Integrated River Basin Planning

Alazani Watershed

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Technical Report

Task 7. Final IRBP

Prepared by the

Alazani Watershed Consortium

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EXECUTIVE SUMMARY

This Integrated River Basin Plan for the Alazani River was prepared by the "Alazani Consortium" consisting of a specially selected team of technical experts from ORIGO Consulting, a Georgian based consultancy firm; with Little Town, a Georgian NGO; and Nature Protection Society, an Azerbaijan NGO, including independent experts. This plan was prepared within the framework of the "Water Management in the South Caucasus" Project, funded by the U.S. Agency for International Development (USAID), and implemented by Development Alternatives, Inc (DAI). The consortium started the implementation of the Integrated River Basin Planning in early January 2002. The final plan was prepared in September 2002.

The principal objective of this work was to demonstrate the process of integrated river basin planning (IRBP) at the local level, and to focus on capacity building in the region. The plan was prepared by implementing the following tasks:

1. Development of stakeholders participation;
2. Preparation of an inventory of water uses;
3. Assessment of issues;
4. Preparation of a public awareness campaign;
5. Formulation of a preliminary integrated river basin plan;
6. Identification of pilot projects; and
7. Preparation of a final integrated river basin plan (IRBP).

The IRBP was developed for the Alazani River Basin pilot area. The Alazani River is one of the major tributaries of the Kura River and is created by the junction of two mountain rivers, Tsiplovaniskhevi and Samkuristskali, which flow from the southern slopes of the Main Caucasus Mountain Range. The highest gauging station on the Alazani River is at elev. 2200 m., above mean sea level, and the low end of the river is at about 200 m., above mean sea level. The river crosses an inter-mountainous depression, streams along the Georgian-Azerbaijan border and then flows into Mingachavir Reservoir in Azerbaijan. There are 11 administrative districts in the region, seven in Georgia: Telavi, Gurjaani, Akhmeta, Kvareli, Signagi, Lagodekhi, Dedoplistskaro; and four in Azerbaijan: Kakh, Balaken, Zagatala, Sheki. Agriculture is the main economic activity within the basin. Most of the agricultural lands in the basin are irrigated, while some areas in the Georgian part of the basin are also drained. Hence, irrigation water use is one of the major water uses for the basin. The usage for drinking water is also significant. However, ground waters, which are quite abundant in the region, are also used for drinking water. The waters of the Alazani Basin are also used for hydropower generation and recreation, since many of the rivers have high hydropower potential and the basin is rich in flora and fauna, and supports valuable ecosystems.

The water resources of the basin are both inefficiently used and under-utilized. Water protection and conservation efforts are very insignificant within the basin as well. Although various national and local agencies operate in the river basin, they have little or no coordination with each other, frequently creating conflicting situations among water users or water-related agencies, or between water users and water-related agencies. In addition, lack of awareness about the behavior of the river basin system results in negative downstream impacts from upstream users. In practice, water resources are allocated with paying little or no attention to real demand and without due consideration of all the needs and requirements of different sectors.

The IRBP, which was drafted to address major water-related issues, includes the following: a framework for, and participatory process of, sub-basin planning and management; a set of criteria for ranking infrastructure development options; priority water functions and issues;

prioritized necessary actions and measures; mechanisms for implementation of these actions and measures; and their possible costs.

Specifically, this is a medium-term (2003-2013) plan consisting of parallel or consistent short to medium-term measures to be implemented to meet the demands of four major water-use sectors: drinking water supply; irrigation; public health and ecosystem support; and hydropower generation. The measures are structural (investments in infrastructure of different water-use sectors) and non-structural (legal-institutional, public outreach, etc). In case of their successful realization, these measures promise to dramatically improve the water resources situation existing in the basin.

Along with remedial measures, drafts of specific (long-term) project proposals have been submitted by local stakeholders. These proposals are generally consistent with the measures identified by the project consultants. However, there still are a number of measures left without proposals of corresponding projects. For example, very few proposals were submitted to combat point and non-point source pollution (construction of wastewater treatment plants, building of new landfill sites) as well as to monitor and assess water resources. The number of proposals corresponding to each of the measures can be regarded as one of the indicators of the importance of the measures, although the maturity of public understanding of specific measures should also be considered.

The measures and projects have been evaluated, prioritized and classified: (1) Investment Measures, (2) Technical Evaluation and Assistance, (3) Public Awareness and Education, and (4) Monitoring and Assessment. Each of the measures and projects is concerned with one of the four major water sectors (functions): drinking water, irrigation, public health and ecosystem support, and hydropower generation. However, some projects are common to several water sectors and are concerned with multiple water uses.

The prioritization of planned measures and project proposals was conducted by using a multi-criteria analysis method taking into consideration environmental, social, economic and other criteria. After being evaluated and prioritized, all the measures and projects with corresponding indication of goals, planned activities, locations, and costs were combined in a summary table and grouped according to water use category and activity type.

In addition to remedial measures and longer-term projects, pilot projects concerning community-based actions to mitigate water-related environmental problems, with costs less than $US 5,000, and durations less than three months, have been identified and evaluated. If implemented these projects will serve for local capacity building and will give an impetus to local stakeholders to get involved in the IRBM process.

