mining industry, fuel and energy facilities (FEF), the chemical industry, mechanic engineering, construction materials and the textile industry. It also plans the restructuring and conversion of industrial enterprises in accordance with the changing demands of internal and external markets, maximal use of the existing industrial enterprises, development of small and medium entrepreneurship, creation of joint ventures with foreign investments and reform of existing industrial, economic and social infrastructure. The key long-term goal of the industrial policy is to prioritize hydropower development, increase production and advanced processing of aluminum and to achieve rapid production rates in cotton processing.

Therefore, development of water supply and industrial sewage water treatment and utilization will be in accordance with the above program and key industrial strategic goals. To this end, it will be necessary to conduct an inventory of water supply and sewage water treatment and utilization systems to assess the magnitude of the required restructuring and conversion.

The construction of new water supply systems as well as systems of industrial water treatment and utilization should take place in accordance with the establishment of new enterprises and in compliance with the legislation of the Republic of Tajikistan.

7.4 Estimated Value

To estimate the value, it will be useful to apply inventory data mentioned in section 7.3 and to develop business plans for the establishment of industrial enterprises that will devote special attention to the creation of operation and maintenance services.

8. IRRIGATION AND DRAINAGE

8.1 Current Situation

The irrigation systems of Tajikistan cover 737,700 ha of land, of which 300,000 ha are zones of machine irrigation. The irrigation systems of Tajikistan are subdivided into 4 categories according to the technical equipment:

Modern irrigational systems (282,000 ha) are characterized by stable water intake, concrete lined channels, flumes and pipelines with the required hydro-technical facilities. These include the Zafarabad, Asht, Yavan-Obikeek, Matcha, Dangara, Beshkent, Garauly, and Kanibadam irrigation systems. Water is supplied mostly through underground pipes.

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Irrigation systems with main channels without anti-filtration cover and the lack of hydro-technical facilities (202,000). The network lies primarily in earth-bed and has few water measurement devices and inadequate equipment. These systems include the Vakhsh, Shurobad, Parhar-Chubek, Khodja-Bakirgan, Pianj and Isfara irrigation systems.

Irrigation systems with rehabilitated networks and large main channels are equipped with water-intake facilities (200,000 ha). The internal network, with exception of several massifs of the Beshkent, Kattasai, Ganchi, Asht, Gissar, Nizhny-Kafirnigan and other irrigation systems is mostly earthen and not equipped with hydro-technical facilities and hydro-posts.

Irrigation systems which are not adequately equipped (53,700 ha), where irrigation covers separate small massifs. These include the systems in the Gorno Badakhshan Autonomous Region, Rasht Valley, Aini, Kuhiston, and Mastchoh districts. Irrigation water here is hardly accounted, mostly through small inter-farm channels.

Pumping stations serve 40 percent of the irrigated areas, 64 percent of which are in the Sogd Region. Almost 30 percent of the pumping stations are of cascade nature and pump water in 5-7 steps to a height of 250-300 meter or more. They have complex structure, hydro-mechanical and power equipment and operation mode and require highly qualified operators which is problematic due to the loss of such staff.

The technical condition of flow pipes, especially in cascades, is a serious concern as they have been in use for over 30 years. Their failure would result in disaster with profound socio-economic consequences, particularly the creation of many ecological migrants. Rehabilitation may prove costly given the required maintenance to pumping stations. Of the current 2,356 bore holes for vertical drainage, 70 percent are out of the order.

An estimated 20 percent of irrigated lands in Tajikistan suffer from water shortages caused by poor regulation of river flows. In the area of the Istravshan (30,000 ha), only 55 percent of water demands are met. In Kyzyl-Su–Yah-Su basin in Kuliab area (60,000 ha) receives only 65 percent of required water. The same situation prevails for 12,000 ha of land in Gissar.

The regulation of the underground water level and salt balance in irrigated areas is supported by a collection and drainage network with area of 311,200 ha (36.2 lm/ha) and with module of the drainage flow of 0.3-0.4 l/sec/ha. Vertical bore holes cover an area of 47,400 ha. Before the 1990s, the drainage system supported a regular ameliorative regime for irrigated lands. Drastic declines in operational investments previously used for cleaning and maintenance resulted in the emergence of 55,500 ha of adversely irrigated lands. The ameliorative status of the lands and distribution of the irrigated areas dependent underground water depth are presented in Tables 10 and 11.

Poor condition of the roads, telephone and radio communication make irrigation system management even more challenging. The availability of the roads in old irrigated areas is 2 to 3 times lower than in the areas reclaimed before 1990. Water is not properly accounted, especially by the farmers, which makes it difficult to arrange payments for water services.

In 2004, agriculture received 8.4 km³ of water, which is a decrease of 1.5 km³ from levels in 1990. Tajikistan forms 4.1 km³ of reversible irrigation and drainage waters, of which 0.35 km³ is used for irrigation and the rest is discharged in rivers. Reduced water intake is due to changes in cropping patterns, introduction of water payments in 1996, the existence of adverse lands and the

decrease in rinsing irrigation by half since 1990. By the end of 2005, the efficiency coefficient of irrigation systems in Tajikistan was estimated at 0.55, compared to 0.59 in 1990.

Agricultural irrigation techniques have remained unchanged over the past few years and are principally performed through furrows. Before 1990, only 3,500 ha of land received water through flexible pipes that delivered it to furrows and rain water irrigation was used for 296 ha. At present, these new irrigation techniques are hardly used and there is no immediate intention to apply water saving technologies. Funding from the current water sector budget (including water supply payments) and tentative foreign investments will allow only maintenance of the irrigation systems with efficiency coefficients of 0.56. The average irrigation norms of 14,600 m³/ha can thus be expected to remain constant. Introduction of new technologies (rain-drop, underground, and drip irrigation) will multiply water saving rates by 2 to 3 times, despite funding constraints and a limited manufacturing sector which continues to present barriers to the adoption of these technologies.

At present, the main funds for irrigation and drainage systems and related infrastructure have decreased by 50 percent. The pumping station funding has also decreased by 65 percent. Technical data on irrigation systems are provided in Tables 12, 13, 14, 15 and 16.

In 1992-2004, almost no new irrigated lands were reclaimed, though they could potentially be expanded to 1.6 million ha. Current deficits in capital investment and planning for irrigated lands has led to reduced availability (at present, 0.11 ha per capita compared to 0.17 ha per capita in 1970), poor irrigation quality, expansion of fragmented salination and unequal watering.

8.2 Goals and Constraints

Tajikistan has set a long-term goal to reclaim all lands suitable for irrigation and rehabilitation and increase the technical level of the irrigational and collection-drainage systems, which will require complex and capital intensive solutions. These new lands will provide citizens with increased employment prospects and play important an economic and environmental role for the 72 percent of the population who live in rural areas. These tasks must be addressed on the basis of short-, mid- and long-term programs to increase the efficiency of inter-farm and internal irrigation systems, improve irrigation techniques and technology, implement capital and current land planning, and integrate the reconstruction of irrigated lands and leaching irrigation.

In addition, these plans foresee the phased reclamation of 835,000 ha of newly irrigated lands given the inter-basin diversion of the Zeravshan River run-off to the Shahristan depression, which includes the reclamation of 87,000 ha of land and improved water supply for 30,000 of the old irrigated lands. It is also important to find ways to increase gravity irrigation. Finally, it is vital to create a framework through which normal operations and maintenance can be carried out on the basis of budgetary support, water fees and sources of funding.

It is necessary to ensure the rational use of water through improved soil quality, ameliorative and hydro-module zoning, integration of improved irrigation regimes, progressive water saving technologies and the improved ameliorative status of significant land areas. It is also necessary to resolve the problem of debt and create a system of state support for farmers which increases household incomes and allows their input in irrigational and collection-drainage systems and water saving.

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The key organizational objectives include the integration of water records, staff training, development and implementation of water use plans, creation of water users associations, shifts to hydrographic management methods and increased public awareness.

However, these objectives face the following restraints:

- Absence of inventory of the irrigation and drainage systems since 1990;
- high deterioration of capital funds for irrigation and drainage systems;
- lack of financial resources;
- low water tariffs;
- inflation, increased power tariffs and tariffs for energy carriers;
- absence of reform procedures and provision of state support (although permitted by the Water Code);
- a complex mechanism of inter-state cooperation for solving trans-national irrigation and drainage problems;
- problems in providing water organizations with land for ameliorative works;
- poor investment prospects for irrigation and drainage facilities;
- unsolved property rights issues for inter-farm systems, which delays creation of water users associations (WUA);
- absence of law on the WUA;
- absence of comprehensive water saving mechanism.

8.3 Planned Rehabilitation and Reconstruction

Priority Strategic Trends and Values

The greatest challenge for irrigation and drainage systems is the current 55,500 ha of land with unsatisfactory ameliorative status. On 2 July 2005 the Government of Tajikistan issued Resolution # 236 on the rehabilitation of these lands during 2005-2009 with funds of \$12,149 million. These works are to be carried out at the expense of the national and local budgets and water users' funds (Table 17).

The highest priority targets are unique and vulnerable hydro-technical facilities, including large culverts, flumes, pumping stations, main channels on subsiding soils and slopes, damless water intakes, closed drains, and main water pipelines. An accurate estimation of the cost of their rehabilitation requires an inventory and priority-phased funding. In total, bringing the irrigation and drainage systems and associated infrastructure back to their 1990 status will require \$746 million. Estimates suggest that with the state subsidies and continued GDP annual growth of 10.3 percent, 100 percent payment of the water fees based on current tariffs and realistic foreign investments, the irrigational and drainage systems in Tajikistan will reach the level of 1990 not earlier than in 2015.

Therefore, the main strategy for irrigation and drainage should be to return satisfactory status to all existing irrigated lands and to prevent their further deterioration.

9. LEGAL AND INSTITUTIONAL COMPLEMENTARY MEASURES

9.3 Requirement of Reforms Caused by Imminent Water Crisis:

Water resources are under growing pressure from population growth, economic activity and the expanding water needs of users. Indeed, water intake has grown apace with the population and increasingly intensive development has had growing an impact on the environment. Increasing concerns regarding climate change will require improved water resource management to help prevent more intense floods and draughts.

Past institutional approaches to water resource management are still in force, resulting in uncoordinated water resource management with clear inefficiencies. **Integrated water resource management (IWRM)** provides equality between water users, coordination of different economic sectors, stakeholder involvement, transparency and economically-viable local governance.

Introducing IWRM will require reforms at all stages of water resource planning and management and the elaboration of common action plan. The integration of the present Strategy will require reforms of water-related legislation and institutions and will accordingly be a long-term process.

9.2 Water Management Assessment and its Compliance with the IWRM Principles

90 percent of production in Tajikistan is produced by irrigated lands that consume 85 percent of water resources. Agriculture employs around 70 percent of the working population and comprises 25 percent of the national GDP.

The operational structure descends from the IWRM to regional, territorial and district water resource management facilities and finally directly to water users. At the national and local levels there are specialized divisions responsible for the operation of the pumping stations, vertical bore holes, substations, transmission and communication lines, as well as the hydro-geological and ameliorative services that maintain ameliorative condition of irrigated lands.

Inter-farm water management is to operate at the lowest possible level. The structure of the inter-farm operation of the irrigation systems is represented by the Ministry of Agriculture and local executive bodies, including agricultural management bodies, which monitor activities of agricultural producers and water users.

