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ISFARA RIVER BASIN PLAN
Isfara Rayon
Republic of Tajikistan

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1. Introduction

In the framework of the 'Water Management and Basin Organisations in Central Asia' project implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Transboundary Water Management in Central Asia Programme and financed by the European Union and the German Federal Foreign Office the project of the Isfara River Sub-Basin Plan for the Tajik territory was drafted. The Plan was drafted by the working group on basin planning during the meeting in Khudjand in April 2014.

The sub-basin area of the Isfara River in its estuary is 3,240 km^2. The sub-basin of the Isfara River totally covers the areas of the Isfara administrative rayon and partially the Kanibadam rayon of Sughd oblast. The majority of territory of Tajikistan is modified by piedmont areas with elevation from 400 m to 800 m above the sea level. Vorukh enclave is at the elevation of 1,400 m and is the highest point in the Isfara rayon. The upper part of the Isfara river basin is located in the territory of Kyrgyzstan, while its lower part is closer to Ferghana Valley and is regarded as the Tajik territory.

Population of the Tajik part of the Isfara basin is 350,000 people, of them 250,000 reside in the Isfara rayon and some 100,000 – in the Kanibadam rayon (with total population of 192,000 people).

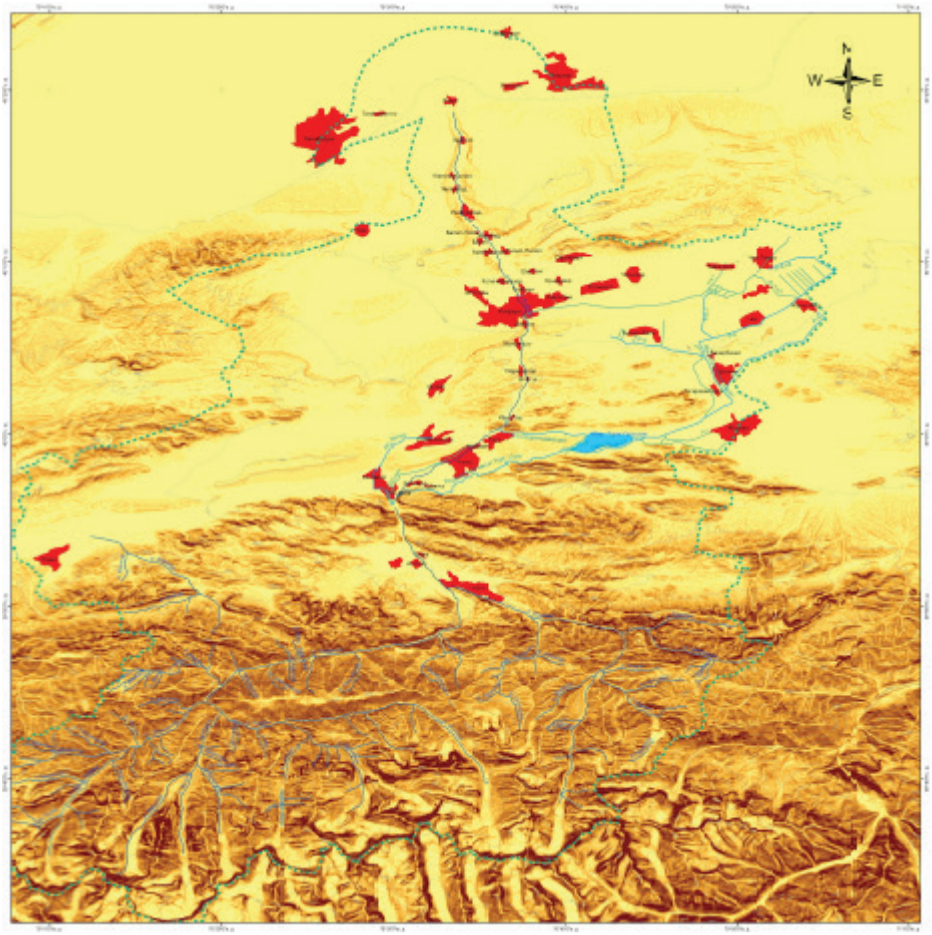


Figure 1. Preliminary map of the Isfara river basin

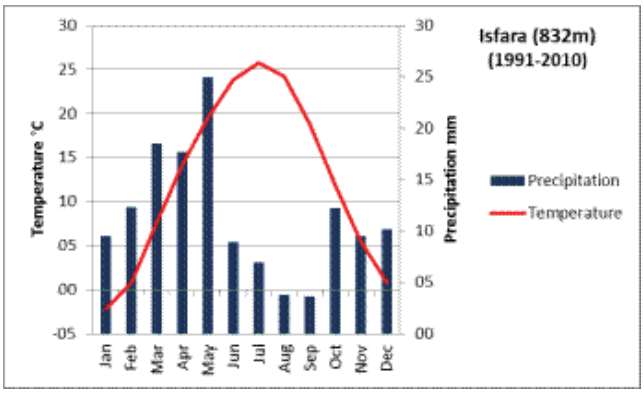
2. Current Analysis of Environmental Components

2.1 Climate

Climate in the Isfara and the Kanibadam rayons is dry continental. Winter is mild, yet at times harsh. Snow blanket has short lifetime. Temperature in January fluctuates from 0°C to -3,2°C. Summer is hot with July temperature ranging from +23 to +30° C, with the average maximum of +36,8°C. Vegetation period lasts for 210-220 days. The aggregate effective temperature for this period is 4.300-4.700° C. The unfavourable side of the climate conditions are strong winds and dust storms. In the average, there are 42 windy days in Ferghana Valley.

Isfara river basin receives some 160-400 mm of precipitation per year. The precipitation variability is explained by the different elevation in the basin. The maximum precipitation is observed in spring.

According to the forecasts for 2031-2050 (as compared with 1991-2010) the water resources formation area will be exposed to annual increase of precipitation to some 40 mm.
The most probable precipitation increase might occur during the vegetation period. In general, the main climate elements, to the most probable scenario, are not subject to significant change.