Two major approaches: *Integrated Water Resources Management* and *River Basin Management* were employed in the process. The first means the process of utilization and conservation of water and land resources in an integrated and coordinated manner with due consideration of all requirements, needs, demands and localized opportunities for the exploitation of water resources. The second implies the development and protection of water and related land resources using natural hydrological boundaries, defined by the river basin instead of using more artificial administrative boundaries for establishing a water management system. It is the proper approach for achieving integrated management and is more practical and viable.

Thus, this report demonstrates water resources planning, which is the first phase for water resources management with an application of IWRM and RBM approaches. Due consideration is also given to two additional elements, public participation and institutional setting which together with the application of an appropriate methodology are essential for implementing IRBM.

In terms of institutional framework, the plan includes recommendations on establishing an appropriate river basin organization, and offers several suggestions to initiate the process of establishing such an entity.

Public outreach activities are included in the plan as both specific project proposals and continuous measures throughout the planned period.

Given the limited time and resources, as well as lack of baseline data for the river basin, the plan was developed as more of a process and procedure, rather than a detailed management plan. Within this limited time frame, it was not possible to address all the needs and requirements of the river basin, but only those, which were of highest priority, according to local stakeholders. Hence, the plan should be the subject of periodic revisions, and amendments. Apart from this, it was not possible to conduct more detailed evaluations of both measures and projects included in the plan, in terms of costing and application of an integrated approach. Instead, a multi-criteria analysis method was adapted to the Alazani River Basin. Many of the project proposals suggested in the plan are very general, although the ideas contained in them are good, and necessary to be implemented. Similarly, many of the projects could serve as alternatives for each other, hence could be combined and implemented in an integrated manner. Thus, these projects need further evaluation and preparation for donor financing.

The plan identifies a series of "next steps" that can be undertaken to advance the process of integrated river basin management for the Alazani River Basin. Key among these next steps is the further development of the concept of the institutional entity, or “River Basin Council”, to be responsible for the management of the river basin. It is recommended that these next steps be carried out as a continuation of the process of developing the capacities of people in the South Caucasus to manage their water resources in a cooperative manner. With experiences such as these, the overall goal of regional cooperation in management of the Kura-Aras Basin will become closer to realization.

INTROUDCTION

1.1 Objectives and Tasks

Two new concepts are recently gaining worldwide attention in the water resources management field: *Integrated Water Resources Management (IWRM)* and *River Basin Management* ***(RBM).*** Both of them are essential for resolving conflicts among human beings and between human beings and environment and achieving sustainability.

Integrated Water Resources Management (IWRM) is the process of utilization and conservation of water resources in an integrated manner. This integrated approach means that all water and related land resources are given due consideration in the process, including all surface and groundwater. It is also means that all requirements, needs, demands and localized opportunities for the exploitation of water resources are given due consideration in a concurrent and inter-sectoral manner with appropriate criteria and weighting given to the resolution of competing demands. This holistic approach to resources management is intended to assure equity in the application of resources for the benefit of those to whom these resources pertain.

The process of integrated water resources management requires pubic education, awareness and participation, so that decisions regarding the utilization and conservation of these resources reflect the public will, and are based on general consensus, in addition to sound technical, economic, financial, environmental, and social criteria.

Water resources management, in this integrated manner, requires that due consideration be given to the institutional framework within which these resources are to be utilized, conserved and developed. This setting becomes all-important to assure that the right policies and techniques are applied for the successful implementation of the integrated approach.

Thus, three elements: 1) approach; 2) public participation; and 3) institutional setting, are required to work in concert for the successful application of IWRM.

River Basin Management implies the development and protection of water and related land resources using hydrological boundaries, defined by the river basin instead of using more artificial administrative boundaries for establishing water management system. It is a good tool for achieving integrated management and is more practical and viable since the territory of the river basin facilitates relation among those who live in it.

The river basin management consists of three stages:

- Preliminary (Planning): studies, formulation of plans and projects;
- Intermediate (Development): the investment for the resource development and conservation;
- Permanent (Operation/maintenance & management): the operation and maintenance of infrastructure and management and conservation of natural resources.

This report demonstrates water resources planning in the Alazani River Basin with an application of IWRM and RBM approaches.

The U.S. Agency for International Development (USAID) has contracted with Development Alternatives, Inc. (DAI) to develop and implement the Water Management in the South Caucasus Project. Five principal activities were identified for implementation of this project and one of these activities was the demonstration of Integrated River Basin Planning in pilot areas in

a bilateral setting in the South Caucasus. One of the pilot areas is a river basin of one of the tributary to the Kura River in the region between Georgia and Azerbaijan identified as the "Alazani River Basin" (See figure 1 for the location of the Alazani River Basin). Pre-qualified consortium “Alazani Consortium” consisting of a specially selected team of technical experts from ORIGO Consulting, a Georgian based consultancy firm; with Little Town, a Georgian NGO; and Nature Protection Society, an Azerbaijan NGO, including independent experts, started implementation of the Integrated River Basin Planning in Alazani River Basin pilot area in early January, 2002. The final plan was prepared in September, 2002.