Out of 600 kolkhozes and sovkhoses that previously existed in Tajikistan, 400 have been restructured into over 23,000 dekhkan farms.

The republic is undergoing a long process of creating water users associations among farmers. At the national level, water resource management remains close to its structure under the Soviet period, despite changes with the transition to a market economy.

9.3 Political and Social Understanding of Water Sector Reform

The Republic of Tajikistan has developed a number of primary legislative acts (see Section 1.3) that makes the process of reform irreversible, including the Law “On Property”, the Law “On Dekhkan Farms” and the Presidential Decree on paid water supply to state users of irrigation and

amelioration systems, Cotton Production Development Program for 2000-2005 and Grain Production Development Program for 2000-2005.

The concept of the rational use and protection of the water resources in Tajikistan implies that in the next 10 to 15 years and beyond, water use will depend on achieving sustainable economic development and demographic situations, including the improvement of living standards. Food challenges are becoming more acute and should be resolved through increasing the productivity of existing lands (primarily irrigated lands) and the reclamation of new irrigated areas. Given trends in other sectors, this process will be estimated to annually require 19-20 km³ of water per year. Additionally, expanded creation of water users associations (WUA) are crucial for the reform process.

9.4 Factors Destabilizing Sustainable Water Supply

The status and effectiveness of the national water utilization system very much depend on economic conditions. Problems and priorities include:

At the national level:

- poor use of vast hydropower resources and the need to ensure national energy independence;
- provision of food security, employment and poverty reduction;
- considerable deterioration of capital assets in water sector infrastructure and the need for their rehabilitation;
- insufficient funding for water infrastructure and poor economic mechanisms regulating water use;
- poor access to drinking water supply systems and canalization.

At the basin level:

- inadequate mechanisms for joint water and energy resource management, including mechanisms for prevention and resolution of conflict in dry years;
- absence of coherent criteria and means for creating bilateral and multilateral agreements on the use of water and energy resources in compliance with framework agreements;
- absence of strategy for distribution of use of water between states in the Central Asia region.

Global climate change has resulted in complex glacier and snowfield shrinking processes accompanied by repeated dry years, draughts and other negative phenomena. Reduced snow layers and snow coverage have impacted the seasonal formation of river flows that influences power production, effective agricultural activity, water quality and biological productivity of the flora and fauna.

Expert assessments of expected climatic changes predicts increased evaporation by 5-14 percent as well as vapor transpiration by 10-20 percent. If CO₂ in the atmosphere doubles, water resources will be reduced by 10-20 percent with increased flow during the low stream flow period and decreased flow during high floods.

9.5 National Vision of the IWRM Experience

Integrated water resource management (IWRM) entails the harmonization of key factors for the effective management and use of water, lands and energy resources within local contexts at different administrative levels. The horizontal and vertical management hierarchy currently provides water delivery from the water source to the consumer, with different factors determining water supply stability at each level. The optimal structure of the national water resource management system consists of four levels:

National level, including the Parliament, Government, authorized ministries and institutions issuing permits for special water use (see Section 5.1). The National Committee on Irrigation and Drainage is a non-governmental organization uniting diverse stakeholders concerned with the rational use and protection of water resources.

Basin level, including basin water management for main national water courses (Syr-Darya, Zerravshan, Karatag-Shirkent, Kafirnigan, Vakhsh, and Pianj). Inter-sector participation will be encouraged with the formation of Water Basin Committee. It will represent state agencies at the oblast level, as well as the representatives of the public associations and commercial actors.

Water channel level, which concerns the management of irrigation systems and large channels. Inter-sector participation will be assured with the formation of Water Channel Committees.

Grass-roots level, comprising large agricultural enterprises, associations and water users' federations.

Integrated water resource management aims to promote:

- Organizational development, with the participation of key stakeholders including communities;
- Strengthened capacity of water economy organizations and WUA;
- Creation of water organizations within hydrographic units;
- Creation of the legal and regulatory framework, including mechanisms for conflict resolution;
- Organization of an effective system of equal water distribution and environmental protection;
- Effective use of water and water saving.

9.6 Assessed Application of the IWRM Principles

The whole water utilization system depends on institutions of water resource management and the degree to which they enforce current legislation.

To date, the water utilization system in Tajikistan has not been privatized. It is thus important to carry out institutional assessment of each agency and identify linkages between them, evaluating their performance and efficiency in providing services. The main indicator of this efficiency should be the amount of annually contributed resources and investments in the water utilization system budget. Due to the changing prices of agricultural products, efficiency assessments of water use should be based on unit of production which will form the basis for reliable record of the water and

produced commodities. The introduction of an economic mechanism for water use will provide strong incentive for providing reliable water records, especially in zones of machine irrigation.

Agricultural water users will not be able to cover all expenditures for water supply in the short term. Consequently, a sustainable farmer support system (customs, tax and tariff regulation; subsidies, etc.) will be necessary so that the state funding and water fees can cover the necessary expenditures. To increase the efficiency of the water resource management system, it is important to manage the resources within the limits of hydro-geographical units, accelerate creation of water users associations and provide varying water fees based on specific local conditions.

It is also important systematically to adapt the management system to market conditions. Under current conditions, the basin management system appears to be most effective as it allows for better accounting processes, water supply, fee collection and control over rational use of water by all types of the water users. Accordingly, current district water management bodies should join basin management units of the irrigation systems. In general, the IWRM should become the alternative to the command management system for Tajikistan's water sector.

9.7 Proposed Goals of Strategic Planning

Considering the complexity of these tasks, activities will be carried out in phased manner.

In the short-term perspective, it is important to:

- clarify estimated water needs for specific periods;
- develop schedules of water intake and water delivery based on economic mechanisms to regulate water flow and provide water services to other countries;
- determine mechanisms for regulating water delivery schedules;
- define the list of water courses to which Tajikistan will make claims in inter-state relations;
- define perspectives on inter-basin river flow diversion, including the diversion of part of the Zeravshan River flow into the Shahrstan depression;
- develop frameworks for damage compensation caused by the violation of inter-state agreements on water distribution;
- carry out pilot projects on water saving;
- prepare Tajikistan's claims to the FS of the Water-Energy Consortium and diversion of part of the Pianj River flow into the Vakhsh River for increased power production;
- encourage public awareness for and participation in the rational use and protection of water resources;
- develop programs of short-, mid- and long-term rehabilitation for water sector infrastructure and begin their implementation.

In the mid-term perspective:

- initiate, as required, redistribution of water between the states;
- integrate and update viable technologies and methods of water saving in domestic and agricultural water sectors;

- continue implementation of rehabilitation program of the water carrier network infrastructure

In the long-term perspective:

- ensure installation of anti-filtration coverage for channels;
- carry out reconstruction of irrigation systems, water facilities and other water carrier infrastructure;
- carry out reconstruction of inter-state water facilities;
- begin operation of the Rogun HPP and plan the construction of new HPPs and water reservoirs.

9.8 Main Trends for Reform of Water Resource Development

Main trends for reform of water resource development are presented in Table 18.

9.9 Key Strategic Trends

Regulatory Measures:

- provision for the rational use and protection of water resources;
- participation in the elaboration of contemporary strategies for inter-state water distribution and economic mechanisms regulating water consumption;
- establishment of economic mechanisms for water consumption, support for regional efforts to further participatory water resource management, creation and strengthening of effective mechanisms of conflict prevention and conflict resolution, especially in dry years;
- organization of accurate evaluations of water sources;
- implementation of a gradual shift towards integrated water resource management based on hydrographic units and acceleration of the establishment of water users associations;
- practical integration of water demand management;
- development by relevant ministries and management institutions of water utilization system responsive to the market conditions;
- establishment of state support system for irrigated farming, development of farmers' initiative and associated farms support for reliable ameliorative fund and guaranteed water supply;
- inventory of the status of irrigation systems and evaluation of necessary reconstruction tasks;
- institutional assessment and reform of water organizations;
- inventory of capital assets of water supply systems;
- development and integration of advanced technologies of water supply, sewage and irrigation systems.

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Educational and Advocacy Measures:

- advanced staff training in the water sector;
- promotion of public awareness about saving and protection of water resources.

Legal Measures:

- development of coherent criteria and methods to solve inter-state water problems, including bilateral and multilateral agreements;
- elaboration of provisions and charters for new, market-based water sector institutions;
- development of the draft laws of the Republic of Tajikistan “On Water Resource Fee”, “On Monitoring of Water Resources”, “On Drinking Water and Drinking Water Supply”.

Financial Measures:

- creation of economic incentives for water saving;
- development of economic mechanisms for water utilization system management, including mechanisms for mutual settlements between providers and water consumers, and between individual links in water delivery systems and maintenance organizations;
- annual allocation of funds from state and local budgets, as well as land tax revenues for the support of ameliorative water sector activities;
- development and integration of compulsory mechanisms for collection and use of funds for land amortization to reclaim new irrigated lands, improve the ameliorative status of lands and increase their productivity;
- attraction of private sector funding and foreign investments for the operation and rehabilitation of current irrigation and drainage infrastructure as well as the reclamation of new irrigated lands;
- improved tax and tariff policies aimed at increasing the efficiency of irrigated farming;
- gradual achievement of sustainable funding for the water sector;
- priority funding for the most unique and vulnerable hydro-technical facilities;
- implementation of the Millennium Development Goals in the drinking water supply and sanitation sector;
- provision of favorable power supply during transition period for machine irrigation zones.

Environmental Measures:

- phased solution of harmful water impact problems (floods, water-logging of lands, residential areas, engineering constructions, etc.), disaster prevention and mitigation;
- protection of the national interests of Tajikistan during the construction of water infrastructure in the territory of neighboring states;
- implementation of lands amelioration program;
- integrated solution of water resource protection problems under the framework of State Environmental Programs;

- implementation of measures to predict catastrophic glacier movements through target glacier research.

Technical Measures:

- implementation of the Program of Priority Measures to improve the ameliorative status of lands for 2005-2009 approved by the Government of the Republic of Tajikistan;
- elaboration and implementation of a Program of short-term, mid-term and long-term measures aimed at the rehabilitation and development of the water sector;
- increased efficiency of inter-farm and internal irrigation systems, improved irrigation techniques and technologies, implementation of capital and current land planning, and integrated reconstruction of irrigated lands on the basis of long-term programs;
- rational use of water through improved soil quality, ameliorative and hydro-module zoning; integration of proven irrigation regimes and progressive water saving technologies;
- phased program implementation of rehabilitation, expansion and construction of new water supply and sewage system capacities;
- equipment of water supply systems with water measuring devices and provision of strict water control framework for integration of water consumption.

9.10 IWRM Integration Plan

The action plan includes the following activities:

- IWRM information and support process;
- elaboration of typical charters and internal procedures for WUA, channels, irrigation systems, and basins;
- on-the-job staff training at different levels;
- monitoring and evaluation of the IWRM's implementation progress;
- creation of information networks, information dissemination and organization of training workshops, etc.;
- estimation of required rehabilitation works at water supply and water intake facilities; attraction of governmental and non-governmental funding;
- definition of BWRM borders, irrigation systems, channel, federation and association management and water users;
- technical assistance to newly formed institutions for the preparation and implementation of maintenance plans, budget development and price lists for services.
- financial needs and service assessment of newly formed institutions carried out together with water users.