Picture 2. Climate of the Isfara Meteorogical Station

2.2 The Isfara River Water Resources

The Isfara river run-off, in general, is formed by firn basin and glaciers of the Turkestan Range in the upper part of the Kyrgyz territory of the Isfara river basin. The total area of glaciers on the Turkestan Range at the elevation over 5,000 m above the sea level constitutes some 169.6 km^2, or 4 % of their total area on this Range. The major influxes of the Isfara are Kshemysh and Karavshin rivers, where, in Vorukh jamoat, at the point of their conflux they form the Isfara River, with length of 107 km. The aggregate length of all of its influxes is 499 km. The average river gradient is 31 m/km. Based on the decades-long data by Tajikhydromet the average water discharge equals 14.7 m^3/s. The high water period is from the end of April until October, with its maximum in July-August (77 m^3/s).
According to forecasts there is a probability of the run-off increase in the period until 2050. However, the National Action Plan to Mitigate Climate Change of the Republic of Tajikistan, 2003, indicates insignificant growth of precipitation due to the increased aggregate evaporation ratio.
Additional sources from ground water reserves are accumulated in the quaternary geological deposits (pebblestone, sand, rubble, loessial loam) and moranic debris. The approved operational ground water reserves in the Isfara rayon are 216,008 m^3/day, while in the Kanibadam rayon are 490,000 m^3/day. The eastern part of the Karakchikum-Kanibadam depression is represented by powerful debris cone sediments of the Isfara River. The underground river flow at the cone periphery dissipates to separate and hydraulically associated aquifers. The lower aquifers are pressurized. The head water is opened by wells at the depth of 10-15 to 25 m. The spouted water debits to 0.25-4.0 l/s.
Analysis of water quality in the Isfara River demonstrates its total mineralisation of 1.2 g/l., and irrigation water can also be regarded as of good quality. Also, water quality parameters in the Isfara River reveal availability of chemical ingredients, which are either in line, or close to the maximum permissible concentration (MPC) for impurities, yet the content of hazardous substances is below MPC, and this is relevant to good water quality.

Table 1. Water Quality of the Isfara River

BoD		Weighed particles		Total N		Total P		Heavy metals	
Mg/l		Mg/l		Mg/l		Mg/l		Mg/l	
MPC<2		MPC<1000		MPC<2		MPC<3/5		Various MPC	
1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
2.3	2.5	135	165	1.8	2.3	0.03	0.02	0.1	0.08

Water analysis in the area of the Isfara River debris cone shows insignificant deviations from MPC, and which cannot drastically impact the water quality. The MPC in the above Table indicates the need of preliminary water treatment before its use as a drinking water.

2.3 Land Resources and Land Amelioration

In 2013 according to the State Committee on Land Management and Geodetics of the Republic of Tajikistan 83,594 ha of land was registered in the Isfara rayon, including 17,107 ha of arable land, while in the Kanibadam rayon water fund lands constitute 26,119 ha of which 80% refers to the Kairakum Water Reservoir.

The total cropland in this area is 10,533 ha. According to the Isfara Water Management Administration data from total 24,078 ha of agricultural land some 5,054 ha are in poor ameliorative condition. The area of land with the increased ground water level is 6,472 ha, not salt-affected lands – 9,804 ha, weakly salt-affected lands – 9,120 ha, medium-salt-affected lands– 985 ha, and 144 ha of saline soil.

Water consumption by agricultural crops in the Isfara rayon, as per average water use plan, is 154 mln. m^3. The Isfara River and ground water drawn from wells are used for irrigation purposes. The average water consumption in the Kanibadam rayon is 276.3 mln.m^3. The sources of irrigation in these territories are the Isfara River, irrigation wells, the Big Ferghana Canal and Kairakum Water Reservoir. According to the inventory, there are some 742.67 km of irrigation canals in the Isfara rayon, 182.9 km of farm ditches and 559.77 km of on-farm canals; 126 water control structures, 42 pumping stations, including 11 farm and 31 on-farm structures, 188.4 km of collector and drainage networks, including 24.6 km of farm and 163.94 km of on-farm networks. There are 4 WUAs which do not have any material assets on their balance.

There are 825.3 km of canals in the Kanibadam rayon, including 161.7 km of farm and 663.3 km of on-farm canals; with concrete casing - 94.7 km and 100 km of closed network canals, 635.8 km of inter-farm canals, including 76 km of farm and 559.9 km of on-farm canals; with closed drainage 355.3 km and 71 water control structures; 103 gauging stations, 192 bridges, 108 irrigation wells, 75 km of check-dams of the Kairakum Water Reservoir, 375.5 km of penstock, 13 pumping stations and 300 km of inspection paths. The depreciation ratio of canals and pumping stations is 45% against their initial technological parameters.

The area of gravity system in many places lacks waterproofing. Water users encounter water deficit in different locations, specifically in the Isfara-Lyakkan Valley and the Matpara Massive. It is worth noting that they practice water re-use. Main problems of Kanibadam Water Management Administration are connected to supply of water with the Big Ferghana Canal during vegetation period.

52.6% of collector and drainage systems are in unsatisfactory ameliorative condition, which are primarily in on-farm networks. There are only 33.6% of vertical drainage wells in use. Almost all of the closed-type collector and drainage networks are out of use due to the absence of specialised machinery for their irrigation and repair works.

The most difficult amelioration situation is in the Isfara-Lyakkan Valley in the area of up to 10,000 ha of arable land, where the level of ground water varies just from 1 to 1.5 m.

Table 2. Ground water levels, in hectares

Gwl <1m	1-1.5m	1.5-2m	2-2.5m	2.5-3m	Gwl >3m
399	1,875	973	716	685	12,396

2.4 Water-related Natural Disasters and Emergencies

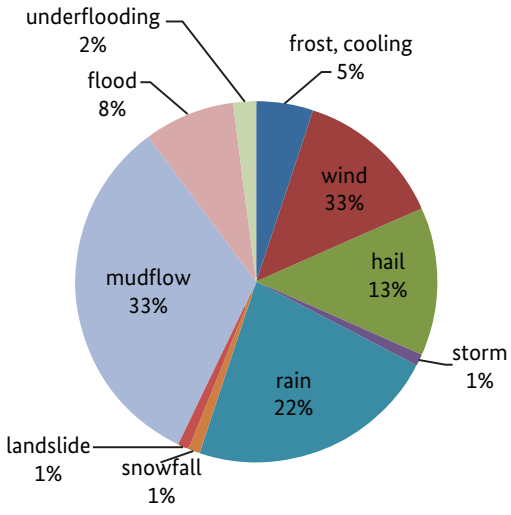


Figure 3. Types of natural disasters

The diagram shows that the majority of disaster-associated risks fall to mudflows and floods (41%) and heavy rains (22%). The table below provides water-related natural disasters which cause potential threat to the Isfara rayon and the adjacent jamoats.