The principal objective of this work was to demonstrate the process of IRBP at the local level, and focus on capacity building in the region. The Alazani Consortium has conducted following tasks:

1. Stakeholders Participation;
2. Inventory of Water Uses;
3. Assessment of Issues;
4. Public Awareness Campaign;
5. Formulation of Preliminary Integrated River Basin Plan (PIRBP);
6. Identification of Pilot Projects;
7. Preparation of Final Integrated River Basin Plan (IRBP)

IRBP for the Alazani River Basin was developed based on all information currently available, stakeholder inventory and issues assessment reports. It includes the following: a framework for and participatory process of sub-basin planning and management; a set of criteria for ranking infrastructure development options; priority water function and issues; prioritized necessary actions and measures and use of existing resources; mechanisms for implementation of these actions and measures; their possible costs and potential sources for finances.

There were some limitations, hindering the implementation of the project. Firstly, it was impossible to conduct detailed studies regarding water quality, quantity, environmental degradation, etc. within the Alazani basin, due to extremely limited financial resources and time allocated for the project. Hence, the report is mostly based on information available at present, as well as expert's evaluations. Second, baseline data on the Alazani river Basin was extremely lacking or absent, especially for the Georgian part of the basin, where environmental data collection has virtually collapsed since 1990. Third, in many cases it was impossible to collect compatible and coherent information from both sides of the basin, since data collection services in Georgia and Azerbaijan employ somewhat different data processing and reporting methodologies. Further, the quality of data available is not guaranteed due to non-existence of national quality assurance and quality control systems. Most importantly, information on Akhmeta district (Georgia), located within the Alazani basin is completely absent, due the recent political unrest in Pankisi gorge.

Given limited time and resources as well as lack of baseline data for the river basin, the plan was developed as more general action type rather than detailed management plan. Within limited timeframe, it was impossible to address all the needs and requirements for the river basin, but only those, which were of first priority, according to local stakeholders. Hence, the plan should be the subject of periodical revisions and amendments. Apart from this, it was impossible to conduct comprehensive evaluation of both measures and projects included in the plan, in terms of costing and application of integrated approach. Instead, simple multi-criteria analysis method, developed by group of experts from Khrami-Debed Consortium, which was in charge of implementing a similar project for Khrami-Debed river basin, adapted to Alazani River Basin was used. Many of the project proposals suggested in the plan are too general, although ideas contained there are good and necessary to be implemented. Similarly, many of projects could

serve as alternatives for each other, hence could be combined and implemented in an integrated manner. Thus, these projects need further evaluation and preparation for donor financing.

1.2 Background

1.2.1 Geographic Context

The River Alazani is one of the major tributaries of Kura River and is created by the tributary of two mountain rivers, Tsiplovaniskhevi and Samkuristskali, which flow from the southern slopes of the Main Caucasus Range[1]. The river crosses intermountainous depression, streams along Georgian-Azerbaijan border and then flows into Mingachavir Reservoir, situated on Azerbaijan territory. The total length of the river is 351 km, average fall - 745 m and average gradient - 2.12‰, total catchment area 10,800 km^2. The highest gauging station on the Alazani River is at elev. 2200 m., above mean sea level, and the low end of the river is at about 200 m., above mean sea level. The basin is directed from northwest to southeast, and at the entry of River Ayrichay (Azerbaijan) it changes direction to the south (See figure 2 for the Alazani River Basin).

Relief and Geology. There are three geo-morphologic zones with various relief in the Georgian side, such as the Alazani Valley, Gare-Kakheti Plateau and Tsivi-Gombori Range. The Alazani Valley is spread from northwest to southeast and is situated among steep mountainsides of the Greater Caucasus, the Tsivi-Gombori Range and the Gare-Kakheti Plateau. The Valley is strongly indented by many rivers that flow from the mountains. The left-bank rivers are full of sediment-consisted mainly of pebbles and loams that are accumulated on the Valley. On the edges of the Valley there are terraces, covered mostly by marl and conglomerates.
The Gare-Kakheti Plateau – southwestern part of the Basin is spread as well as Alazani Valley, from northwest to southeast. The Plateau is covered by only two or three small rivers and therefore water shortages are identified on the greatest part of it. The conglomerates and pebbles are mostly common here. The flat surface is covered by alluvial sediments and the slopes of the ranges are represented by alluvial - talus surface. The Plateau is mainly covered with loam.

The Tsivi-Gombori Range is spread in parallel to he Greater Caucasus. The northeastern slopes of the Range descend to the Alazani Valley and are covered by many small rivers, characterized by flooding during high precipitation periods. In the summer and winter times they get dry beds covered with sediments - pebbles and gravels. The conglomerates and loams dominate there.

In the Azerbaijan side of the Alazani Basin, two types of relief are mainly significant: Valley and Mountains. The valley is situated between the Alazani - Ayrichay intermountain depression, as to the mountainous zone is located on the southern slopes of the Greater Caucasus. The Alazani - Ayrichay depression is stretched along the Southern slopes of the Greater Caucasus, with the absolute height variation between 200 and 700 meters. Alluvial fans and river terraces characterize the depression. The alluvial fans are characterized by a stony surface, created by the spring floods.

The mountainous zone of the Greater Caucasus is significant with many small deep and steep gorges that are directed to the south, to the depression, and are filled with numerous small rivers. It is characterized by landslides, avalanches and floods as well.