The recommended water resource management institutions for irrigation, including the MIWM, basin water resource management (BWRM), irrigation system and channel management, should be organized according to hydrographic principles. At the level of irrigation systems, the participation of public and commercial organizations will be ensured through water committees for ir-

rigation systems and channels. Inter-sector management at the basin level will be performed by the Water Committee.

9.11 IWRM Development Monitoring

The IWRM development monitoring at respective levels will be carried out by the National Commission on the implementation of the Water Sector Strategy established by the Government, as well as by MIWM, Ministry of Energy, OSHC “Barki Tojik”, State Committee on Environment Protection and Forestry, SUE “Khojagee Manzili va Kommunalni”, other interested organizations, regional, city and district khukumats, basin water committees (management), water committees of irrigation systems and channels, WUA and other NGOs.

The IWRM Monitoring should be carried out along the following lines:

- information support of the IWRM process among key government officials, civil society groups, etc.
- elaboration of an action plan for IWRM implementation at different levels;
- elaboration of typical Charters and Provisions for newly formed institutions;
- identification of the needs and on-the-job staff training for newly formed institutions;
- promotion of mutual cooperation and consensus among all stakeholders through newly created information systems, information dissemination, organization of workshops, etc.;
- control over rehabilitation works on water supply facilities and attraction of financial resources;
- control over elaboration of the IWRM’s legal framework;
- coordination and control over formation of professional competence of newly formed institutions and their performance.

10. REVIEW OF WATER RELATED SECTOR

10.1 Hydropower

Hydropower is a foundation of the energy sector in Tajikistan and its development could multiply energy production for the whole Central Asian Region. With low deposits of oil and gas and difficult access to coal mines, Tajikistan has an abundant, even inexhaustible, supply of hydropower resources (527 billion kW/h/year) at a low prime cost (0.4 cents per 1 kW/h). Technically viable hydropower resources for the foreseeable future total 317 billion kW/h/year, yet only 5 percent have been developed. Due to fuel deficits at thermal power plans (TPP), total energy production in Tajikistan has been reduced by over 3 percent. The electrical consumption by the domestic sector has also increased from 1 billion kW/h in 1990 to the current 5 billion kW/h. As a result, there is obvious power deficit (3.0-3.5 billion kW/h/year) and in the winter power consumption must be rationed. The aluminum smelter is also forced to buy additional 1-1.5 billion kW/h in winter from external markets at double the price.

During the last 10 years, payment for electrical power at the price of 0.4 cents per 1 kW/h (world prices are 5-6 cents) constituted an average 50 percent of consumption. In the past four years, however, it increased and in 2005 reached 85 percent.

In summer, however, Tajikistan has stable abundance of hydropower (1.5 billion kW/h) that exceeds both internal and external demand given restrictions on economic exchange between former Soviet Republics. This valuable energy is thus lost in the form of idle water discharge. Energy deficits in autumn and winter increase the inefficiency of educational institutions, medical facilities and the industrial sector, particularly in rural areas. As a consequence, poor access to electrical power for both the public and economic sector makes achievement of the Millennium Development Goals in Tajikistan next to impossible.

Therefore, the hydropower development strategy should focus on the following areas:

- hydropower should become greater priority and should be developed to enhance not only the energy sector but environmental protection and the water sector as well;
- development of hydropower sector to meet internal demand and expand energy export opportunities;
- increased effectiveness of produced electrical power;
- better planning to include energy resources in long term investment policy;
- pursuing policies to ensure compensation for both damage and service related to the regulation of irrigation water flows in the Central Asia;
- modernization, reconstruction, and maintenance of all operational hydropower plants and power facilities;
- state ownership of basic power systems, especially generating hydropower plants and transmission lines. Converting enterprises into joint-stock companies and privatization are only possible with regard to small PP, distribution and energy systems and energy marketing;
- hydropower development should be accompanied by supporting institutions such as the establishment of maintenance and technological production facilities for HPP and the development of line construction infrastructure;
- increased power efficiency through organization of full energy consumption records, integration of relevant tariff policies, and implementation of other regulatory measures to stimulate investment (benefits, fines, and incentives);
- active awareness raising for energy saving at all levels, beginning with pilot projects;
- inclusion of environmental protection costs in the prime cost of electrical power;
- development of regional and international cooperation for the reclamation of water and power resources in Tajikistan.

With due consideration to the above tasks in hydropower development and related sectors, the Strategy envisages short-term, mid-term, and long-term activities, as well as monitoring and indicators consistent with the Millennium Development Goals, National Development Strategy (NDS) and Poverty Reduction Strategy till 2015 (Tables 19, 20, 21, 22).

Financial Expenses in 2006-2015

The cost of electrical energy sector development until 2015 is estimated at \$7.95 billion. By January 1, 2005, total foreign investments in the energy sector reached \$1,150 million. The implementation of the national hydropower strategy until 2015 will require additional \$6.8 billion in additional foreign investments.

Hydropower production will reach:

- In 2008, 17.5-18.0 billion kW/h due to hydropower plan modernization with reduced energy losses;
- In 2015, 35 billion kW/h;
- In 2020, 57 billion kW/h with the completed construction of Phase II of the Rogun HPP and Dashtidjum HPP.

Export capacity will increase to:

- In 2008, 2-2.5 billion kW/h in summer;
- In 2015 – 12 billion kW/h;
- In 2020 – 30 billion kW/h.

Partnership and Participation

On October 16, 2004, the Government of the Republic of Tajikistan and the Government of the Russian Federation signed agreements on the order and conditions for the participation of the Russian Federation in the construction of the Sangtuda-1 HPP and on the long-term cooperation between the Government of the Republic of Tajikistan and the OJSC “Russian Aluminum”. In accordance with these Agreements, the Government of the Russian Federation will invest \$250 million in the construction of the Sangtuda-1 HPP. The share of the OJSC “Russian Aluminum” in the construction of the Rogun HPP will be \$550 million.

Other regional partners have been found to support development of the hydropower sector. The Government of the Islamic Republic of Iran, following the Memorandum of Understanding on the construction of the Sangtuda-2 HPP, signed by the two governments on June 11, 2005, provided a favorable loan in the amount of \$180 million for the HPP construction. On April 27, 2005, the Government of the Republic of Tajikistan and the Government of the Islamic Republic of Afghanistan signed a Cooperation Agreement on the reclamation of hydropower resources of the River Pianj and development of inter-state electrical transmission lines. On March 30, 2005, the Ministry of Energy of the Republic of Tajikistan and the Ministry of Water and Energy of the Islamic Republic of Iran signed a Memorandum of Understanding and Cooperation Protocols with companies of China, Turkey, the Ukraine, India and other countries.

The Program of External Investments for 2006-2008 (Government Resolution # 393 issued on October 31, 2005) envisages investments of \$190.82 million in the energy sector. In 2005, the country signed a Loan Agreement with the World Bank on the implementation of the “Reduced Energy Loss Project” in the energy sector on favorable terms (\$15 million). The US Development and Trade Agency is also helping to prepare a feasibility study for the modernization of the Kairakkum HPP and the cascade of the Varzob HPP. In 2006, the Asian Development Bank will provide technical assistance for the development of a feasibility study for the rehabilitation of the Vakhsh HPP cascade and the reconstruction of energy sector in the Khatlon Region. A grant do-

nated by the Islamic Development Bank will also help develop a feasibility study for the installation of the “South – North” transmission line. The Government of Germany is providing assistance for a feasibility study for the reconstruction of ORU-200 and ORU-500 kW of the Nurek HPP. Direct investments in the energy sector of \$1.2 billion will be gradually utilized until 2010.

10.2 Environment

Sustainable development of Tajikistan highly depends on the rational use and protection of the water resources from pollution. The key problems of environmental protection in the water factor are as follows:

- contamination of water resources;
- rising water tables in residential areas;
- swamping and salting of irrigated lands;
- ineffective use of water resources;
- change of natural hydrological regimes in most rivers through caption or regulation of water flow;
- marginal erosion of river banks caused by reservoirs and changing silting regimes;
- loss of valuable agricultural lands, deterioration of water intake conditions and the need for community relocation and transfer to risky machine irrigation, especially in the construction of valley reservoirs;
- reduced capacities of water treatment facilities, which aggravate the negative impact of urbanization on water resources;
- global climate changes and diverse glacier shrinking processes;
- impact of the Aral Sea environmental disaster on ecology and climate.

On the whole, environmental conditions associated with water are characterized by the following data (2004):

Indicator	
Total water intake	12.6 km ³ (20 percent of total flow)
Total sewage water discharge	4.76 km ³
Sewage water discharge to surface reservoirs	4,73 km ³
Polluted water discharge in rivers and lakes	20.3 million m ³
Discharge of normative clean water in rivers and lakes	4.55 km ³
Discharge of normative treated sewage water	152.2 million m ³
Discharge of transit water	2.6 million m ³

In total, water treatment capacities were reduced from 245.9 million m³ in 1990 to 87.08 million m³ in 2004.

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On the whole, there is less anthropogenic impact on the water resources than in 1990. However, economic growth brings with it increased pollution, requiring greater attention to ecological concerns and adequate preventive measures.

The main environmental water trends are as follows:

- phased removal of contamination sources out of water protective river banks, channels and other water sources and zones of sanitary water intake protection;
- prohibited operation of new and reconstructed infrastructure that do not protect water from harmful impacts and pollution;
- regulated use of fertilizers and toxic chemicals;
- construction of the plants producing coagulants for drinking water treatment out of local raw materials;
- construction of waste processing facilities in big cities;
- rehabilitation and creation of institutional laboratories for the control of water quality;
- rehabilitation and construction of waste depots, treatment facilities and installation of filtration fields with consideration of the local hydro-geological conditions;
- control over the quality of underground waters adjacent to waste depots, sludge reservoirs and catch basins;
- rehabilitation and construction of canalization treatment facilities in cities and towns;
- integration of advanced technologies of treatment and utilization of sewage waters;
- strict observance of ecological requirements in the operation of water reservoirs, water infrastructure and areas of preferential protection for mineral and thermal water sources;
- monitoring the quality of all country water;
- complete elimination of contaminated sewage water discharge in water bodies and the environment;
- impact study of large scale water and industrial sector on water resources and climate;
- observance of Tajik national interests in the construction of hydro-technical facilities on the territory of the neighboring states, which impact Tajikistan's water sector or environment;
- implementation of program with a budget of \$12.14 million to improve the ameliorative status of lands for 55.51 thousand ha, in accordance with the Resolution of the Government of Republic of Tajikistan (# 236) issued on July 2, 2002 (Table 17);
- implementation of state environmental programs (in the water sector);
- implementation of a set of measures aimed at the study and prediction of glacier status;
- implementation of anti-erosion interventions;
- improved coordination of ministries, institutions, organizations, enterprises and NGOs in the environmental sphere with the transfer to basin principle for managing water resources on the basis of hydrographic units;

- development of legislation, monitoring and regulating mechanisms (standards and permits), economic mechanisms and pricing schemes
- coordination of external assistance.

On the whole, environmental support will require \$258.13 million, such that the current funding deficit stands at \$189.6 million.

