



Land-Water Linkages in Rural Watersheds Electronic Workshop

18 September – 27 October 2000

Case Study 23

Integrated land and water management in the upper watersheds in the Aral Sea Basin: the case of Tajikistan

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Desiccation of the Aral Sea, one of the world's largest land-locked water bodies, and the environmental crisis caused by it have become world-renowned due to the rates and scale of desertification and land degradation, and a dramatic drop in the living standards of the local population. Exhaustion of water resources has necessitated radical structural changes in the economy and renunciation of the monocultural agrarian orientation, and caused a number of social and political problems. More than 80% of water extraction and pollution take place in the downstream countries. Nevertheless, there is human activity influencing water resources in the upper watersheds, too.

The Aral Sea crisis has affected the territory of the five Central Asian States: Republic of Kazakhstan, Kyrgyz Republic, Republic of Tajikistan, Turkmenistan and Republic of Uzbekistan with a total population of over 41 million. As a result of the global transport of salt and dust through the atmosphere the crisis has affected a larger territory.

The Aral Sea Basin occupies a vast territory of approximately 1,760,000 km². Major rivers have their sources in the Tien-Shan and Pamir mountain ranges with the highest peaks of more than 7,000 m above the sea level. In the middle-courses they flow through densely populated valleys of flourishing agriculture. Downstream the rivers pass the arid plains of the Kyzylkum and the Karakum deserts and end up in the Aral Sea - or before that in irrigated fields.

Degradation of lands, felling of forests, erosion, water and soil pollution, floods and mudflows have considerably aggravated the people's living standards there. Besides creating considerable environmental problems in the upper watersheds all these factors have a negative impact on downstream areas. The quality of water in major plainland rivers is at present classified as bad or dangerous causing disastrous consequences for the environment and people in the lower reaches of Central Asian rivers. It is absolutely obvious today that no matter what kinds of water management problems arise in the Aral Sea Basin they all originate in the upper watersheds.

The Central Asian states, jointly with the UNDP and the World Bank, have developed a Program to address the Aral Sea Basin problems. The Program was approved at the meeting of the Heads of the Central Asian states in Nukus on January 11, 1994 and is aimed at developing a comprehensive system of interventions and mechanisms promoting efficient use of land and water resources and improving environmental and socio-economic conditions in the Aral Sea Basin. One of the Program objectives is to develop interventions for a comprehensive use of land and water resources and improvement of the environmental situation in the upper watersheds (Program 6). The main objectives of Program 6 are the following:

- assessing the current status and impact of water and land resources management on regional surface and groundwater in general and in the upper watersheds in particular as well as on the economy, people's living standards and environment including soils and forests;
- developing and assessing the most acceptable land and water resources management methods in the area under consideration with the aim of securing the necessary economic development and social conditions and simultaneously meeting environmental requirements;
- finding possibilities to restore the degraded ecosystems and assessing prospects for improving the quality of the environment by implementing a comprehensive program.

Program 6 is being implemented by phases. At present it is going through Phase 1 with the assistance of the Finnish Government. The following outputs have been achieved at this stage:

- four national reports on the situation in the upper watersheds have been prepared by Tajikistan, Kyrgyz Republic, Uzbekistan and Kazakhstan on whose territories most rivers of the Basin take their source;
- national Pilot Projects have been developed (one for each state) implementation of which is intended to set an example of solving certain problem (or a set of inter-related problems) in the upper watersheds;
- the regional report has been prepared on the main areas of integration of efforts of the riparian countries in solving common problems of the upper watersheds.

PROGRAMME 6: PRELIMINARY EXPERIENCES AND RESULTS WITH REGARD TO WATER QUALITY AND EROSION

Water quality

In the Aral Sea Basin water is mostly withdrawn from transboundary rivers and transboundary water quality has significantly worsened. Discharge of highly saline drainage wastewater from farmlands containing pesticides, increasing pollution of water sources with domestic and industrial wastewater and reduction of the total flow due to excessive water withdrawal for irrigation are the main causes of deteriorating water quality. Water salinity in the downstream reaches and deltas of the Amu Darya and Syr Darya rivers increased by 3-6 times comparing to the natural level. This restrains water use for potable supply, fish-breeding and recreation.

Permanent monitoring, metering and limitation of wastes is a priority for management of transboundary water quality. Water quality problems are not limited by national borders, they have a regional significance. Therefore, transboundary water quality problems can be solved only with close scientific collaboration between researchers of various countries.

Erosion

Erosion is widespread in Tajikistan and is damaging the economy of the republic and affecting ecological conditions in the Aral Sea Basin. If specific erosion control measures are not introduced, erosion may change the ecological balance of the whole Aral Sea Basin.