[1] Sources:
State Department of Hydrometeorology of the USSR. Surface Water Resources of the USSR. Hydrographical Description of Rivers, Lakes and Reservoirs. Trans-Caucasus and Dagestan. V. 9. First Edition. Leningrad. 1974

State Committee of Hydrometeorology of the USSR & Trans-Caucasus Regional Institute of Hydrometeorology. Water Resources of the Trans-Caucasus. Leningrad. 1988

Geological conditions of the mountainous and valley zones of the Alazani Basin on the Azerbaijan side are completely different. The mountainous zone is characterized by the layers from Mesozoic Era, and the Valley - from Cenozoic Era. The intermountain depression has composition of chalk, while the high mountainous zone has Jurassic layers. The alluvial sediments from Cenozoic Era, such as, sandstones and forest loams, cover the intermountain depression. The mountainous zone is covered by thick sedimentary rocks, which contribute to strong erosion processes in the riverbeds.

Groundwater Basin. An artesian basin covers the same geographic area as the Alazani River Basin, with the same climate and relief characteristics. Resources are located in the Quaternary period alluvial layer, which is characterized as one of the richest layers of water and can be a great resource for drinking water supply for the administrative districts in the whole basin.

The total groundwater reserve in the major part of the Alazani-Ayrichay Valley (6,000 km^2) is estimated to be 39.3 m^3/sec; 20.4 m^3/sec is in Georgia and 18.9 m^3/sec in Azerbaijan. While the minimum flow measured at the most downstream gauging site on the Alazani-Ayrichay basin is 63.7 m^3/sec, the exploitation of 39 m^3/sec appears to be safe.

According to the two observatory estimations of ground water balance, inflow is 46 m^3/sec, of which the infiltration from precipitation is about 7.6 m^3/sec and infiltration from the rivers Alazani and Ayrichay is 38.4 m^3/sec. The ground water discharge is also 46 m^3/sec, from where the aquifer discharge in the riverbeds of Alazani and Ayrichay is 29.4 m^3/sec and the amount of evaporation and transpiration is around 16.6 m^3/sec. These estimations are indicators of abundance of groundwater resources in the region.

Table 1. Estimated Groundwater Resources in the Alazani Basin[2]

#	Aquifer calculated units	Unit Flow, l/(sec km^2)				Surveyed area, km^2			Commercial resources, l/sec		
		M-Natural Resource	M-Reserves	M-commercial reserves	M-commercial resources	Total	Balance	Beyond Balance	Balance	Beyond Balance	Total
1	Kvareli aquifer, calculated for nine districts	6.0-8.0	0.78-1.56	0.96-1.98	6.22-13.28	2760	2760	-	29463	-	29463
2	Telavi aquifer, calculated for three districts	1.22-4.21	0.39-1.17	-	1.64-5.38	2410	2410	-	7877	-	7877
3	Gurjaani aquifer, calculated for one district	1.22	0.57	-	1.79	900	-	900	-	1611	1611
4	Methane aquifer, calculated for one district	-	-	-	1.79	230	-	230	-	411	411
	In Total:					6300	5170	1130	37340	2022	39362
	Georgia					4740	3610	1130	20977	2022	22999
	Azerbaijan					1560	1560	-	16363	-	16363

Ground waters of the basin are of high quality, excluding waters at the Georgian borders, which are mineralized to 1.5-2.7 g/l. In total, mineral composition of groundwater varies between 0.1-1.0 g/l and is composed of calcium-hydrocarbon minerals; hence, on the alluvial fans the magnesia - calcium composition is dominating.

Climate. The Alazani Basin belongs to the transition zone from sub-tropical continental climate to humid climate. As the intrusion of air masses is possible only from southeast, therefore, the

[2] Source: "Gorgasali", JSC. Groundwater Resources of the Alazani Basin. Water Management in the South Caucasus. USAID/DAI. June, 2002

Basin is characterized as one of the driest regions. The average annual amount of atmospheric precipitation varies between 300-500 mm in Georgia and 500-1400 mm on the Azerbaijan side. The average annual air temperature is from $+9+10^0$ C to $+13+14^0$ C where the average temperature of the coldest month is $0 +5^0$C and the hottest month - $+22+27^0$C. On the Georgian side summers are droughty and sometimes temperature reaches up to $+40^0$C.

Vegetation cover. In the high mountains (2,500 m) alpine flora transforms into the broad-leafed forests (between 600-800 m and 1,800-1,900 m), with dominating oak, ash-tree, elm, etc. The Alazani depression is famous for riparian forests (groves) and agriculturally wealthy lands for crops, vineyards and livestock. On the right bank of the river Alazani, the steppe environment predominates, while the left bank of the river is significant with semi-desert flora and fauna.

1.2.2 Socio-economic Context

The population of the basin totals 737.7 thousand people: 333.1 thousand[3] on the Georgian side and 404.6 thousand[4] on the Azerbaijan side. There are 11 administrative districts in the region, seven from Georgia: Telavi, Gurjaani, Akhmeta, Kvareli, Signagi, Lagodekhi, Dedoplistskaro and four from Azerbaijan: Kakh, Balaken, Zagatala, Sheki (See figure 2).

Agriculture is the main economic activity within the Basin. Viticulture and wine making is one of the most developed in all districts of Kakheti (Georgian Side of the basin). The surface of the vineyards is around 38,000 ha in Kakheti. Therefore, nowadays there are around 36 wine factories with different ownerships, which are collaborating with the enterprises of American, French, German, Dutch, Russian and other countries for making high quality wine.