10.3 Anti-Flood Measures and Disaster Preparedness

The current flood situation in Tajikistan is described in sections 2.1, 2.2, 2.3 of the present Strategy. Anti-flood measures are an inter-agency activity, including networks of hydrological and hydro-meteorological stations and posts, data processing systems, legislative and planned control of flood prone areas, disaster preparedness, search and rescue and resolution of disaster consequences. In 2002, with the support of the Asian Development Bank and the assistance of the national Tajik experts, the *Mott McDonald* Company developed the Improved Flood Management Strategy to reduced disaster losses and floods. The Improved Flood Management Strategy includes the following main components:

- improved network of river hydrological posts for the support of flood management, prediction, and warning measures;
- rehabilitation and development of hydro-meteorological stations to support management, prediction and warning;
- improved procedures for the processing and analysis of hydro-meteorological data;
- measures aimed at improved flood management, including an increased coordinating role of the Government with due attention paid to community, NGO mobilization and integration of structural and non-structural management;
- improved systems of forecasting and warning at the national and local levels;
- project planning, design and implementation;
- institutional reform taking into account an integrated approach to flood management and establishment of a unified body under the Government of the Republic of Tajikistan responsible for flood management coordination;
- improved flood preparedness, including the development of communication and provision of equipment;
- The Sarez Agency program in case of the collapse of the Usoy Dam;
- Shifting regulatory institutions that accord with structural plans; distribution of responsibilities in flood management sector as well as the implementation of mechanisms for insurance and community relocation;
- community involvement in the increased efficiency, role identification and appointment of community liaison officers, as well as the introduction of required changes and amendments in institutional regulations and local executive bodies (khukumats).

The present Strategy is focused on the whole population and country territory, including the poorest groups and is being gradually implemented.

10.4 Fisheries

Fishery development in Tajikistan is supported by an abundance of lakes, reservoirs, good natural and climatic conditions. It is necessary to fully restore the fish pond establishment with an annual capacity of 4.5 thousand tons of fish, to develop scheme for new fish farms and to provide sites for the establishment of new fish ponds to private business on tender basis. Local rural communities could be engaged in small pond fishery development as well as stocking of the lakes and other water reservoirs.

Creation of warm water fishery ponds is of the great practical interest in the Pamirs, with its rich thermal springs located along the banks of the big rivers. The use of piped warm water will make it possible to maintain water temperatures of 13⁰-16⁰ C and cultivate up to 3-3.5 tons of fish per hectare. It is also important to restore ichthyologic research on the acclimatization of highly productive fish species, resolve food supply issues, organize stock breeding as well as production of planting material, species control and veterinary support.

10.5 Stock-Water Development

There are 3,761.4 thousand ha of pastures in Tajikistan, of which 3,064.6 thousand ha are used by agricultural enterprises. Stock water development facilities are available only in winter pastures (totaling 659.9 thousand ha) and are in need of considerable rehabilitation. According the government's land reclamation concept (endorsed by Government Resolution # 349 issued on August 1, 2004) funds required for the rehabilitation of developed pastures amount to \$16 million. The lack of stock water development on vast territories impedes the effective use of pastures. It is necessary to develop a special integrated program on stock water development, including the construction of bridges, passages, cattle routes and other infrastructure. It is also advisable to initiate meadow formation with the use of local water courses and springs, especially in the Gorno-Badakhshan Autonomous Region.

10.6 Water Recreation

The territory of Tajikistan has a huge recreation capacity (over 5 percent) of which 2,567 km² (about 2 percent) is water related. There are 162 landscape monuments in the country, over 200 mineral springs, as well as 18 mud and salt lakes. Outputs of carbon, silicate, hydro-sulfuric, iodide-bromine and radon mineral waters make it possible to simultaneously admit about 50,000 people, several times higher than current demand. These resources provide base for development of national recreation sector, for income generation and employment needs beyond the agricultural sector. It is thus important to develop general scheme of water facility use for recreation purposes, reserve relevant areas, create the necessary infrastructure and service industry that meets international standards, all while respecting environmental protection.

Table 1: Overview of operational, constructed, and perspective water reservoirs in Tajikistan

Reservoir	Location	Water source	Volume in million.m ³		Regulation type	Use type	Beginning and end of construction
			Total	useful			
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
Farhad	Sogd Region	Syr-Darya River	330		daily	I, E, R, S	1942-1948
Kairakkum	Sogd Region	Syr-Darya River	4160	2600	seasonal	I, E, R, S, F	1952-1956
Kattasay	Sogd Region	Kattasay River	55	36,6	seasonal	I, M, R, S	1958-1966
Nurek	Khatlon Region	Vakhsh River	10500	4500	seasonal	E, I, S, R	1961-1983
Golovnoye	Khatlon Region	Vakhsh River	94,5	20,0	daily	E, I, S, R	1956-1962
Muminabad	Khatlon Region	Obi-Surkh River	31	30	seasonal	I, S, R	1958-1959
Selbur	Khatlon Region	Kyzylsu River	20,7	17	seasonal	I, S, W, M	1961-1966
Baipaza	Khatlon Region		125	87	seasonal	E, I, S, R	1962-1989
Daganasay	Sogd Region	Daganasay River	28	14	seasonal	I, S, M	1977-1983
Rogun	RRS	Vakhsh River	13300	8600	multyear	E, I, S, R	1980 under construction
Djar	Sogd Region	Aksu River	51,7	27	seasonal	I, S, M	perspective
Baljuvan	Khatlon Region	Kyzylsu River	202	140	seasonal	I, S	perspective
Khovaling	Khatlon Region	Obi-Mazor River	7,5	6,6	seasonal	I, S	perspective
Nizhny Kafirnigan	Khatlon Region	Kafirnigan River	905	583	seasonal	I, S, F	perspective
Khanakin	Gissar district	Khanaka River	40	38	seasonal	I, E, S, M	perspective
Shurob	Nurobad district	Obikhingou River	50	20	daily	E	perspective
Ziddy	Varzob district	Varzob River	240	227	seasonal	I, E, S, M	perspective
Sangtuda I	Dangara district	Vakhsh River	250	120	seasonal	I, E, S, F	under construction
Sangtuda II	Dangara district	Vakhsh River	75	5	seasonal	I, E, S, F	under construction
Total:			30465,4	17071,1			
Dashtijum	GBAO	Pianj River	17600	10200	annual	I, E, S, F	Far perspective
Jumar	GBAO	Pianj River	2300	1300	daily	E	Far perspective
Kokchi	Khatlon Region	Pianj River	1200	200	daily	E, I	Far perspective
Moskovsky	Khatlon Region	Pianj River	800	40	seasonal	E, I, R,	Far perspective
Shirgovat	GBAO	Pianj River	1900	40	seasonal	E	Far perspective
Khostov	GBAO	Pianj River	1200	40	daily	E	Far perspective

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Yazgulem	GBAO	Pianj River	400	20	daily	E	Far perspective
Rushan	GBAO	Pianj River	5500	4100	seasonal	E	Far perspective
Khorog	GBAO	Pianj River	100	100	daily	E	Far perspective
Anderob	GBAO	Pianj River	1400	100	daily	E	Far perspective
Pisht	GBAO	Pianj River	200	30	daily	E	Far perspective
Barshar	GBAO	Pianj River	2200	1250	seasonal	E	Far perspective
Granite heights	GBAO	Pianj River	1300	30	daily	E	Far perspective
Total:			36100	17450			
Grand total:			66565,4	34521,2			

Note: S – Water Supply, I – Irrigation; E – Energy, R – Recreation, M – Mudflow Protection, F – Fishery – the last three names are supplementary to the main concepts.

Table 2: Baseline information for the NSD Matrix for 2006-2015

№	Current problems (general)	Measures (Activities)	Priority	Expected results
1	Poor legislative base	Development and adoption of the Law “On Drinking Water and Water Supply”	I (immediate)	Improved water supply and canalization
2	Absence of sustainable power supply	Provision of regular power supply	M (mid-term)	Improved operation of water supply and sewage systems
3	Deterioration of water supply and sewage systems	Improved operation of water supply and sewage systems	L (long-term)	Rehabilitation of existing water supply and sewage systems
4	Lack of water supply systems in rural areas	Access of rural population to drinking water	L (long-term)	Construction of local and medium water supply and sewage systems
5	Lack of water supply and sewage systems in residential areas	Construction of new water supply and sewage systems	L (long-term)	Increased population access to water & sanitation

Table 3: PRS Matrix of Measures in Water & Sanitation Sector for 2006-2008

Priorities	Objectives	Implementation measures	Indicators of achievement	Timeframe	Expected re-sults	Resources (\$1000)
1. State Government Reform	1.1 Development of the Law "On Drinking Water and Water Supply"	1.1.1. Development of the Law "On Drinking Water and Water Supply"	Effective sector management	2006	Increased efficiency of water supply and canalization systems	60,0 (source to be identified)
		1.1.2. Development of normative documents	Improved quality of water	2006-2007	M	60,0 (source to be identified)
		1.1.3. Rehabilitation, reconstruction and construction of laboratories of water quality control	Improved quality of water	2006-2008	M	5000,0 (source to be identified)
		1.1.4. Procurement and use of new technologies of water quality testing	Improved quality of water	2006-2008	M	15000 (source to be identified)
		1.1.5. Development of Provisions for the Water & Sanitation Committee	Improved population access to drinking water	On a constant basis	S M	15,0 (source to be identified)
		1.1.6. Establishment of local rural water & sanitation committees	Improved access to drinking water	On a constant basis	S M	50,0 (source to be identified)

		1.1.7. Training and re-training of the Water & Sanitation Committee staff	Improved access to drinking water	On a constant basis	S M	20,0 (source to be identified)
		1.1.8. Establishment of sanitation protective zones	Improved quality of water	2006-2008	M	(source to be identified)
		1.1.9. Development of industrial bases of communal enterprises	Increased responsibility of communal service enterprises	Immediately	S	2000,0 (source to be identified)
		1.1.10. Installation of water-meters	Rational use of drinking water	On a constant basis	S M	(source to be identified) 150,0
		1.1.11. Increased level of tariff collection for the use of drinking water and canalization	Rational use of drinking water	On a constant basis	S M	(source to be identified)
		1.1.12. Increased salaries of communal enterprise personnel	Increased responsibility of communal service enterprises	Immediately	S	(source to be identified)
WATER SUPPLY						
2. Development of private sector and investment attraction	2. 1. Rehabilitation and reconstruction of all city water supply systems	The city of Dushanbe	Improved quality of water	2006-2008	M	9200,0-IDB 1400,0-Government of the RT
		2.1.1. Rehabilitation and reconstruction of the DRP (daily runoff pond)				

		water supply systems in rural areas						the RT
		2.1.9. Rehabilitation and resumed construction of water supply systems			Improved access to drinking water	2006-2008	M	15415,0 (source to be identified)
SANITATION								
3. Human capacity development	3.1. Population access to adequate sanitation conditions and canalization	The city of Dushanbe			Increased population access to canalization	2006-2015	M-L	50000,0 (source to be identified)
		3.1.1. Rehabilitation and reconstruction of sewage water treatment facilities						
		The city of Khujand			Increased population access to canalization	2006-2008	M	20000,0 (source to be identified)
		3.1.2. Completion of the second construction stage of water treatment facilities						
		SUE "Khojagee Manzili Kommuni"			Increased population access to canalization	2006-2008	M	780,0 – Government of the RT
		3.1.3. Rehabilitation of canalization systems						
		3.1.4. Rehabilitation of canalization systems in cities and district centers			Increased population access to canalization	2006-2008	M	300,0 Consumers' funds 8400,0 - WB