The main problem is that the mudflow conduits were not cleaned up from warp soil, while check-dams were not maintained due to lack of financial resources. Therefore, the risks of negative impact of mudflows onto population and facilities are increasing.

The Isfara City Emergencies and Defense Office reports that the disasters damaged social and cultural sector of this rayon to the amount of 18.9 mln. somoni (US$3.95 mln.) during 3 last years, which constitutes 54.5% of local budget. The most serious damage to the Isfara rayon by different natural disasters was in 2012 to the amount of 7.7 mln. somoni (US$1.61 mln.). In 2013 there were 3 natural disasters in the Isfara rayon with total damage over 1 mln. somoni.

Table 3. Water-related Natural Disasters in the Isfara Rayon

Settlement	Disaster location	Type of disaster
1.Isfara city	City downtown	Mudflows, floods, probable breakthrough of Tortgul Water Reservoir
2.Chorku jamoat	Chorku makhalla	Mudflows, floods
	Makhalla Khodj vi Akhlo	Mudflows, floods
3. Vorukh Jamoat	Makhalla Vorukh	Mudflows, floods, rock falls
4. Lyakkan Jamoat	Makhalla Lyakkan	Mudflows, ground water, probable breakthrough of Tortgul Water Reservoir
	Makhalla Dakhana	Mudflows
5.Jamoat Chilgazi	Makhalla Chilgazi	Mudflows, ground water
	Makhalla Bogiston	Mudflows
6.Jamoat Khanobod	Makhalla Zarkhok	Mudflows
	Makhalla Kevillipol	Mudflows
	Makhalla Arabkishlak	Mudflows, probable breakthrough of Tortgul Water Reservoir
	Makhalla Baland	Mudflows, probable breakthrough of Tortgul Water Reservoir
	Makhalla Khonobod	Mudflows, probable breakthrough of Tortgul Water Reservoir
	Makhalla Yangiobod	Mudflows, probable breakthrough of Tortgul Water Reservoir
7.Nefteabad Township	Makhalla Nefteabad	Mudflows, probable breakthrough of Tortgul Water Reservoir
8.Jamoat Navgilem	Makhalla Kushdevor	Mudflows, ground water
	Makhalla Oftobrui	Mudflows
	Makhalla Shurtang	Mudflows
	Makhalla Gumbazi	Mudflows, probable breakthrough of Tortgul Water Reservoir
9. Jamoat Surkh	Makhalla Surkh	Mudflows, floods
	Makhalla Naiman	Mudflow, floods
10.Jamoat Shakhrak	Makhalla Shakhrak	Mudflow, floods
	Makhalla Yakimu Mai	Ground water
	Makhalla Matpari	Mudflows
	Makhalla Chorkishlok	Mudflow, floods
11.Nurafshon Township	Nurafshon	Mudflows
12.Shurab Township	Shurab	Mudflows

Table 4. Water-related disasters in the Kanibadam rayon

Name of disaster	%	Localisation
Mudflows	85	Makhram, Niyazbek, Pakhtakor, Kuchkak
Floods	70	Makhram, Ravot, part of Patar village
Waterlogging	65	Makhram, Lokhuti
Frost, low temperatures	80	In all the rayon
Strong wind	85	Lokhuti and Sharipov
Earthquakes	75-80	In all the rayon
Hail	55	In all the rayon
Heavy rains	80	In all the rayon

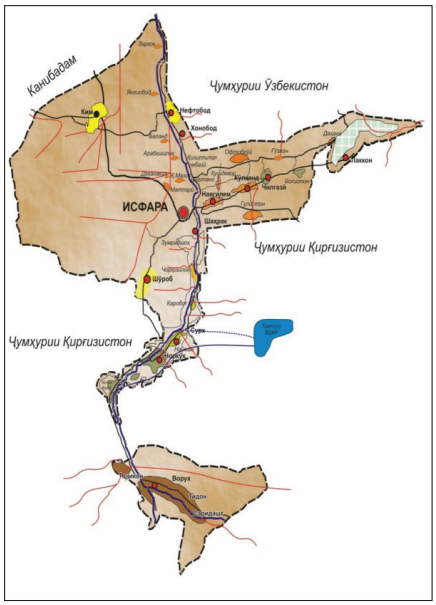
In the Kanibadam rayon the floods in the mudflow channel №7 represent a hazard, specifically in its lower part clogged up with silt, along with poor technical conditions of dike dams at the Kairakum Water Reservoir, in the places prone to the risk of the breakthrough and flooding.

3. Current Situation Analysis by Economic Components

3.1 Drinking Water Supply and Sanitation

Centralised water supply in the Isfara rayon consists of two parts – surface and ground water supply. Currently, surface water intake, due to depreciation of equipment, functions at its capacity of 2,300 m³/day (840,000 m³/year). Ground water intake facility is located in the north-western part of the rayon and consists of 6 drinking water wells. Capacity of ground water intake facility is 3,500 m³/day (1.26 mln. m³/year). This water intake facility, in the course of 45 years of operation, has significantly deteriorated.

Water supply in rural areas is under the Main Department of Amelioration responsibility; it has on its balance 3 pumping stations, 23 drinking water supply wells, 120 km of pipelines and 2 mud traps with capacity of 1,400 m³, which provides with clean drinking water more than 106,000 people in the Isfara rayon. This is not enough nowadays, since 71% of population is not served with clean drinking water, while many jamoat residents use water from open sources (Isfara city, jamoats Navgilem, Chorkukh, Vorukh, Surkh and Shalhrak). For water supply purposes 265 street water pumps were installed in rural areas, including 232 units in jamoats Navgilem, Chorkishlak, Zumrd-Shokh , and 33 units in Lyakkan jamoat.



Picture 4. Mudflow zones in the Isfara river basin

All the water supply facilities are totally worn out. Key figures of clean drinking water supply of the Isfara rayon population in 2013 are in the Table below.

Table 5. Clean Drinking Water Supply Indices in the Isfara Rayon

No	Name	Population			
		Total	Including supplied with drinking water	Including not supplied with drinking water	Supplied in %
1	Isfara city	45,054	28,055	16,999	63
Townships and Jamoats					
2	Shurob	2,953		2,953	0
3	Nefteobod	4,095	103	3,992	10
4	Nuravshon	1,590	1,590		100
5	Vorukh	29,753		29,753	0

6	Navgilem	37,185	21,032	16,153	57
7	Kulkand	22,265	2,790	19,835	13
8	Khonobod	11,878	896	10,892	8
9	Surkh	13,941	1,154	12,7787	9
10	Chilgazi	15,655		15,655	0
11	Chorkukh	36,485	5,724	30,761	16
12	Shakhrak	16,015	7,718	8,297	49
13	Lyakkan	7,380	1,619	5,761	22
T		244,609	68,988	175,621	29

Special attention shall be paid to the problem of drinking water supply to township Shurab, which is now almost a social disaster. Water supply of Shurab township is rather problematic. The existing transboundary water supply pipeline 'Vorukh-Shurab' runs through 2 densely populated settlements of Vorukh jamoat, township Shurab in Tajikistan and 6 villages in Kyrgyzstan.