During the Soviet era, there were silk and tobacco production, timber processing and other industries developed. Nowadays, the small silk and tobacco factories have left in Azerbaijan and though small sunflower-seed creameries and lemonade factories operate in mostly all districts of Basin.

The Basin is rich in fruit and vegetable, as well as technical crops are very common. Cattle breeding in summer and winter pastures and viticulture are well developed on both sides of the Basin (See figure 3 for major land uses).

1.2.3 Legal-institutional Context

1.2.3.1 Institutional Context

Georgia. The Ministry of Environment (MoE) is the main regulatory agency of water resource management and protection. Specifically, the Department for Water Resources Protection carries out direct regulatory and policy-making activities, having a responsibility to develop general policies and programs, regulations, methodologies in water protection, issue surface water use licenses and maintain the State Water Use Register. The Department for Mineral Resources Protection issues licenses for ground waters. The Kakheti Regional Office of the MoE has responsibilities for water management and protection in the Kakheti Region. Specifically, MoE regional authority in Kakheti region is engaged in compliance assurance monitoring and control, as well as in water use licensing for river bodies of local importance. Recently, local inter-agency experts council has been established under Kakheti regional authority with a responsibility to review water use license applications and draw final recommendations.

[3] 2001 census data
[4] 1999 census data

Other agencies also have responsibilities for water use and protection: The Ministry of Agriculture through its Irrigation and Drainage Department, the State Department for Hydrometeorology, the Ministry of Health through its Sanitary-Hygiene Oversight Services, the State Department for Geology, the Ministry for Urbanization and Construction, the Ministry for Energy and Fuel through its Hydro Power Division and Hydro Power Design.

Azerbaijan. The Committee of Land Reclamation and Water Industry of Azerbaijan is a regulatory and law enforcement body in relation to water use for irrigation purposes. Wastewater quality is monitored and controlled by the Ministry of Ecology and Natural Resources. The Hydro-meteorological Service, subordinated to the ministry conducts surface water quantity and quality data collection. Regulatory policy in terms of water use for hydropower generation is implemented by the Ministry of Fuel and Energy.

Other water-related organizations, either state or private are as follows: Absheron Water Company, water related departments under local governments, Azerbaijan Hydro-project Institute, Institute for Geography of Academy of Science and other water related institutes under different state organizations develop scientific programs for water management.

Baku State University, Cabinet of Ministers, the Committee of Land reclamation and Water Industry and the Ministry of Ecology and Natural Resources develop regulations, state policies, programs and plans in the field of water use and protection.

Presently separate licensing systems exist for water use and wastewater discharges. Even since the Soviet Union the instructions or so-called recommendations for the allowable concentration of pollutant substances in the river waters remain, as well as the recommendations for the defined permissible limits of discharge. These allowable concentrations discharge limits are not being controlled at present.

Since January 1, 1997, the whole country of Azerbaijan established a chargeable water use for Agriculture. Since 2000 the whole country of Azerbaijan, including the River Alazani Basin started establishment of Water-users Associations. The main goals of the associations are to buy the water from Melioration Committee and the Water Industry, and to distribute among agricultural farmers.

1.2.3.2 Legal Context

Georgia. Water in Georgia is ruled, managed and regulated by the Georgian "Water Law" of 1997. According to the law water bodies are divided into the following categories: *a) Special State importance; b) State importance; c) Local importance.* The MoE compiles and approves the list of surface waters of *Special State* and *State importance*[5].

In the "Water Law" two types of water-use are identified: *general* and *special. General water-use* is not intended for economic activities, but to meet personal needs, e.g. drinking, bathing, recreation, etc., without using such buildings and equipment to influence water regime and quality; *General water-use* is free of charge and does not require licensing. *Special water-use* is conducted by hydro-technical facilities and equipment, or by usage of water quantity, which significantly affect its regime and quality. The *Special water-use* requires licensing. Licenses are issued for using, as well as discharging water. The MoE of Georgia is the authorized licensing body.

[5] Ground waters are regulated by Georgian Water Law and the Law on Mineral Resources.

Another major law in water management is the Georgian law on Land Reclamation (Melioration) regulating irrigation and drainage activities in Georgia. Specifically, it defines property rights for irrigation-drainage systems and hydro-technical facilities, delineates duties and powers between central and local authorities, and defines types and rules and procedures for the payment of irrigation water use fees.

Azerbaijan. In Azerbaijan, water resources use and protection is regulated by water code, which sets goals and objectives, rules and procedures for water use and protection, defines duties and powers of appropriate agencies and divides them between state and local authorities. The code, inter alia, sets requirement for state water registration (cadastre) and charges the State Committee on Geology, State Committee of Hydrometeorology and the State Committee of Land Reclamation and Water Industry with the responsibility to conduct state water cadastre.

1.2.3 Water Hydrology

The run-off of the Alazani River and its tributaries significantly fluctuates during the year. In winter, rivers in the basin are dry and in spring inundations and floods are common.

Most of the rivers of the Alazani basin are fed by multiple sources. Precipitation during the spring plays a significant role in forming corresponding river runoff. Estimation of expected spring flood runoff is impossible without precipitation forecast. Nowadays it is impossible to predict the precipitation with the lead-time exceeding a month. Intensity of snowmelt has a significant influence on forming the maximum river runoff. Hence, data of maximum water discharge mainly depend on meteorological conditions. Ground waters also play a significant part in forming river runoff (more than 60%) in the middle Alazani basin, which is explained by the intensive recharge of left bank tributaries from aquifers.