Rural areas: "Tajikselkhozvodoprovodstroy"						
		3.1.5. Construction of treatment facilities and improves sanitation-hygiene conditions in public places	Increased access to sanitation-hygiene facilities	2006-2008	M	38,5 (source to be identified)

Note: S = short-term; M – mid-term, L – long-term

Table 4: Matrix of Measures in Water & Sanitation Sector for 2006-2015

Priorities	Objectives	Implementation measures	Indicators of achievement	Timeframe	Expected results	Resources (\$1000)
1. State Governance Reform	1.1 Development of the Law "On Drinking Water and Water Supply"	1.1.1. Development of the Law "On Drinking Water and Water Supply"	Effective sector management	2006	Increased efficiency of water supply and canalization systems	60,0 (source to be identified)
		1.1.2. Development of normative documents	Improved quality of water	2006-2007	M	60,0 (source to be identified)
		1.1.3. Rehabilitation, reconstruction and construction of laboratories of water quality control	Improved quality of water	2006-2008	M	5000,0 (source to be identified)
		1.1.4. Procurement and use of new technologies of water quality testing	Improved quality of water	2006-2008	M	15000 (source to be identified)

			1.1.5. Development of Provisions for the Water & Sanitation Committee	Improved access to drinking water	On constant basis	S M	15,0 (source to be identified)
			1.1.6. Establishment of local rural water & sanitation committees	Improved access to drinking water	On constant basis	S M	50,0 (source to be identified)
			1.1.7. Training and re-training of the Water & Sanitation Committee staff	Improved access to drinking water	On constant basis	S M	20,0 (source to be identified)
			1.1.8. Establishment of sanitation protective zones	Improved quality of water	2006-2008	M	(source to be identified)
			1.1.9. Development of industrial bases of communal enterprises	Increased responsibility of communal service enterprises	Immediately	S	2000,0 (source to be identified)
			1.1.10. Installation of water-meters	Rational use of drinking water	On constant basis	S M	150,0 (source to be identified)
			1.1.11. Increased level of tariff collection for the use of drinking water and canalization	Rational use of drinking water	On constant basis	S M	(source to be identified)
			1.1.12. Increased salaries of communal enterprise personnel	Increased responsibility of communal service enterprises	Immediately	S	(source to be identified)

WATER SUPPLY							
2. Development of private sector and investment attraction	2. 1. Rehabilitation and reconstruction of all city water supply systems	The city of Dushanbe		Improved quality of water	2006-2008	M	9200,0-IDB 1400,0-Government of the RT
		2.1.1. Rehabilitation and reconstruction of the DRP (daily run-off pond)		Improved access to drinking water	2006-2008	M	Grant of the Government of Japan-1420,0 WB-3000,0 6493,0 (source to be identified)
		2.1.2. Rehabilitation and reconstruction of house water supply networks		Improved access to drinking water	2006-2015	L	1290,0 The Government of the RT 13620,0 IDB 138568,0 (source to be identified)
		The city of Khudjand					
		2.1.4. Rehabilitation and reconstruction of water supply networks		Improved access to drinking water	2006-2008	M	EBRD grant-3270,0 loan-1200,0
		2.1.5. Construction of water-pipe and house water supply networks		Improved access to drinking water	2006-2008	M	25230,0 (source to be identified)

		2.1.6. Construction of new water supply systems	Improved access to drinking water	2006-2015	L	115754
		SUE “Khojagee Manzili Kommulani” 2.1.7. Development of communal structures	Improved access to drinking water	2006-2015	LM	15000,0 WB 2815,0 Government of the RT
		2.1.8. Reconstruction of water supply systems of district centers and towns	Improved access to drinking water	2006-2008	M	8653,0 – WB 1287,0 Government of the RT
		2.1.9. Reconstruction of water supply systems	Improved access to drinking water		M	9600,0- WB
		2.1.10. Construction of new water supply systems	Improved access to drinking water	2006-2015	L	176873,0 (source to be identified)
Rural areas: “Tajikselkhozvodoprovodstroy”						
		2.1.11. Rehabilitation and reconstruction of water supply systems in rural areas	Improved access to drinking water	2006-2008rr.	M	8350,0- ADB 835,0 – The Government of the RT
		2.1.12. Rehabilitation, reconstruction and construction of water supply systems	Improved access to drinking water	2006-2015rr.	L	115815,0 (source to be identified)

SANITATION

3. Human capacity development	3.1. Population access to adequate sanitation conditions and canalization	The city of Dushanbe	Increased population access to canalization	2006-2015 гг.	ML	50000,0 (source to be identified)
		3.1.1. Rehabilitation and reconstruction of sewage water treatment facilities				
		The city of Khujand				
		3.1.2. Completion of the second construction stage of water treatment facilities	Increased population access to canalization	2006-2008 гг.	M	20000,0 (source to be identified)
		3.1.3. Construction of new canalization and sanitation systems	Increased population access to canalization	2006-2015 гг.	L	45778,0 (source to be identified)
		SUE “Khojagee Manzili Kommulani”	Increased population access to canalization	2006-2008 гг.	M	780,0 Government of the RT
		3.1.4. Rehabilitation of canalization systems	Increased population access to canalization	2006-2008 гг.	M	300,0 Consumers; 8400,0 - WB funds
		3.1.5. Rehabilitation of canalization systems in cities and district centers	Increased population access to canalization	2006-2008 гг.	M	300,0 Consumers; 8400,0 - WB funds
		3.1.6. Construction of new canalization and sanitation systems	Increased population access to canalization	2006-2015 гг.	L	151779,0 (source to be identified)

	tems					
Rural areas: “Tajikselkhozvodoprovodstroy”						
		3.1.7. Construction of treatment facilities and improving sanitation-hygiene conditions in public places	Increased access to sanitation-hygiene facilities	2006-2015 гг.	M	72000,0 (source to be identified)

Note: S = short-term; M – mid-term, L – long-term

Table 5: Matrix of actions prioritized for the NDS for 2006-2015

№ п/п	Current problems	Measures (Activities)	Priority	Expected results
1	2	3	4	5
1.	Absence of legislative base	To develop and adopt the Law “On Drinking Water and Water Supply”	Immediate	Improved and increased efficiency of sector management and water supply services
2.	Poor technical condition of water supply systems	Rehabilitation of water intake and water treatment facilities, pumping stations; replacement of equipment, water-pipes, devices for decontamination of drinking water	Short-term, (1-3 years)	Guaranteed water supply of new residents, including upper stories of high residential buildings / drinking water quality
3.	Poor technical condition of sewage systems	Rehabilitation of all sewage water treatment facilities, pumping stations, emergency collectors and chlorinators	Short-term, (1-3 years)	Guaranteed full biological treatment of sewage waters meeting the MCL requirements of wastewater discharge in the environment
4.	Poor capacity of water supply systems, poor quality of water, population growth	Reconstruction of the existing and construction of new water supply systems	Mid-term (3-5 years) Long-term (5-10 years)	Improved access to drinking water
5.	High deterioration level of cold water supply systems	Rehabilitation of cold water supply systems in residential houses with	Mid-term (3-5 years)	Reduced water losses, intensity of use, increased free head, power saving for water

	tems, considerable losses and irrational use of drinking water in housing sector	the duration of 35 years (in the absence of capital repair) or more. Installation of water-measuring devices in each house.		supply, reagent expenditures
6.	Lack of canalization systems in many cities and towns with centralized system of water supply	Construction of new canalization systems	Long-term (5-10 years)	Improved sanitation conditions and environmental protection
7.	Lack of qualified specialists in designing, construction and operation of water supply and canalization systems	Target specialist training – from welders to engineer – from among local young enterprise staff	Immediate	Increased operational efficiency of water supply and canalization systems, improved water supply of population, including canalization
8.	Lack of stable power supply of water supply systems and regulations of guaranteed power supply for 2006-2015	Development and adoption of package of documents on the provision of electrical power to water supply and canalization facilities, followed by assessment and damage compensation	Immediate	Design and implementation of technical operation of systems under pressure, contractual and financial obligations, especially with the population; coordination of security measures with relevant inspection bodies
9.	Deterioration of centralized heating systems of the majority cities and towns	Development and adoption of regulations on the operation of water supply and canalization systems under new conditions (considerable overloading of the cold water supply system and irregular operation regime of canalization systems).	Immediate	Implementation of all types of operational and rehabilitation works with the consideration of additional system load
10	Absence of unified body pursuing general technical policies and coordination in the water supply and canalization sector of the country	Establishment of national specialized body from among managers and professional specialists of water supply and canalization sector and municipality with relevant authorities.	Immediate	Guaranteed implementation of target actions aimed at the improved population access to drinking water and sanitation

11.	Poor condition of the system of the collection and utilization of solid domestic wastes (SDW), individual and public toilets	Rehabilitation of the existing and construction of new garbage dumps, public toilets; construction of sanitary facilities for households; procurement of garbage bins and dump-trucks.	Mid-term (3-5 years)	Improved sanitation/hygiene and environmental conditions of habitat, households and residential areas
12.	Low cultural level of water & sanitation use	Compulsory contractual relations and control over their performance. Development of videos, brochures and posters. Creation of public unions of water users. Development of different learning formats.	Short-term, (1-3 years)	Tangible socio-economic benefit and increased responsibility of communal service organizations and the population in general

Table 6: NDS and PRS Water & Sanitation Sector: Cost funding by agencies and enterprises for 2006-2008

.№	Types of works	Name of communal agencies	Total costs (in thousand USD)	Funding sources				Additional population coverage by water supply and sanitation services (in thousand USD)
				Including: (in thousand USD)				
				State budget	Local budget	Investments and grants	Core funds (economy activities)	
1	Rehabilitation, reconstruction and construction of water supply systems	SUE "Khojagee Manzili Kommulani"	42821	4822	-	37699	300	37,3
2	Rehabilitation, reconstruction and construction of water supply systems	SUE "Dushanbevodokanal"	21513	1315	-	12417	7781	55,5
3	Rehabilitation, reconstruction and construction of water supply systems	SUE "Khudjandvodokanal"	59700	3000	3800	47760	5140	80
4	Rehabilitation, re-	Rural areas: "Tajik-	24600	2549	895	20500	656,0	580,75

construction and construction of water supply systems	selkhozvodoprovod-stroy"											
	Total in the Republic	148634	11689	4695	118376	13877	753,55					
	Funding deficit	100333	20000	-	80000	333	-					

Table 7: NDS and PRS Water & Sanitation Sector: Cost funding by agencies and enterprises for 2006-2015

№	Types of works	Name of communal agencies	Total costs (in thousand USD)	Funding sources				Additional population coverage by water supply and sanitation services (in thousand USD)
				<i>Including: (in thousand USD)</i>				
				State budget	Local budget	Investments and grants	Core funds (economy activities)	
1	Rehabilitation, reconstruction and construction of water supply systems	SUE "Khojagee Manzili Kommulani"	371533,0	10048,0	-	334233,0	27252,0	342,205
2	Rehabilitation, reconstruction and construction of water supply systems	SUE "Dushan-bevodokanal"	218498,0	1534,0	-	177889,0	39075,0	123,0
3	Rehabilitation, reconstruction and construction of water supply systems	SUE "Khudjand-vodokanal"	211232,0	6000,0	9000,0	188996,0	7236,0	185,0
4	Rehabilitation, reconstruction and construction of water supply systems	Rural areas: "Tajik-selkhozvodoprovod-stroy"	197000,0	16664,0	7208,0	165864,0	7264,0	3458,0
		Total in the Republic	998263,0	34246,0	16208,0	866982	80827,0	4108,0