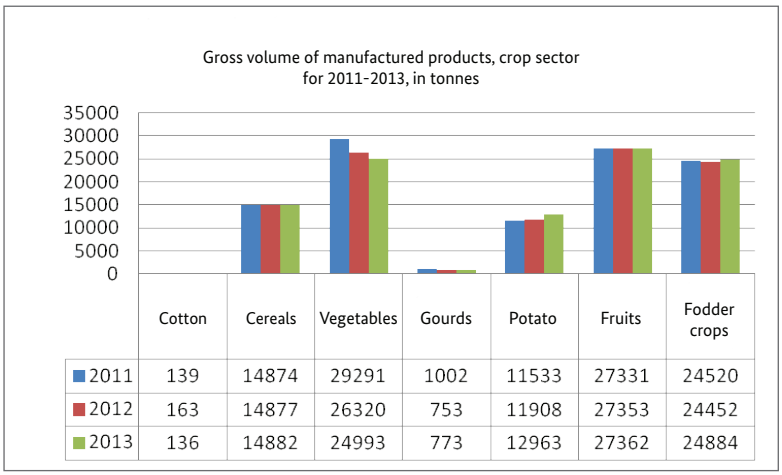
No	**Name**	**Population, thousand people**			
		Total	**Including supplied with drinking water**	**Including not supplied with drinking water**	**Supplied in %**
1	Kanibadam	48,200	21,200	27,000	44
Jamoats					
2	Patar	16,200	11,300	4,900	70
3	Pulatan	29,900	14,300	15,600	48
4	Artykov	21,900	3,500	18,400	16
5	Khamrabaev	25,100	12,500	12,600	20
6	Sharipov	22,100	3,100	19,000	14
7	Lakhuti	18,800	7,300	11,500	39
Total		182,200	73,200	109,000	40

Unauthorised connections to the pipeline and illegal water intake for use in irrigation are carried out in Kyrgyz villages. Until 1966 water supply to Shurab was done by the left-bank pumping station at the Isfara River in Naiman village. Following the construction of main water supply pipeline 'Vorukh-Shurab' in 1996, the water supply was then switched to this line.
The water intake facility is located in Vorukh jamoat. This is the pipeline of 450 mm in diameter; some 17 km of this pipeline runs across the territory of Kyrgyzstan. The system has 2 gravity filters: one is at the water intake, the other one is in Shurab township. The main source of drinking water supply for population is the artesian wells located in the lower part of Kanibadam. The water supply pipelines were constructed during 1960-1985, and as a result of long exploitation they are deteriorated to 70%.

Agriculture and Fishery

Agriculture is the most important sector in economy of the Isfara rayon in terms of supply of food, revenues and jobs and is the main water consumer. The total area of irrigated land of Isfara city, according to the data by the State Water Management Department, is 17,107 ha. In the earlier times these lands were used for growing cotton in combination with cereals, vegetables, orchards, vineyards, rice and fodder crops for milk and meat animal husbandry.
However, over the past decades the cotton sowing sharply decreased due to aggravation of ameliorative condition of land in Lyakkan Valley: the land is used for other agricultural crops production.
However, this is not enough, because the volume of agricultural production is not consistent with the trend of population growth in the area.

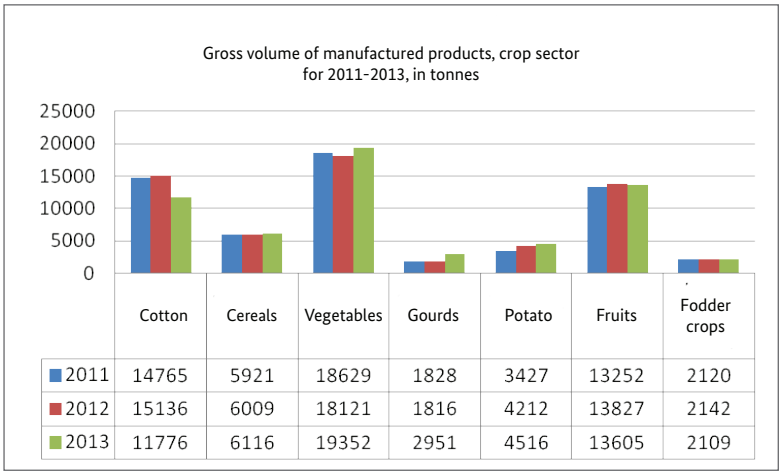
Just from 2001 to 2011 the Isfara rayon population grew by 34,300 people (17.2%) and reached 237,100 people in 2011.



	Cotton	Cereals	Vegetables	Gourds	Potato	Fruits	Fodder crops
2011	139	14874	29291	1002	11533	27331	24520
2012	163	14877	26320	753	11908	27353	24452
2013	136	14882	24993	773	12963	27362	24884

Agriculture of the Kanibadam rayon is as well an important economic sector in terms of providing the population with food, income and employment. Again, agriculture is the main water consumer in the rayon. The land resources comply 82,894 ha, of them 32% or 26,469 ha are under agricultural crops, primarily cotton, horticulture and fodder crops. In 2008-2009 a trend of land reduction under the fodder crops and cotton was observed due to the low return rates, aggravated amelioration and land erosion. However, the land area with horticulture, cereals, vegetables and gourds increased.

Total irrigated land area in the Kanibadam rayon, according to the State Water Management Department data, is 24,078 ha, of them 6,500 ha of mechanical irrigation and 17,578 ha of gravity feed irrigation from the Big Ferghana Canal (BFC), the Isfara River and the Kairakum Water Reservoir. However, due to some subjective and objective reasons, the pace of irrigated land development significantly decreased.