Overall, the rivers of the Alazani basin fall under the category of rivers with 25-50% spring run-off. For example, about 39% of the annual runoff of the Alazani river is generated in spring, 29% - in summer, 20% - in fall and 12% - in winter. Spring floods begin in March (in lowlands in the end of February) and reach maximums in May-June. The summer low water level is unstable, while in winter the low water level is stable. Daily amplitude of the water level fluctuation doesn't exceed 20 cm. In some cases, the water level remains invariable for 25-30 days. However, seldom due to rains and warm periods water level significantly increases.

Maximum alluvial run-off of the R. Alazani occurs during inundations. Mean monthly alluvial run-off reaches 100 kg/s in July at vil. Birkiani, 400 kg/s at vil. Shakriani (June) and 2300 kg/s at inflow of R. Ayrichay (June).

Table 2. Multi-year Average Values of River Run-off and other Hydrologic Parameters for the Alazani Basin[6]

River-gauging site	Drainage area km^2	Average altitude m	Discharge rate, m^3/sec	Annual flow volume km^3	Unit flow $m/(sec\ km^2)$	Factor of variation	Annual flow of different probability, m^3/sec		
							50%	75%	95%
Alazani-v. Birkiani	282	2,200	14.5	0.456	51.4	0.19	14.3	12.5	10.3
Alazani-v. Shakriani	2,190	1,200	43.5	1.370	19.9	0.25	42.5	35.7	27.4
Alazani-v. Chiauri	4,530	980	63.3	1.993	14.0	0.26	61.8	51.5	39.0
Alazani v. Zemo Kedi	7,450	900	97.5-102	3.0076-3.226	13.1	0.26	95.2	79.4	60.2

[6] State Committee of Hydrometeorology of the USSR & Trans-Caucasus Regional Institute of Hydrometeorology. Water Resources of the Trans-Caucasus. Leningrad. 1988

Alazani-1.7km from inflow	11,600	-	107	3.370	9.22	025	105	87.7	67.4
Samkuristskali –v. Khadori	121	2,590	5.60	0.176	46.3	0.15	5.56	5.0	4.31
Stori-v. Lechura	203	1,850	7.90	0.248	38.9	0.20	7.79	6.78	5.50
Intsoba-v. Sabue	41.4	1,620	1.60	0.050	38.6	0.22	1.57	1.35	1.07
Chelti-v.Shidla	72.2	1,782	2.10	0.066	29.1	0.28	2.04	1.68	1.24
Turianchai-v.Madagiz	1,340	1,280	13.8-15.8	0.435-0.498	10.3-11.3	0.23	15.8	13.4	10.6

Table 3. Average Monthly Water Discharges in Azerbaijan Part of the Alazani Basin[7]

Site	Discharge Rate, m^3/sec											
	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Alazani – Ayrichay, 1981-	71.2	73.1	94.4	146	200	178	107	90.7	90.4	87.1	94.2	87.0
Balakenchay-Balaken, 1981-	2.24	2.04	3.28	6.39	8.21	7.76	5.13	4.56	3.53	3.44	3.21	2.50
Talachay-Zagatala, 1981-	2.21	2.16	3.13	5.43	6.66	6.06	4.88	4.17	3.53	3.57	3.33	2.47
Kurmukhchay-Saribash , 1981-	1.00	0.94	1.19	1.93	3.33	2.90	2.42	2.18	2.21	1.87	1.72	1.39
Kurmukhchay-Ilisu, 1981-95	1.96	1.79	2.23	5.37	8.52	9.70	8.14	6.83	5.18	3.97	2.92	2.19
Bulaniskhu-Saribash, 1981-	---	---	---	---	1.68	1.63	1.31	1.15	1.32	1.05	---	---
Kunakhaisu-Saribash, 1981-	0.32	0.28	0.40	1.04	1.50	1.76	1.29	1.16	1.13	0.80	0.79	0.49
Gamamchay-Ilisu, 1981-87	0.49	0.53	0.72	1.82	3.15	2.99	2.07	1.80	1.32	1.21	0.87	0.63
Ayrichay-Bash, 1981-95	1.81	1.75	1.99	3.65	4.47	4.60	3.80	3.19	2.88	2.58	2.17	1.88
Ayrichay-mouth, 1981-95	14.8	15.8	16.4	18.9	23.9	22.5	16.3	13.2	14.9	16.6	17.9	17.0
Chukhoturmas-mouth, 1981-95	0.55	0.52	0.62	0.93	1.31	1.59	1.41	1.23	0.98	0.88	0.80	0.69
Damarchik - mouth, 1981-95	1.07	1.05	1.25	1.73	2.43	2.61	2.26	2.20	1.82	1.69	1.44	1.29
Hainar-mouth, 1981-95	0.37	0.33	0.41	0.69	1.00	1.11	0.84	0.80	0.67	0.60	0.56	0.46

Water quantity monitoring. The number of hydrological stations has been changed from time to time within the Alazani River Basin. According to the latest information from national Hyro-meteorological Observatories in Georgia and Azerbaijan, there are 15 hydrological stations in the Alazani basin (6 in Georgia and 9 in Azerbaijan).