Table 8: Industrial use and pollution of water resources in Tajikistan

(in million m³)

	1991	By 1.01.2003	2003 to 1991 in %
Industry			
Intake of fresh water	496,3	343,93	69,2
Used fresh water	496,3	274,28	55,3
Used fresh water for industrial drinking water supply	97,5	46,10	47,3
Used fresh water for industrial needs	266,7	150,61	56,5
Used fresh water fir irrigation	64,5	54,48	84,5
Used fresh water for agricultural water supply	67,66	3,13	4,6
Used fresh water for the other needs	63,31	19,96	31,5
Discharged sewage water	188,7	105,29	55,8
Discharged sewage water in surface water objects	125	98,29	78,6
Discharged polluted sewage waters in rivers and lakes	7,047	7,29	103,4
Discharged normative-clean water in rivers and lakes	101,8	84,41	82,9
Discharged normative-treated water in rivers and lakes	14,86	6,59	44,3
Capacities of reversible and repeated-successive water supply	520,8	37,69	7,4
Surface fresh water intake	342,2	261,86	76,5
Underground water intake	146,0	82,07	56,2
Shaft-mining water intake	6,833	2,84	41,6
Discharged sewage water in underground horizons	0,035	0,02	57,1
Irretrievable water consumption in the process of use	319,6	158,23	49,5
Used drinking water	213,2	88,69	41,6
Used drinking water for industrial needs	141,9	46,74	32,9
Used water of communal water-pipes for industrial needs	57,53	12,79	22,2
% of fresh water saving	66	20	
% of used water from the water intake	100	99	
Untreated discharge	8,350	6,31	75,6
Capacities of treatment facilities with the discharge in water objects	25,86	16,43	63,5
Full BOC (in thousand tons)	9501	0,19	37,9
Suspended substance – in thousand tons	3,607	0,71	19,7
Dry residue- in thousand tons	47,14	7,50	15,9
Sulfates – in thousand tons	0,436	0,02	4,6
Chlorides – in thousand tons	0,209	1,54	7,4
Total phosphorus	-	2,40	-
Total nitrogen	-	0,02	-
Ammonia nitrogen	26,97	10,08	37,4
Iron	0,282	0,33	117,0
Copper	0,364	0,36	98,9

Data provided by the State Water Cadastre of the Republic of Tajikistan

Table 9: Industrial Sources of Water Pollution

Country	Location	Type of industry	Place of discharge	Main discharge			Availability/type of treatment	Efficiency of treatment	
				Contaminant	Content, mg/l				
					1988	1999			
Tajikistan	Yavan	Yvan Electro-chemical Plant	Narynsu River	BOC-5	1,8	1,7	storage	None	
				Suspended substances	14,5	15,8			
					Total nitrogen	0,17	0,12		
					Total phosphorus	0,06	0,05		
					Mineralization	1620	1242		
					Chlorides	492	494		
	Sarband	Vakhsh Nitrogen Fertilizer Plant	Vakhsh River	BOC-5	2,5	2,0	Part of discharge in the Kurgan-Tube STF; the other part in the Vakhsh River without treatment	Insufficient	
				Suspended substances	30,6	32,6			
					Total nitrogen	35,0	37,0		
					Total phosphorus	0,38	0,05		
					Heavy metals	-	-		
					Mineralization	-	-		
Choruh Dai-ron	Leninabad Factory of Rare metals	Tuzbutu-Say River	BOC-5	22,4	18,6	mechanical	Insufficient		
			Suspended substances	28,0	26,0				
				Total nitrogen	9,8	7,6			
				Total phosphorus	-	-			
				Heavy metals	0,3	0,05			
				Mineralization	1672	1482			
Dushanbe	Cement factory	Varzob River	BOC-5	0,8	1,6	mechanical	Insufficient		
			Suspended substances	26,6	42,0				
				Total nitrogen	0,29	0,33			
				Total phosphorus	0,11	0,13			
				Heavy metals	-	-			
				Mineralization	276	268			

Country	City, object	Number of population in thousand people	Place of discharge	Contaminant	Содержание, мг/л		Availability/type of treatment	Efficiency of treatment
					1988	1999		
Таджикистан	Dushanbe	Thermal Heating Station (THS)	1. Besh-Kata Channel 2. Dushanbinka River	BOC-5	1,2	1,3	none	
	Suspended substances			9,7	10,2			
	Total nitrogen	0,06	0,08					
	Total phosphorus	0,13	0,28					
	Heavy metals	0,002	0					
	Mineralization	160	180					
	Dushanbe	Production enterprise "Stroymaterialy"	Shurak Say, Varzob River	BOC-5	2,5	2,8	mechanical	Insufficient
	Suspended substances			14,0	15,0			
	Total nitrogen			0,5	0,48			
	Total phosphorus			0,03	0,07			
				Heavy metals	-	-		
				Mineralization	402	506		
				<i>Main contaminants</i>				
	Dushanbe	512,7	Kafirigan River	BOC-5	7,2	8,0	Mechanical and biological	Insufficient
				Suspended substances	20,0	20,5		
				Total nitrogen	6,3	5,7		
				Total phosphorus	2,9	2,6		
				Heavy metals	-	-		
				Mineralization	562	486		
	Tursan-Zade	38,8	Karatag River	BOC-5	8,6	8,8	Mechanical and biological	Insufficient
				Suspended substances	50,4	50,6		
				Total nitrogen	3,16	3,76		
				Total phosphorus	2,1	2,3		
				Heavy metals	-	-		
				Mineralization	256	262		
				Fluorides	0,80	0,78		

Khujaand	153,3	Syr-Darya River	BOC-5 Suspended substances Total nitrogen Total phosphorus Heavy metals Cr Mineralization	33,2	24,6	Mechanical and biological	Insufficient
				11,2 13,5 - 0,08 0,03 1330	50,8 9,4 - 0,09 0,03 1350		
Kurgan-Tube	58,8	Collector V-10-1, Vakhsh River	BOC-5 Suspended substances Total nitrogen Total phosphorus Heavy metals Mineralization	18,0	12,0	Mechanical and biological	Insufficient
				171,4 15,1 - - 1170	112,6 12,6 - - 1080		
Yvan	21,8	Yavansu River	Suspended substances Total nitrogen Total phosphorus Heavy metals Mineralization Chlorides	7,4 116 5,14 - - 1380 312	5,8 124 4,81 - - 1288 382	Mechanical and biological	Insufficient

Data provided by the SUE “Khojagee Manzili Kommunalit”

Note: BOC - Biological oxygen consumption
STF – Sewage treatment facilities

Table 10: Ameliorative status of lands by January 1, 2005, Tajikistan

Name of region/district	Ameliorative status or irrigated lands in ha					
	Good	Satisfactory	Unsatisfactory	В том числе		
				Prohibitive depth of underground water levels (UWL)	Land salination	Prohibitive depth of UWL; land salination
Sogd Region	201491	30605	27169	15086	8411	3672
Kurgan-Tube zone	151535	66225	24363	16201	6384	1778
Kuliab zone	54162	21751	4011	329	842	140
Total: Khatlon Region	205699	87976	28374	19216	7226	1932
RRS	99667	114	53	-	53	-
GBAO	21631	-	-	-	-	-
Total in the Republic	528488	119725	55596	34302	15690	5604

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 11: Distribution of the irrigated areas by the depth of underground waters

Name of region	Level of underground waters					
	До 1м	1,0-1,5	1,5-2,0	2,0-3,0	3,0-5,0	Более 5,0м
Sogd Region	2365	13236	10297	21224	43788	168355
Kurgan-Tube zone	4794	11385	27159	59632	76362	62791
Kuliab zone	2083	7637	11785	21669	12152	24600
RRS	-	-	103	4615	6553	89593
Total in the Republic	9242	32258	49344	107140	138855	366970

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 12: Data on the availability of pumping stations and vertical drainage bore holes in balance of the MIWM of the RT by January 1, 2005

Name of agency	Equipment of pumping stations							Equipment of bore holes	
	Number of pumping stations, in pcs.	Number of aggregates, in pcs.	Total productivity of pumps in cubic m.	Total engine productivity in th kW/th.	Number of bore hole, pcs.	Total bore holes productivity m/sec	Total engine capacity in th. kW/h	Pumped water in thousand cubic m.	Used electrical power
LOPREMO	188	709	677,7	713,6	1539	61,0	-48,2	3951750,8	1102
KTTPREMO	105	473	26,4	234,9	110	0,9	26,7	1729443,0 4	262
DUMO	79	277	116	122,8	43	2,3	1,3	178331,1	962
KTPREMO	48	214	1108	85,0	258	8,4	8,3	339609,9	106
GBAOPREMO	14	35	12,2	3,0	-	-	-	2993,9	4
SE "TSHVS"	67	113	7,4	1,3	90	2,83	2,8	3552,9	429
Total:	501	1821	2274,5	1160,6	2040	75,43	87,3	6205681,6	1610

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 13: Technical status of the inter-farm network by January 1, 2005

Name of region	Unit measure	Quantity	Operational	In poor condition
1. SOGD REGION				
Irrigation channels	km	1762	346,0	1416,0
Collectors and drains	km	576	406	170
Hydraulic works	pcs	1187	237,4	949,6
Water measurement facilities	pcs	812	249	563
Including irrigation	pcs	796	246	550
Including collectors and drains	pcs	16	3	13
2. KHATLON REGION				
Irrigation channels	km	2063	753	1308
Collectors and drains	km	1485	976,1	508,7
Hydraulic works	pcs	2887	1442	1443
Water measurement facilities	pcs	1372	509	863
Including irrigation	pcs	1174	469	705
Including collectors and drains	pcs	198	40	158
3. RRS				
Irrigation channels	km	1671	501	1170
Collectors and drains	km	152,3	89,5	62,8

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Hydraulic works	pcs	675	540	135
Water measurement facilities	pcs	1077	749	408
Including irrigation	pcs	1065	745	320
Including collectors and drains	pcs	12	4	8
4. GBAO				
Irrigation channels	km	138	55,0	83
Collectors and drains	km	-	-	-
Hydraulic works	pcs	706	247	456
Water measurement facilities	pcs	470	141	329
Including irrigation	pcs	470	141	329
Including collectors and drains	pcs	-	-	-
IN THE REPUBLIC				
Irrigation channels	km	5634	1655	3979
Collectors and drains	km	2213	1472	741
Hydraulic works	pcs	5455	2468,4	2983,6
Water measurement facilities	pcs	3705	1601	1904
Including irrigation	pcs	226	47	179
Including collectors and drains	pcs	3731	1648	2083

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 14: Technical characteristics of the irrigation network

Adminis- trative regions	Inter-farm network in km					Internal farm network in km			
	To- tal	In earthe n bed	Concrete lined channels / flumes	Piped	EC	Total	In earthe n bed	Concrete lined channels / flumes	Piped
Sogd	1762	777	963	22	0,83	12675	10269	1395	1012
Khatlon	2063	1429	562	72	0,85	7359	4708	2282	368
RRS	1671	1086	502	83	0,76	2963	2134	651	178
GBAO	138	93	45	-	0.74	2100	1760	315	25
Republic	5634	3385	2072	177	0,79	25057	18871	4643	1583