	Cotton	Cereals	Vegetables	Gourds	Potato	Fruits	Fodder crops
2011	14765	5921	18629	1828	3427	13252	2120
2012	15136	6009	18121	1816	4212	13827	2142
2013	11776	6116	19352	2951	4516	13605	2109

Table 6. Total area of irrigated lands

Rayon	Total irrigated lands, ha	Including irrigated lands by 01.01.2014	Including irrigated lands in perspective
Isfara	37,600	17,179	20,421
Kanibadam	39,400	24,078	15,322

Fishery in the Isfara rayon is not currently developed, yet in perspective it may become profitable sector for economy without significant loss of water for consumptive use. The Tajik part of the Isfara River basin lacks water reservoirs, hydro power stations, log transport, while recreational use of water is rare. Water quality complies with the requirements for sanitary and household water supply.

Industry

There are 17 industrial enterprises in the Kanibadam rayon, operating primarily on local raw materials. There are cotton and agricultural crops processing plants, spinning mill, auto parts production, oil extraction and crude oil processing plants. In the industrial structure prominent place belongs to cotton processing industry, crude oil processing, machinery manufacturing,

including repairs of railcars, manufacturing of car parts and agricultural machinery and food production. In the post-Soviet period industry performance faced significant dropdown due to the disintegration process and outdated technical equipment of enterprises.
Some enterprises have their own water wells, and extract water based on the permits for specialised water use.

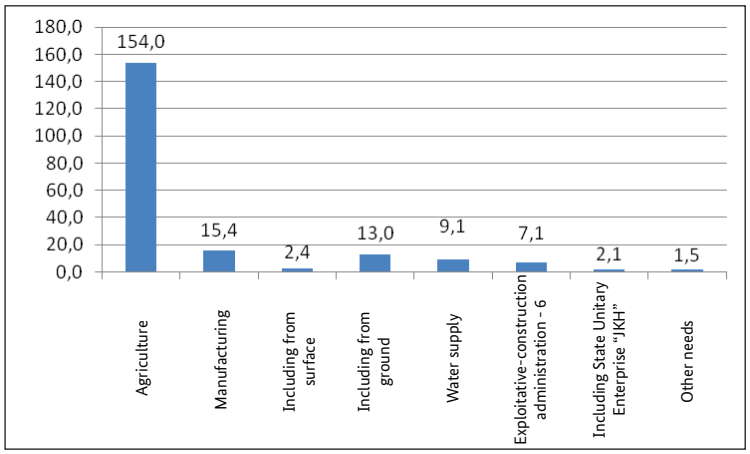


Figure 7. Average consuption by industrial enterprises in the Kanibadam rayon

4. Analysis of Current Environmental Condition

The major negative natural and economic factors affecting environment in Isfara river basin, are:

- High growth rate of population and density of population
- Unregulated cattle pasturing
- Felling trees and bushes for fuel
- Unresolved issue of safe utilisation of animal residues
- Topsoil deterioration and aggravation of soil erosion
- High level of stand and mineralisation of ground water
- Salinisation of soil in arable land
- Irrigation and drainage and related irrigation and drainage water discharge
- Industrial, household and communal wastewater, solid household and industrial wastes which find their way to water facilities
- The use of gravel and sand from the Isfara river floodplain

There are flooded settlements in the arable territory: Inkilob, Kuruk, Togai-Kuichi, Shamtkarayantak, Dasht-Karayantak, Begovat, Khamirju, Kuchkak, Batyrkurgan, Makhram in the Kanibadam rayon with total area of 300 ha exposed to flooding. In the Isfara rayon the following settlements were flooded: Lyakkan, Kulkent, Chilgazy, Dakhana and Navgilem in the area of 309 ha where the ground water level is less than 1 metre. The reason for flooding is the ground water inflow from the upper-located arable lands, poor drainage, extensive irrigation of crops in Isfara rayon, due to the pressurised water from the Kairakum Water Reservoir and poor performance of vertical and horizontal drainage, irregular performance of drainage pumping stations, poor performance of horizontal drainage systems and economic problems in Kanibadam rayon.

5. Analysis of Water Resources Management, Irrigation and Water Use

In Sughd oblast operates the Department for Amelioration and Irrigation in Sughd Oblast with the subordinated Isfara and Kanibadam State Departments for Amelioration and Irrigation. The Isfara Main Department for Amelioration and Irrigation (MDAI) consists of its central office, planning and operation departments, water use, accounting and 2 operational sections. The latter include 7 hydrological units on gravity feed canals, and 11 hydrological units on pumping stations.

Agriculture is the main water consumer in the Isfara rayon. There are, in general, 50 major agricultural production units and 555 smaller farms (water users). Also 4 WUAs operate in the Isfara rayon established in the framework of the EU and UNDP Project 'Promoting Integrated Water Resources Management and Fostering Transboundary Dialogue in Central Asia'. The Water Users Federation was established to coordinate activities of the WUAs with the common system of water resources management, maintenance and operation of on-farm irrigation and drainage systems to ensure effective water use by farmers

on fields. The land reform is expanding according to which the larger farms and other entities with an area exceeding 10 ha are enlarged. This requires relevant increase of the WUAs to include their new water users.
To improve administrative structure the Government of Tajikistan, in November 2013 introduced a reform in irrigation sector that separated economic and political functions. The Ministry of Energy and Water Resources of the Republic of Tajikistan (water and energy policy) and Agency on Amelioration and Irrigation under the Government of the Republic of Tajikistan (economic activity) were established. The work to come is to establish the basin-based water management administrations instead of administrative territorial; tariff policy optimisation and upgrading the market mechanisms with improved differentiated fee for water supply depending on economic conditions (gravity or mechanical irrigation, mountain and lowland areas, crops diversity and their water consumption). In particular with the Isfara River, it is planned to switch to the sub-basin principle of management.

6. List of Water Economy Problems

The list of actual problems in water economy consisting of 6 sections was drafted by the working group members including the Smaller Basin Council (SBC) participants on the basis of expert work and consultations with stakeholders. During the regular meeting on 13.11.2013 in Khudjand, the group has prioritised the short and long-term perspective problems of water economy. Below is the preliminary ranking table (see Table 1) that is to set the priorities of the identified problems.