Among the Georgian stations one is closed, three measure only water level, and only two upstream stations measure both discharge and level. In Azerbaijan, all nine stations operate in their full schedule.

Water level data at each station are recorded twice a day, and at a lesser frequency, a discharge measurement is made (usually, two times per month). Daily data consist of water level, water turbidity, water temperature, air temperature, and precipitation. An observer logs the data on site and sends to the regional centers (Telavi in Georgia, and Sheki in Azerbaijan). Only from two

[7] Source: Azerbaijan HMS

stations data are sent to the Hydro-meteorological Observatory headquarters (Tbilisi and Baku) on a daily basis (Alazani-Shakriani and Alazani-Ayrichay). Otherwise, data from regional centers go to Tbilisi and Baku only once per month (See figure 4 for the location of water monitoring points).

Table 4. Hydrological Sites in the Alazani River Basin[8]

Region	Station	Year of Starting Operation	Max. Depth (cm)	Range of Discharge (m^3/sec)	Max. Width (m)	Location	Status
Kakheti	Alazani-Birkiani	1950	317	1-365	30-40	343 km from the mouth	2*
Kakheti	Alazani-Shakriani	1912	295	3.80-1160	50-60	280 km from the mouth	2
Kakheti	Alazani-Chiauri	1912	709	5.33-685	70-90	201 km from the mouth	2
Kakheti	Alazani-Zemo Kedi	1955	580	17-755	80-100	95 km from the mouth	3
Kakheti	Stori-Lechuri	1945	170	2.1-33.2	10-15	16 km from the mouth	1
Kakheti	Intsoba-Sabue	1951	122	0.1-7.6	8-15	9.9 km from the mouth	1
Sheki-Zagata	Ayrichay- Bash Dashagil	1948	250	19.5-56.6	15 -25	0.5 km above the c. Zagatala	1
Sheki-Zagata	Chkhodurmaz-Mansab	1947	220	6.0-35.0	15.0- 20	1.7 km below the inflow of r. Ayrichay	1
Sheki-Zagata	Damarchik - Mansab	1947	250	18.2-129	15.0- 45	0.5 km above the c. Balaken.	1
Sheki-Zagata	Gaynar- Mansab	1948	200	3.5-25.5	7.0-12.0	0.5 km above the c. Kakh	1
Sheki-Zagat a	Ayrichay- Mansab	1962	260	59.8-112	20- 45	0.4 km from the mouth	1
Sheki-Zagata	Kurmukhchay- Ilisu	1937	350	50.0-420	27.0- 60.0	122 km from the river mouth	1
Sheki-Zagata	Talachay- Zagatala	1948	350	53.0-331	25.0-50.0	0.5 km from the mouth	1
Sheki-Zagata	Balakanchay-Balakan	1960	350	44.7-308	25.0-55.0	0.5 km from the mouth	1
Sheki-Zagata	Alazani- Ayrichay	1950	650	43.4-684	80-100	Mouth, 12 km below the v Kipchak	1

* Note: 1 – discharge and level, 2 – level, 3 – station closed

1.2.4 Water Quality

In the Georgian side of the basin, recent water quality data are not available, neither in the regional office of Georgian State Department of Hydro meteorology or in the Central office in Tbilisi. The most representative and valid data, according to HMS experts exist for years 1984-88, reflecting maximum pressures on water resources from economic sectors.

For its chemical composition, River Alazani belongs to hydrocarbon class, species calcium. During the period from 1984-88, the major constituents were biogenic substances: NH_4, NO_2^- and NO_3^-, phenols, oil products and copper. Almost every year of observation, trace concentrations of pesticides, specifically DDT, have been detected 2-3 times a year. In most cases, the concentrations of organic compounds, namely, chloroganics have varied from 3 to 36 mg/l. Salt contents varied from 60 to 700 mg/l. The maximum salt content was observed in summer period (low flow) and the minimum during high flow. The relation of common ions to different seasons is significant. Their concentrations are characterized by seasonal fluctuations. Increase of sodium and potassium concentrations was also observed during low flows, characteristic of winter periods.

High content of biogenic substances as well as existence of pesticides in surface waters of Alazani basin may be explained by pollution from return flow from cultivated lands and

[8] Source: USAID/DAI. Water Quantity and Quality in Armenia, Azerbaijan and Georgia. Analytical Report. Water Management in the South Caucasus.2000

livestock farms. Pollution by phenols, oil products and copper is supposed due to the urban run-off as well as effluents from some industrial activities.