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 15: Constructions and water-meters of irrigation network

Name of region	Irrigation network facilities			Irrigation network water-measuring facilities		
	Total	Including, in pcs.		Total	Including, in pcs.	
		Inter-farm	Internal		Inter-farm	Internal
Sogd	2578	1187	1391	827	796	31
Khatlon	9571	2887	6684	1210	1174	36
RRS	1542	675	867	1065	1065	-
GBAO	706	706	-	470	470	-
Republic	14,397	5455	8942	3572	3505	66

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 16: Technical characteristics of the collection-drainage network

Name of region	Spread of collection-drainage network		Including				Vertical drainage bore holes	
	km	Lm/ha	Inter-farm		Internal		Irrigation	<i>Drainage</i>
			<i>open</i>	<i>closed</i>	<i>open</i>	<i>closed</i>		
Sogd	3515,4	48,0	576	-	1566,2	1373,4	1074	563
Khatlon	7370,5	31,9	1484,8	-	3586,4	2299,2	-	400
RRS	606	48,1	152,3	-	309,4	144,2	16	17
GBAO	-	-	-	-	-	-	-	-
Republic	11402	37,0	2213	-	5462,1	3816,9	1090	984

Data provided by the Ministry of Irrigation and Water Management of the Republic of Tajikistan

Table 17: Actions on improvement of meliorative conditions of the plots for 2005-2009

№№ п/п	наименование р-нов, областей	всего мелiorативного фонда (га)	площадь подлежащая улучшению (га)	источник финансирования																									
				2005г		2006г		2007г		2008г		2009г																	
				стоимость работ 2005-2009 (га)	площадь земель (га)	стоимость работ (тыс сомони)	за счет плат по водопользованию (тыс сомони)	за счет респуб. бюджета (тыс сомони)	за счет местного бюджета (тыс сомони)	площадь земель (га)	стоимость работ (тыс сомони)	за счет плат по водопользованию (тыс сомони)	за счет респуб. бюджета (тыс сомони)	за счет местного бюджета (тыс сомони)	стоимость работ (га)	площадь земель (га)	стоимость работ (тыс сомони)	за счет плат по водопользованию (тыс сомони)	за счет респуб. бюджета (тыс сомони)	за счет местного бюджета (тыс сомони)									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Н.Хуровского р/на	3632	3632	2542,4	726	508,2	254,1	152,5	101,6	726	508,2	254,1	152,5	101,6	726	508,2	254,1	152,5	101,6	727	508,9	254,4	152,7	101,8	727	508,9	254,4	152,7	101,8
2	Бохтарского р/на	1196	1196	836,5	239	167,3	83,6	50,2	33,5	239	167,3	83,6	50,2	33,5	239	167,3	83,6	50,2	33,5	239	167,3	83,6	50,2	33,5	239	167,3	83,6	50,2	33,5
3	Вахшского р/на	1993	1993	1394,4	396	278,6	139,3	83,6	55,7	398	278,6	139,3	83,6	55,7	398	278,6	139,3	83,6	55,7	399	279,3	139,6	83,8	55,9	399	279,3	139,6	83,8	55,9
4	Хуровского р/на	759	759	532	152	106,4	53,2	31,9	21,3	152	106,4	53,2	31,9	21,3	152	106,4	53,2	31,9	21,3	152	106,4	53,2	31,9	21,3	152	106,4	53,2	31,9	21,3
5	Яванский р/н	4865	4865	3405,5	973	681,1	340,6	204,3	136,2	973	681,1	340,6	204,3	136,2	973	681,1	340,6	204,3	136,2	973	681,1	340,6	204,3	136,2	973	681,1	340,6	204,3	136,2
6	Кабдинский р/н	2160	2160	1512	432	302,4	151,2	90,7	60,5	432	302,4	151,2	90,7	60,5	432	302,4	151,2	90,7	60,5	432	302,4	151,2	90,7	60,5	432	302,4	151,2	90,7	60,5
7	Калпазбадский р/н	2083	2083	1458,1	417	291,9	146	87,5	58,3	417	291,9	146	87,5	58,3	417	291,9	146	87,5	58,3	416	291,2	145,6	87,4	58,2	416	291,2	145,6	87,4	58,2
8	Кумсангирский р/н	769	769	539	154	107,8	53,9	32,3	21,6	154	107,8	53,9	32,3	21,6	154	107,8	53,9	32,3	21,6	154	107,8	53,9	32,3	21,6	154	107,8	53,9	32,3	21,6
9	Панджский р/н	1539	1539	1076	308	215,6	107,8	64,7	43,1	308	215,6	107,8	64,7	43,1	308	215,6	107,8	64,7	43,1	308	215,6	107,8	64,7	43,1	308	215,6	107,8	64,7	43,1
10	А.Джамилский р/н	2704	2704	1893,5	541	378,7	189,4	113,6	75,7	541	378,7	189,4	113,6	75,7	541	378,7	189,4	113,6	75,7	541	378,7	189,4	113,6	75,7	541	378,7	189,4	113,6	75,7
11	Шарватский р/н	1226	1226	857,5	245	171,5	85,8	51,4	34,3	245	171,5	85,8	51,4	34,3	245	171,5	85,8	51,4	34,3	245	171,5	85,8	51,4	34,3	245	171,5	85,8	51,4	34,3
12	Джамилский р/н	1437	1437	1005,9	287	200,9	100,4	60,3	40,2	287	200,9	100,4	60,3	40,2	287	200,9	100,4	60,3	40,2	288	201,6	100,8	60,5	40,3	288	201,6	100,8	60,5	40,3
	Итого по Курганлобнскому региону	24363	24363	17055	4872	3410,4	1705,3	1023,1	682	4872	3410,4	1705,3	1023,1	682	4872	3410,4	1705,3	1023,1	682	4873	3411,8	1705,9	1023,5	682,4	4874	3411,8	1705,9	1023,5	682,4
1	Восейский р/н	493	493	345,1	98	68,6	34,3	20,6	13,7	98	68,6	34,3	20,6	13,7	98	68,6	34,3	20,6	13,9	99	69,3	34,6	20,8	13,9	99	69,3	34,6	20,8	13,9
2	Дангаринский р/н	152	152	107,1	30	21	10,5	6,3	4,2	30	21	10,5	6,3	4,2	31	21,7	10,9	6,5	4,3	31	21,7	10,9	6,5	4,3	31	21,7	10,9	6,5	4,3
3	М.А. Хамзаони	1167	1167	816,9	233	163,1	81,6	48,9	32,6	233	163,1	81,6	48,9	32,6	233	163,1	81,6	48,9	32,6	234	163,8	81,9	49,1	32,8	234	163,8	81,9	49,1	32,8
4	Фархадский р/н	2091	2091	1463	418	292,6	146,3	87,8	58,5	418	292,6	146,3	87,8	58,5	418	292,6	146,3	87,8	58,5	418	292,6	146,3	87,8	58,5	418	292,6	146,3	87,8	58,5
5	Темурмалинский р/н	75	75	52,5	40	28	14	8,4	5,6	35	24,5	12,2	7,4	4,9															
	Итого по Кулябскому региону	3978	3978	2784,6	819	573,3	286,7	172	114,6	814	569,8	284,9	171	113,9	781	546,7	273,4	164	109,3	782	547,4	273,7	164,2	109,5	782	547,4	273,7	164,2	109,5
	Итого по Хатлонской области	28341	28341	19839	5691	3983,7	1956	1195,1	790,6	5686	3980,2	1990,2	1194,1	795,9	5653	3957,1	1978,7	1187,1	791,3	5655	3959,2	1979,6	1187,7	791,9	5656	3959,2	1979,6	1187,7	791,9
1	Ашт	7810	7810	5467	1562	1093,4	546,7	328	218,7	1562	1093,4	546,7	328	218,7	1562	1093,4	546,7	328	218,7	1562	1093,4	546,7	328	218,7	1562	1093,4	546,7	328	218,7
2	Ганжинский р/н	101	101	70,7	51	35,7	17,9	10,7	7,1	50	35	17,5	10,5	7															
3	Заврабзадский р/н	1100	1100	770	220	154	77	46,2	30,8	220	154	77	46,2	30,8	220	154	77	46,2	30,8	220	154	77	46,2	30,8	220	154	77	46,2	30,8
4	Истаринский р/н	2702	2702	1891,4	540	378	189	113,4	75,6	540	378	189	113,4	75,6	540	378	189	113,4	75,6	541	378,7	189,4	113,6	75,7	541	378,7	189,4	113,6	75,7
5	Канибадамский р/н	7000	7000	4900	1400	980	490	294	196	1400	980	490	294	196	1400	980	490	294	196	1400	980	490	294	196	1400	980	490	294	196
6	Магчинский р/н	1403	1403	982,1	280	196	98	58,8	39,2	280	196	98	58,8	39,2	281	196,7	98,3	59	39,4	281	196,7	98,3	59	39,4	281	196,7	98,3	59	39,4
7	Сиптаменский р/н	608	608	425,6	121	84,7	42,4	25,4	16,9	121	84,7	42,4	25,4	16,9	122	85,4	42,7	25,6	17,1	122	85,4	42,7	25,6	17,1	122	85,4	42,7	25,6	17,1
8	Б.Гафуровский р/н	5748	5748	4023,6	1149	804,3	402,2	241,3	160,8	1149	804,3	402,2	241,3	160,8	1150	805	402,5	241,5	161	1150	805	402,5	241,5	161	1150	805	402,5	241,5	161
9	Дж.Расуловский р/н	697	697	487,9	139	97,3	48,6	29,2	19,5	139	97,3	48,6	29,2	19,5	139	97,3	48,6	29,2	19,5	140	98	49	29,4	19,6	140	98	49	29,4	19,6
	Итого по Согдийской обл.	27169	27169	19018	5462	3823,4	1911,8	1147	764,6	5414	3789,8	1894,8	1136,9	758,1	5416	3791,2	1895,6	1137,3	758,3	5416	3791,2	1895,6	1137,3	758,3	5416	3791,2	1895,6	1137,3	758,3
	Итого: по Республике	55510	55510	38858	11153	7807,1	3887,8	2342,1	1555,2	11147	7802,9	3901,6	2340,9	1560,4	11067	7746,9	3873,5	2324	1549,4	11071	7750,4	3875,2	2325	1550,2	11072	7750,4	3875,2	2325	1550,2

Table 18: Priority trends of water development sector reform

Level: Tajikistan - MIWM	Level: Region (Oblast)	Level: District	Implementation period
9.2.1.1.1 Structural changes			
Creation of line inspection for regulation of the economic relations between water suppliers and users, control over the rational use of water resources (Water Inspection)	Water Inspection Unit	Water Inspection Unit	2006-2007
Establishment of division providing support for creation and operation of the water users associations	Department of water users associations	Department of water users associations	2006-2007
Establishment of the MIWM Scientific-Information Center, publication of regular bulletin on situation in the water sector of Tajikistan, information and awareness campaign aimed at attracting investments in the water sector.	Collection and submission of data to the MIWM SIC; timely presentation of data	Collection and submission of data; regular examination of the technical condition of irrigation and drainage networks; economic assessment of rehabilitation works	2006-2007
Creation of special unit of the State Register of water economy objects and issuing permits for special water use	Collecting data on important state water economy objects	Preparation and submission of data on the state water economy objects to the State Register	2006-2007
Creation of international relations and water right department	Data submission	Data submission	2006-2007
Improvement of the legislative base in water sector			On a constant basis
9.2.1.1.1 Elaboration of draft laws and introducing amendments in the existing laws			
Law on Water Users Associations	Participatory discussions and proposals	Participatory discussions and proposals	2006
Introduction of changes and amendments in the Water Code of the RT	Participatory discussions of proposed changes and amendments	Participatory discussions of proposed changes and amendments	2006