Table 7. Water Sector Problems Ranking

Identified problem	**Priority rating**
A. Water infrastructure	12.83
Depreciation of water and canalisation infrastructure	12.78
System efficiency	12.38
Absence of water supply and sanitation systems in some settlements	12.5
Depreciation of irrigation and drainage systems	13.22
Insecurity of irrigation and drainage infrastructure	12.63
Increasing risk of emergencies related to water	13.47
B. Water resources management on basin level	12.79
Ineffective water use registration	13.13
Low efficiency of current management system	13.13
Underdeveloped system of WUA	13.03
Unsustainable WUA	12.16
Inadequate awareness of farmers on the WUA establishment procedures and functioning	12.88
Low efficiency of water use in agriculture	12.44
Soil degradation and reduced productivity	11.94
C. Management of river catchment area and disaster risk reduction	12.23
Degradation of forests, mountain slopes and pastures	11.81
Degradation of soil and loss of productivity	11.47
Absence of the early warning system on disasters	13
Absence of interaction with neighbouring states on water-related disasters	12.83
D. Transboundary water management and cooperation	13.01
Weakness of current organisational mechanisms of inter-state water allocation and management in accordance with established quotas on small transboundary rivers	13.41

Absence of inter-state water resources management institutions	12.31
Absence of permanent joint institutions on planning, usage and management of the Isfara River water resources	12.84
Lack of qualified specialists in water resources management	13.5
E. Ecological aspects of water resources management	13.21
Poor ameliorative condition of irrigable land	13.16
Aggravation of ecological condition of land	12.78
Noncompliance with sanitary epidemiological norms	13.41
Pollution of water sources	13.5
F. Economic and social aspects	12.75
Migration of able-bodied population caused by low employment opportunities	13.03
Shortage of water and land resources for rapidly growing population	12.91
Lack of electricity	13.5
Insufficient development of recreational sector	12.31
Inefficient use of fishery resources of the Isfara river basin	12

7. Water Vision of the Isfara Sub-basin in Long-term Perspective

In long-term perspective the social and economic development of the Isfara river sub-basin will continue. This shall lead to full supply of population of Isfara city, jamoats and townships with clean drinking water, reconstruction of municipal sewer systems, new agricultural land development, application of new methods of agro-technology and water saving for crops cultivation and processing, industrial development, production of competitive products, unlimited supply of electricity, rehabilitation of roads, hydrotechnical facilities and the remaining infrastructure and introduction of automated management systems. It is proposed to improve water use control, develop informational system and database. It is also proposed to improve ecological situation, including amelioration of all lands in the sub-basin and to establish sustainably performing WUAs, to provide agricultural and water economy sectors with the required number of agricultural and amelioration machinery and mechanisms.

To prevent water-related risks the improvement of the early warning system, prevention and rehabilitation of disasters will continue. Organisation and implementation of regular training sessions will continue for relevant personnel. At the intergovernmental level accomplishment of delimitation and demarcation of borders, establishment of joint authorities on planning, management, use and protection of water resources on international rivers on the basis of intergovernmental agreements which will play specific stabilising role.

8. Action Plan

8.1 Water Infrastructure

Improvement of Water Supply Systems Efficiency :

- Technical inspection and development of rehabilitation projects.
- Rehabilitation and restoration of water supply network in Lyakkan and Chilgazy jamoats in the Isfara rayon, and also in Patar, Pulotan and Artykova jamoats in the Kanibadam rayon.
- Rehabilitation of pumping stations and vertical water wells in Muldon of the Isfara rayon and pumping station and water well of Oil Extracting Plant (OEP) in the Kanibadam rayon.

Improvement of Water Supply and Irrigation Systems Efficiency:

- Procurement of heavy diggers (2 excavators): 1 for Kanibadam and 1 for the Isfara rayon.

- Rehabilitation and restoration of amelioration water pumping stations.
- Rehabilitation and restoration of vertical water wells in the territory of the Isfara rayon, in jamoats Lyakkan - 3 units, in Chilgazi - 4 units, in Kulkent – 3 units, and 1 in Navgilem.
- Cleaning of 20 km of farm and on-farm canals in the Isfara rayon, 30 km in the territories of Artykov and Khamrobaev jamoats in the Kanibadam rayon.
- Cleaning of 80 km of farm and on-farm collection and drainage networks in Chilgazi, Lyakkan and in Kulkent jamoats of the Isfara rayon and 30 km in Patar jamoat of the Kanibadam rayon.

Sustainable Water Supply to Irrigated Land:
- Construction of gravity conduits to irrigate 4.6 thousand ha of lands in Matpara massive.
- Rehabilitation of Patar-Melnikovsky Canal in the Kanibadam rayon.

Prevention and Reduction of Damage from Emergencies:
- Creation of early warning system.
- Study and identification of high risk-prone areas to emergencies and their prioritisation.
- Cleaning of mudflow conduits Chorvodoron, Kekh, Lochin in the Isfara rayon and mudflow conduits №3, №5, №7, №9 in Khamroboev, Sharipov jamoats in the Kanibadam rayon.
- Implementation of bank protection works at the headworks of Kairma Canal in the Isfara rayon and Kyrgyz Canal in the Kanibadam rayon.
- Construction of sill dam in Oftobrui and Guzlon Massives in the Isfara rayon, in Sharipov jamoat and Niyazbek Massive in the Kanibadam rayon.
- Reconstruction and expansion of bridges (Chorkukh-Shurab and Chorkishlok in the Isfara rayon and mudflow conduit №9 in the Kanibadam rayon).

8.2 Water Resources Management at Basin Level

Improvement of Water Registration System:
- Installation counters for drinking water users.
- In the framework of the Social and Economic Development Programme of the Isfara Rayon during 2013-2017 it is planned to install 15.4 thousand drinking water counters in Isfara city for effective and rational water use.
- In the framework of the Social and Economic Development Programme of the Kanibadam Rayon during 2011-2015 it is planned to install 960,000 somoni worth drinking water counters in Kanibadam.

Rehabilitation of River Stations:
- Tangi Vorukh – to be finished in 2014.
- Matpari – finished in November 2013.
- Opornyi Ravot – to be finished in 2014.
- Isfara waterworks facility – to be finished by May 1, 2014.
- Kanibadam waterworks facility.
- Rehabilitation and construction of control stations at farm and on-farm irrigation canals.

Improvement of Control System:
- Installation and rehabilitation of sluice outlets (20% of the existing)

Improvement of Current and Establishment of new WUAs:
- Drafting WUAs development plan in the basin to cover whole irrigated territory.
- Technical assistance to the current and newly established WUAs.

Transfer of On-farm Irrigation Network to WUAs Balance:
- Inventory taking, rehabilitation and transfer to WUAs balance of on-farm irrigation and drainage networks.

Increased Awareness of Farmers on WUA's Establishment and Functioning:
- With UNDP Tajikistan support, to re-issue and disseminate available recommendations on sustainable WUA functioning, training modules etc., informational bulletins, monthly magazines, brochures, books etc.