Soil erosion occurs on irrigated, rainfed land and pastures throughout Tajikistan. According to some calculations, the annual soil lost in the dry-farming zone of Tajikistan may be more than 50 million tons. This may be equivalent to a loss of more than 1 million tons of humus and about 100,000 tons of nitrogen fertilizer, corresponding to 500,000 tons of ammonium sulphate, 100,000 tons of phosphorus and 1 million tons of potassium.

In 1973, 68% of the agricultural area was affected by erosion and land degradation; in 1993, erosion and degradation extended over 97.9% of the agricultural area. Intensive erosion and gully formation has been observed in all the agro-ecological zones of Tajikistan. According to official figures, the annual average increase in gully length is 7.8 m with a maximum annual increase of 82.4 m.

The newly irrigated lands are also liable to serious erosion. In some newly irrigated valleys, 80-90% of the land is eroded. The situation on newly irrigated lands is particularly serious in Southern Tajikistan, where there has been a catastrophic increase in gully erosion. The number of gullies in the Yavan valley has increased by 15 times over the last 15-20 years. During 25 years of irrigation development, the density of gullies in this valley has increased from 0.1 km/km² to 2 km/km². On newly irrigated lands, the annual average increase in gully length is 20.6 m, with a maximum of 624.6 m. The situation is similar in Dangara, Beshkent and Obi-kiik valleys.

Scientifically proven erosion control measures should be implemented immediately. Before planning, designing and implementing the erosion control measures, it will be necessary to study the dynamics of soil erosion, and the factors determining the spread of soil erosion. Large amounts of money are required to:

- develop sustainable crop rotations to conserve and protect the soil,
- plant forest shelter belts,
- construct erosion control measures,
- construct terraces on the steep slopes,
- improve pastures etc.

PILOT PROJECT PROPOSAL OF TAJIKISTAN: DEVELOPING LAND-USE PRACTICES AND RIVER WATER MANAGEMENT IN THE UPLANDS

As a part of the Aral Sea Basin Program 6, the objective of the proposed Pilot Project is to carry out experiments to promote sustainable land and water management and increase living standard of people in a foot-hill and mountainous area typical of Tajikistan. A main purpose is to prevent damages caused by natural disasters, increase vegetation cover and reduce land degradation which all also have a positive effect on water quality, quantity, and flow regimes.

The area of the Pilot Project is located in the Soviet rayon of Khatlon oblast, central Tajikistan, in the upper reaches of the Tairsu River, a tributary of the Amu Darya River, at the altitude of 900-1500 m. Climate is arid continental, but supports rain-fed agriculture. Average annual temperature is +17°C; +2°C in winter, and +27°C in summer. Precipitation is 650 mm/yr, 70% of that falls during winter time. Evaporation is 350 mm in spring, and up to 1810 mm in summer.

The population of the area is 16,000. The incomes originate almost entirely from agriculture (95%), and average monthly incomes are \$ 3.5 US. The unavailability of drinking water is the main problem of the area. River water is polluted by wastes of communities, agriculture and cattle-breeding. Sanitary systems are poor and population is vulnerable to diseases. Erosion is wide-spread; 80% of land is strongly affected by different erosion processes. Pastures will be turned wastelands if preventive measures are not widely adopted. Annually, destructive mudflows occur in the Tairsu River and its tributaries, and landslides destroy valuable areas. These problems should urgently be resolved before they reach a scale of a national catastrophe.

The activities of the Pilot Project are expected to yield the following benefits for the local people (costs in brackets):

1. Construction of a complete drinking water tap system (1,800,000 \$) using water from springs and rivers will allocate water for 14,000 people, 80% of the whole population of the area.
2. Water quality management includes sanitary systems, river water protection zones, quality monitoring, etc., (400,000 \$) in order to prevent pollution and warn population along the rivers on potential risks of diseases.
3. Experimental constructions to prevent damages caused by frequent mudflows (1,800,000 \$) will protect villages, bridges, transmission lines, cultivated areas, etc. in a length of 20 km along the Tairsu River valley.
4. Erosion control and reclamation of degraded lands (900,000 \$) will increase the productivity of land of 500-700 ha, and this will improve water quality and flow regime. Thus the whole population of the project area will gain benefits from these activities.
5. Developing multi-purpose use of land and establishing model farms and small enterprises (1,500,000 \$). Alternative land-uses include production of honey, herbs, etc., and

sustainable grazing practices, as well as planning or establishing small-scale processing enterprises. These activities will give employment for 3000 people, and ease the over-exploitation pressures of land resources.

6. Small-scale power plants using renewable energy sources (500,000 \$) will provide electricity for 8 villages.
7. Socio-economic studies to evaluate and guide the activities of the project (300,000 \$). At different stages of the project, peoples participation methods will be used.
8. Information collection and distribution, education, and advising local people (300,000 \$).

The results of the project, economic analyses, benefit evaluations, technical solutions, and scientific results, can later be used as a basis for similar activities in the highlands of Tajikistan and of the neighboring countries. Implementation will involve participation of local people, authorities, experts, and organizations as well as assistance of international specialists.