Elaboration of draft Government Resolutions			
Procedure for granting the right to the management of water economy objects to local and foreign legal persons on contractual basis	Providing advice and information to potential claimants for the acquisition of rights; media publications	Providing advice and information to potential claimants for the acquisition of rights; media publications	2006-2007
Plan (A) and procedure (B) of phased transfer to the basin water resource management system. Identification of borders and development of structural models (C) of basin water economy organizations (BWO, BWM, Water region, Water system, etc.).	Participation in the identification of borders of basin water economy organizations (BWO); participation in the development of structural model of basin water economy organizations (BWO, BWM, Water region, Water system, etc.).	Participation in the identification of borders of basin water economy organizations (BWO); participation in the development of structural model of basin water economy organizations (BWO, BWM, Water region, Water system, etc.).	2006-2008
Order of the State Register of water economy objects of the RT	Participation in development	Participation in development	2006
Order of the establishment and use of the water reserve; adoption of the norms and limits of water use	Participation in the identification of limits; study of the proposed order; comments and feedback	Participation in identification of limits; study of the proposed order; comments and feedback	2006-2009
Order of the development and approval of integrated schemes of water resource use and protection in the RT (Water Plan of the RT)	Participation in development	Participation in development	2006-2007
On the State support of drinking water supply	Participation in development	Participation in development	2006-2007
Compensation order of damages inflicted by physical and legal persons to water economy objects	Participation in development	Participation in development	2006
Privatization order of water economy objects	Participation in development	Participation in development	2006-2007
Attracting water users to irrigation and	Participation in development	Participation in development	2007

ameliorative works	Participation in development	Participation in development	2007
Water-protective belts (zones) of small rivers, channels, collectors and other water economy objects	Participation in development	Participation in development	2007
Improvement of the institutional normative base of water management			
Development of mechanism aimed at increased efficiency of water use based on the integration differentiated tariff system	Identification of application areas for different tariffs with the consideration of the total costs of operation and maintenance of irrigation and drainage systems	Identification of application areas for different tariffs with the consideration of the total costs of operation and maintenance of irrigation and drainage systems	2006-2007
Criteria development for the priority assessment of water economy objects of the State Register of water economy objects. The first draft List of water economy objects to be included in the State Register.	Proposals	Proposals	2006-2007
PT Development of the List of follow-up activities aimed at improved water management system.	Participation in development	Participation in development	2007

Table 19: Priority projects in hydropower and energy sector of Tajikistan till 2015

№ п/п	Project name	Core funds (USD million)				Budget funds (USD million)				Foreign investments (USD million)				Total (USD million)
		2006-2008	2008-2010	2010-2015	2006-2008	2008-2010	2010-2015	2006-2008	2008-2010	2010-2015	2006-2008	2008-2010	2010-2015	
1.	Modernization of the Nurek HPP	12						200	105					317
2.	Modernization of the Kairakkum HPP							53,4						53,4
3.	Modernization of the Varzob HPP cascade							10,2						10,2
4.	Modernization of the Vakhsh HPP cascade							57						57
5.	Rehabilitation of electrical grids	18						100	100			42		260
6.	First line of the Rogun HPP							200	250			150		600
7.	Sangtuda HPP-1							200	236					436

8.	Sangtuda HPP-2	10			30		100	100	240
9.	Sub-station "Khatlon" – 500 kW						26	20	46
10.	Sub-station "Dushanbe" – 500 kW						26	20	46
11.	HVL – 200kW "Lolazor-Kulob"			6			13		19
12.	TL – 500 kW "South-North"						146		146
13.	TL – 500 kW "Khujand-Janbyl"						41		41
14.	TL – 500 kW "Rogun-Sangtuda-Puli Khumri-Kobul"						100	59	159
15.	TL – 765 kW "Rogun-Khoroh-Vakhan Corridor-Peshavar"						100	174	274
16.	HVL – 500 kW "Rogun-Sangtuda-Kunduz-Great-Mashkhad"								159
17.	Second line of Rogu HPP								800
18.	Shurab HPP						50	400	912
19.	Dashtijum HPP						50	1550	3200
20.	Obburdon HPP						100	75	175
Total:		40			36		1572,6	3089	7950,6

Table 20: The MDG Monitoring and evaluation indicators in hydropower sector

Millennium Development Goals	Mean indicators Current indicator/ data (mean and latest)	MDG Objectives (2015)	Monitoring indicators	Implementing agencies
1. Increased access to power supply in winter months aimed at the MDG achievement: 1.1. Population	30% in 2005	Provide access to power supply 60% by 2008 100% by 2010	Electrical power generation: 2008 17,5 – 18 billion kW/h/year	Government of the Republic of Tajikistan;
1.2. Industrial enterprises	80% in 2005	100% by 2010		Ministry of Energy of the Republic of Tajikistan
1.3. Social facilities (schools, hospitals, etc.)	30% in 2005	60% by 2008 100% by 2010	2010 20 – 21 billion kW/h/year	

1.4. State-financed organizations	30% in 2005	60% by 2008 100% by 2010	2012 25,5 billion kW/h/year – 26	
2. Prime cost coverage through an increased tariff collection and increased rates up to 2.1 cents by 2010.	82% in 2005 \$0,8 in 2005	100% by 2010 \$2,1 by 2010	Gradual tariff raise: 2007 - \$0,88 2008 - \$1,28 2009 - \$1,74 2010 - \$2,1	
3. Development of effective mechanisms of social support to low-income households caused by increased power tariffs	Needs to be improved	Finalized by 2007		
4. Elaboration of feasibility study and design documentation of priority objects	20% in 2005	100% κ 2010 г.		

Table 21: PRS Matrix of Measures in hydropower sector of Tajikistan in 2006-2015

General priorities	Sector objectives	Measures (activities)	Achieved results (BB, M, L)	Indicator of achievement	Timeframe	Resources (million USD)	
						Foreign investments	Core funds
1	2	3	4	5	6	7	8
MHPP Construction	1. Increased population access to power supply in winter months aimed at the MDG achievement by 2005 and 100% - by	1. Creating favorable conditions providing investment attractiveness and economic viability of projects 1.1. Changes and	QG (quick gain) 2006-2007	Access to power supply for 5,200 families	2006-2008	9,2 IDB loan; 2,6 Grant from the Government of Japan	2,4

Reduced energy losses	2010 1.1. Industrial enterprises: from 80% in 2005 to 100% by 2010 1.2. Social facilities (schools, hospitals, etc.) from 30% in 2005 to 100% by 2010 1.3. State-financed organizations from 30% in 2005 to 100% by 2010	amendments in the Tax Code of the Republic of Tajikistan 1.2. Development of mid-term strategy of phased tariff raise to power supply by 2.1 cents in 2010 1.3. Elaboration of feasibility studies for priority projects	QG	Reduced power loss by 6-7%	2007	24 WB loan and grant from the Government of Switzerland	
Construction of TL-22-kW “Lolazor-Kuliab” and sub-station “Khatlon-200 kW”			QG	Improved power supply in the Kuliab zone of the Khatlon Region; reduced technical loss by 4-5%	2008	19 Foreign investments	
Modernization of the Nurek HPP			L	Increased durability (35 years) and capacity increase by 10% - 300 MW	2006-2010	305	12
Modernization of the Kairakkum HPP			QG	Increased durability (44 years) and capacity increase by 30 MW	2006-2008	51,4	2,0
Modernization of the Varzob HPP cascade			QG	Increased durability (25 years) and capacity increase by 5 MW	2006-2008	10,2	
Modernization of the Vakhsh HPP cascade			QG	Increased durability (50 years) and capacity increase by 30 MW	2006-2008	57	

Rehabilitation of energy sector	4. Elaboration of feasibility study and design documentation of priority objects	QG	Improved quality of power supply and reduced power loss by 4-5%	2006-2008	100	18
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Table 22: NDS and PRS Matrix of implementing measures in hydropower sector of Tajikistan in 2006-2008

№	General priorities	Current problems (general)	Measures (action)	Priorities	Expected results
1	Construction of mini-HPP	3 1. Reduced generating capacity of electrical and thermal power, production of oil, gas and coal	4 1. Creating favorable conditions providing investment attractiveness and economic viability of projects	5 S	6 Access to power supply for 5,200 families
2	Reduced power losses	1.1. Reduced production of gas by 2.6 times, oil (including gas condensate) by 5.7 times; electrical power production - by 7%, and coal production by 3.4 times.	1.1. Changes and amendments in the Tax Code of the Republic of Tajikistan	S	Reduced technical loss by 6-7%
3	Construction of TL-220 kW “Lolazor-Kuliab”; sub-station “Khatlon-220 kW”	1.2. Reduced consumption of natural gas by 4 times, oil products - by 6 times, and coal – by more than 50 times	1.2. Development of mid-term strategy of phased tariff raise to power supply by 2.1 cents in 2010	S	Reduced technical loss by 4-5%
4	Modernization of the Nurek HPP			S	Additional capacity of 300 MW
5	Modernization of Kairakkum HPP		1.3. Elaboration of feasibility studies for priority projects	S	Additional capacity of 30 MW
6	Modernization of Varzob HPP cascade	1.3. Reduced import of FES sectors: of oil products – by 1.5 million tons,		S	Additional capacity of 30 MW

7	Modernization of Vakhsh HPP cascade	natural gas – billion m ³ , liquid gas – by 100,000 tons		S	ity of 5 MW
8	Rehabilitation of power sector	2. Electrical power deficit in autumn-winter time constitutes 3-3.5 billion kW/h		S C (2006-2010)	Additional capacity of 30 MW Reduced loss by 4-5%
9	First line of Rogun HPP	3. Limited power supply in autumn-winter period (October-April)		M	Installed capacity of 1200 MW
10	Sangtuda-1 HPP	4. Low electrical power tariffs impedes sector rehabilitation, modernization and development		M	Installed capacity of 670 MW
11	Sangtuda-2 HPP			M	Installed capacity of 220 MW Reduced loss

Note: S - short-term (2006-2008)

M – mid-term (2006-2010)

L – long-term (2006-2015)

Tables 19, 20, 21 and 22 presented by the Ministry of Energy of the Republic of Tajikistan

Table 23: Resources allocated on poverty reduction in water supply and sewage sector

Priorities	Objectives	Measures (actions)			Indicator of achievement %	Timeframe	Resources in thousand USD
		Quick gain	Mid-term	Long-term			
Access of the urban and rural population to drinking water:							
1. Restoration and rehabilitation	Construction and rehabilitation of water supply and canalization systems	QG	-	L	4,5	C	44910
2. Involvement of the state sector	Government of the Republic of Tajikistan	QG	M	-	3,0	K	31028
3. Involvement	Foreign investments	QG	-	L	23,2	C	232185
4. Involvement	International donors	QG	M	-	8,5	C	84700
5. Human capacity	Improved water supply and sanitation	QG	-	L	60,8	D	607264

Data provided by the SUE “Khojagee Manzili va Kommunalii”