Improvement of Human Resources and Development of a Three-stage Manpower Potential:
- Study the demand for personnel and topics for training and annual qualification development with practical training

courses.
- Encouragement and stimulation of the best employees by increasing their salary.

Improvement of Productivity of Water Use in Agriculture by Reducing Water Loss in Irrigation Network and Introduction of Water-Saving Irrigation Technologies:
- Introduction of recommendations on irrigation technique and technology.
- Creation of pilot area to develop new lands with drip irrigation.
- Introduction of water-saving irrigation technologies.
- Creation of demo sites on irrigation techniques and technologies (10 ha land) in each rayon of the basin.

8.3 Environmental Aspects of Water Resources Management

Ecological Improvement of Irrigated Land:
- Restoration of irrigated land turnover in agriculture and leaching of salts in soil.

Compliance with Sanitary and Epidemiological Norms, Size of Water Protection Areas:
- Improvement of control.
- Establishment of boundaries of water protection zones and strips.

Reduction of Water Sources Contamination Rates, Improved Water Quality in the River:
- Improvement of control over water use and its discharge, compliance with MPCs in sewage water discharged into water bodies, informational campaigns for population on ecological aspects.

Implementation of Activity Plan in the Isfara River Basin in Short-term Perspective for 2014-2020

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Improve efficiency of water economy infrastructure, including water supply and wastewater disposal to full operational level based on technical inventorying					
Improvement of water supply systems efficiency	Technical inspection and rehabilitation projects drafting	Local khukumats, WMD (Water Management Department)	2014-2015	6215	Investments, national budget
	Rehabilitation and restoration of water supply network in jamoats Lyakkan and Chilgazy in Isfara rayon, and jamoats Patar, Pulotan and Artykov in the Kanibadam rayon	Goskom-invest, local khukumats, WMD	2014-2017	To be defined	Investments, national budget
	Rehabilitation of pumping and vertical wells	Local khukumats, WMD, Goskom-invest	2014-2017	To be defined	Investments
	Muldon in the Isfara, pumping stations and wells and OEP in Kanibadam				
Improvement of irrigation and drainage systems efficiency	Procurement of heavy diggers (2 excavators); 1 for the Kanibadam rayon, and 1 for Isfara	Local khukumats, State Agency on Amelioration and Irrigation	2014-2015	To be defined during tender	Investments, local budget
	Rehabilitation and restoration of amelioration pumping stations	Local khukumats, State Agency on Amelioration and Irrigation	2015-2020	To be defined during design	Investments, state budget
	Rehabilitation and restoration of vertical wells in jamoat Lyakkan, Isfara – 3 u., Chilgazi – 4 u., Kulkent Zed– 3 u., Navgilem – 1 u.	Local khukumats, State Agency on Amelioration and Irrigation	2015-2020	94	Local budgets, investments
	Clean farm and on-farm canals				
	20 km in the Isfara rayon, 30 km in jamoats Artykov and Khamrobaev of the Kanibadam rayon	Local khukumats, State Agency on Amelioration and Irrigation	2015-2020	To be defined during design	Local budgets, investments
	Clean farm and on-farm collector and drainage networks				
	In jamoats Chilgazi, Kulkent, Lyakkan of the Isfara rayon (80 km) and jamoat Patar of Kanibadam rayon (30 km)	Local khukumats, State Agency on Amelioration and Irrigation	2015-2020	1652.2	Local budgets, investments
Sustainable supply of water of irrigated land	Construction of gravity conduits, water supply of 4.6 thousand ha of land in Matpara Massive	Local khukumats, State Agency on Amelioration and Irrigation	2014-2020	20000	State budget, investments
	Rehabilitation of Patar-Milnikovsky Canal in the Kanibadam rayon	Local khukumats, State Agency on Amelioration and Irrigation	2014-2020	600	State budget, investments

Prevention and reduction of damage from emergencies	Creation a system of early warning	Local Khukumats, CE	2014-2020	To be defined during design	State budget, local budgets
	Studing and identification of areas prone to high risk of disasters and their prioritisation				
	Cleanning of mudflow conduits (Chorvordon, Kekh, Lochin in the Isfara rayon and №3, №5, №7 and №9 in jamoats Khamrobaev, Sharipov in Kanibadam rayon	Local	2014-2020	To be defined during design	State budget, local budget, investments
	Reconstruction of elevated flume at Matpari Canal	Local khukumats	2014-2016	200	State budget, investments
	River bank improvement works at headworks facility of Kairma Canal in the Isfara rayon and Kyrgyz Canal in Kanibadam rayon	Local khukumats, CE, State Agency on Amelioration and Irrigation	2014-2020	To be defined during design	State budget, local budget, investments
	Construction of sill dam in Oftobrui and Guzlon Massive in Isfara rayon, jamoat Sharipov, Niyazbek Massive in the Kanibadam rayon	Local khukumats, CE, State Agency on Amelioration and Irrigation	2014-2020	To be defined during design	State budget
	Reconstruction (Chorkukh-Shurab and Chorkishlok in the Isfara rayon) and at mudflow conduit №9 in the Kanibadam rayon	Local khukumats, CE	2017-2025	To be defined during design	State budget, investments

Implementation of Activity Plan in the Isfara River Basin in Short-term Perspective for 2014-2020

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Improvement of water resources management system, improvement of system of water use registration and improved WUAs performance					
Improvement of water use registration system	Installation of drinking water counters in the Isfara and the Kanibadam cities	WDM	2014-2017	4265	Local budgets, investments
	Rehabilitation of river stations and hydrological posts	Local khukumats, Ministry of Energy and Water Resources of the Republic of Tajikistan, Hydromet	2014		UNDP, GIZ, local budget
	Rehabilitation and construction of river stations on farm and on-farm canals	Local khukumats, State Agency on Amelioration and Irrigation	2015-2020	To be defined	Local dudgets, investments
Improvement of the control system	Installation and rehabilitation of drainage outlets (20% of the existing).	Local khukumats, State Agency on Amelioration and Irrigation	2014-2020		Local dudgets, investments

Improvement of current and establishment of new WUAs	Drafting of WUAs development plan in the basin to cover entire irrigable territory	Local khukumats, State Agency on Amelioration and Irrigation	2014-2020	To be defined during design	Local dudgets, investments
	Technical support to current and new WUAs	Local khukumats, State Agency on Amelioration and Irrigation	2014-2016		Local dudgets, investments
Re-assignment of the on-farm network	Inventory taking, rehabilitation and re-assignment to WUAs balance of on-farm irrigation and drainage systems	Local khukumats, State Agency on Amelioration and Irrigation	2014-2016		Investments
Increase awareness of farmers on the WUAs establishment and operation procedures	Re-issue of available recommendations for sustainable WUAs functioning, training modules etc., informational bulletins, monthly issues of journals, books, brochures etc.	Local khukumats, State Agency on Amelioration and Irrigation, NGOs	2014-2016		Local budgets, investments
Improvement of stuff capacity and preparation of 3-stage manpower development	Studying of the needs in personnel, specific training. Annual skills upgrading of employees	Local khukumats, State Agency on Amelioration and Irrigation			State budget, local budgets, investments
	Encouragement of the upfront employees by increasing their salaries	GoRT, local khukumats, State Agency on Amelioration and Irrigation	2015-2020		State budget, local budgets, investments
Improvement of water use efficiency in agriculture by reducing water losses in irrigation networks and introduction of water saving irrigation technologies	Re-issue and introduction of available recommendations on irrigation technique and technology	Ministry of Agriculture, State Agency on Amelioration and Irrigation, Agrarian University, Tajik & D, UNDP Tajikistan	2014-2020		State budget, local budgets
	Creation of pilot project to develop lands with drip irrigation	Goskom-invest, Agency, local khukumats	2015-2020	To be defined during design	State budget, local budgets, investments
	Introducion of water-saving irrigation technologies	State Agency on Amelioration and Irrigation, Ministry of Agriculture, Tajik R&D, khukumats	2015-2020	To be defined during design	State budget, local budgets, investments
	Creation of the basin demo sites for irrigation technique and technology in each rayon (10 ha model sites)	Local khukumats, State Agency on Amelioration and Irrigation, Ministry of Agriculture, NGOs	2015-2020		State budget, investments

Implementation of Activity Plan in the Isfara River Basin in Short-term Perspective for 2014-2020

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Achievement of acceptable environmental situation by improved amelioration of irrigable lands, reduction of contamination of surface and ground water sources					
Improvement of ecological situation of irrigable land	Restoration of irrigable land in agricultural turnover, leaching salts in soil	Ministry of Agriculture, State Agency on Amelioration and Irrigation, Committee on Environment Protection, local authorities	2014-2020		Local budgets
Observation of sanitary and epidemiological norms, size of water protection areas	Improving control. Establishment of boundaries of water protection zones	SCEP, State Agency on Amelioration and Irrigation	2015-2020		Local budgets
Reduction of water sources contamination rates, improvement of water quality in the river	Improvement of control over water use and discharge, observe MPCs when dumping waste water into water bodies, raising environmental awareness among population	SCEP, State Agency on Amelioration and Irrigation, local khukumats	2015-2020		Local dudgets

Implementation of Activity Plan in the Isfara River Basin in Long-term Perspective for 2020-2030

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Improvement of efficiency of the existing water economy infrastructure, including water supply and wastewater disposal, up to operational level based on thorough inventory					
Improvement of water supply systems efficiency	Rehabilitation and restoration of water supply and sewage systems	Goskom-invest, local khukumats, State Unitary Enterprise «JKH» (housing/utilities infrastructure)	2020-2030		Investments, state budget
	Rehabilitation of pumping stations and vertical wells	Goskominvest, local khukumats, State Unitary Enterprise «JKH»	2020-2030		Investments

Supply of population with clean drinking water and sewage systems	Construction of water pipeline network and reservoirs in settlements	Goskominvest, local khukumats, State Unitary Enterprise «JKH»	2020-2030		Investments
	Procurement of machinery and equipment to maintain water supply systems	Goskominvest, local khukumats, State Unitary Enterprise «JKH»	2020-2030		Investments
	Construction of biological ponds and chlorination rooms	Goskominvest, local khukumats, State Unitary Enterprise «JKH»			
Improvement of irrigation and drainage system efficiency	Reconstruction of pumping stations	Goskominvest, local khukumats, State Agency on Amelioration and Irrigation	2020-2030	17,000	State budget, investments
	Construction of new amelioration wells and drainage systems	Goskominvest, local khukumats, State Agency on Amelioration and Irrigation	2020-2030	2000	State budget, investments
Improvement of control system	Automation of system of control and water resources distribution	State Agency on Amelioration and Irrigation	2021-2030		Investments

Implementation of Activity Plan in the Isfara River Basin in Long-term Perspective for 2020-2030

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Improvement of water resources management system by improving the system of water use control and WUAs performance					
Restoration of forest massives, introduction of pastures rotation	Expansion of forest plantations, improved bank protection, pastures management specifically on slopes	Local khukumats, Committee on Emergencies, EPC, Forestry Agency	2020-2025		Local budgets
Soil degradation reduction and improved land productivity	Increase of tree belt areas, erosion control structures, recultivation	Local khukumats, Ministry of Agriculture, Forestry Agency	2020-2030		Local budgets
Development and introduction of early warning systems	Creation of a system of early warning	Local khukumats, Committee on Emergencies	2020-2025		State budget, investments

Drafting of coordinated action plan on water-related emergencies prevention	Skills upgrading, share experience, sustainability of personal relations and reduction of probable conflicts	Committee on Emergencies, local khukumats, State Agency on Amelioration and Irrigation, International Institutions, NGOs			Investments

Implementation of Activity Plan in the Isfara River Basin in Long-term Perspective for 2020-2030

Task	Activity	Responsible	Implementation period	Proposed budget (thousand somoni)	Source of financing
Economical and social matters					
Creation of jobs	Development of agriculture, new kinds development, development of industry, tourism and small business	Ministry of Labour, Ministry of Economy, State Agency on Amelioration and Irrigation	2020-2030		Local budgets investments
Increase of productivity of soil and land	Development of potentially suitable to irrigation land, use of recycled water, improved land amelioration with wide introduction of water-saving technologies	State Agency on Amelioration and Irrigation, Ministry of Energy and Water Resources of the Republic of Tajikistan, local authorities			Local budgets investments
Small hydro power station development	Construction of small HPESs on irrigation canals and Isfara river with daily regulation	State Agency on Amelioration and Irrigation, Ministry of Energy and Water Resources of the Republic of Tajikistan, local authorities			Local budgets investments
Tourism development	Creation and development of infrastructure, attract tourists	Local khukumats	2020-2030		Local budgets investments
Fisheries development	Construction of fishery ponds in overflow lands, cage culture fishery and small ponds fishery and also rehabilitation and restoration of the existing ponds	Local khukumats	2025-2030		Local budgets, investments