Table 5. Annual Average Water Quality Data for R. Alazani 1986-88[9]

River Point	Year	Pollutant, mg/l												
		DO	BOD_5	COD	SS	NH^+_4	NO^-_2	NO^-_3	PO^{3-}_4	Fe	Cu	Phenol	Oil Products	Surfac-tants
Alazani - Birkiani	1986	10.27	0.7	3.3	208	0.95	0.07	2.09	0.013	0.19	0.004	0.003	0.12	0.03
	1987	10.24	0.95	19.8	216	1	0.031	0.56	0.013	0.2	0.001	0.005	0.02	0.01
	1988	10.57	3.15	8	323	1.05	0.025	0.4	0.011	0.12	0.001	0.005	0.03	0.02
Alazani-Chiauri	1986	8.13	0.72	4.8	298	0.76	0.04	2.95	0.017	0.23	0.005	0.005	0.11	0.03
	1987	7.93	1.41	27.8	381	0.8	0.041	0.92	0.019	0.22	0	0.006	0.02	0.08
	1988	9.76	3.9	7.7	417	1.21	0.037	0.49	0.012	0.13	0.004	0.006	0.02	0.02
Alazani-Zemo Keda	1986	7.54	0.86	7.4	194	0.82	0.033	1.89	0.02	0.22	0.007	0.005	0.13	0.02
	1987	7.48	1.09	14.1	388	0.75	0.041	0.96	0.02	0.23	0.001	0.007	0.04	0.01
	1988	10.11	3.7	6.6	761	1.22	0.032	0.62	0.011	0.13	0.022	0.008	0.03	0.02
Alazani Canal -Kondoli	1986	8.66	0.76	5.7	1009	0.8	0.026	2.05	0.019	0.31	0.003	0.005	0.1	0.03
	1987	8.66	1.28	22.9	186	1.18	0.037	0.84	0.017	0.2	0	0.006	0.01	0.02
	1988	10.56	4.16	8	249	1.42	0.025	0.55	0.012	0.14	0.001	0.006	0.01	0.02
Alazani Canal - Zemo Keda	1986	7.1	0.81	6.1	1140	0.97	0.042	3.78	0.017	0.32	0.004	0.006	0.08	0.03
	1987	7.04	1.4	14.4	456	0.82	0.047	0.92	0.014	0.17	0.001	0.007	0.03	0.01

Only episodic data exist for Lower Alazani Irrigation system water and nearby soil quality, collected under the WB Irrigation-Drainage System Rehabilitation program as a part of the EIA[10]. In 1998, water samples were taken from two points located at headworks. No significant pollution of water was detected, except for the pollution from ammonia, which exceeded existing Georgian water quality standards two-three times. Ammonia concentration was beyond the EU limits as well. In soil samples, trace levels of DDT and DDE and heavy metals were also detected[11].

In the Azerbaijan side, water quality data are available up to date. In total, average mineral composition from the river source to the mouth varies between 150 mg/l to 500 mg/l. With the highest mineral contents in the River Ayrichay with the 500-600 mg/l minerals at the junction. In total, all the rivers are included in the group of medium mineral content.

One of the main parameters of water quality is turbidity. The turbidity of studied rivers in Azerbaijan varies between 500-1000 g/m^3 to 4000 g/m^3. The maximum turbidity exceeding 4000 g/m^3 is for Kishchay and Shinchay rivers. The turbidity of the rivers is increasing at their junction to the Alazani -Ayrichay depression. Kainar, Talachay and Ayrichay are significant with the highest turbidity. During the cold period of the year the turbidity of the rivers falls and during the warm periods it rises. This regularity is appropriate to the characteristics of the annual river runoff with the annual distribution of precipitation.

9 Source: Institute of Hydrometeorology of Georgia, HMS of Georgia
10 EIA-Environmental Impact Assessment
11 Source: EC Tacis/World Bank. Environmental Impact Assessment: World Bank Irrigation and Drainage Community Development Project. Georgia. April 2001

Table 6. River Turbidity in the Azerbaijan Part of the Alazani Basin, 2000[12]

?	River-Point	Turbidity, mg/m^3												
		Monthly												Annual
		1	2	3	4	5	6	7	8	9	10	11	12	
1	Katekhchay-Kabisdare	0.012	0.008	0.311	0.213	0.350	0.405	1.085	0.748	0.667	0.528	0.054	0.078	0.445
2	Talachay-Zagatala	0.538	0.494	0.550	1.745	2.070	1.992	1.647	4.640	5.902	1.302	0.664	0.636	2.186
3	Kurmukhchay-Saribash	0.480	0.490	0.885	1.265	1.897	1.924	1.542	1.303	1.161	0.878	0.750	0.636	1.232
4	Kurmukhchay-Ilisu	0.120	0.125	0.314	0.478	0.752	1.329	1.300	1.252	1.254	1.253	0.250	0.172	0.867
5	Kunakhaisu-Saribash	0.147	0.200	0.200	0.462	0.825	0.844	0.643	0.475	0.403	0.250	0.167	0.119	0.500
6	Gamamchay-Ilisu	0.044	0.060	0.105	0.135	0.179	0.179	0.160	0.137	0.118	0.103	0.082	0.077	0.137
7	Agchay-Agchay	0.328	0.338	0.384	0.442	0.536	0.535	0.491	0.448	0.440	0.400	0.378	0.353	0.438
8	Ayrichay-Bash Dashagil	0.400	0.467	0.692	1.746	2.921	3.333	2.238	2.000	1.824	1.357	0.944	0.616	2.165
9	Damarchik-mouth	0.074	0.056	0.065	0.375	1.896	4.053	4.058	3.225	2.910	0.830	0.246	0.115	1.956
10	Chukhadurmas-mouth	0.526	0.563	0.572	0.484	0.759	2.259	1353	0.530	0.458	0.444	0.441	0.462	1.0
11	Kainar-mouth	2.500	2.857	2.500	1.834	2.500	4.052	2105	1.600	1.591	1.500	1.880	2.273	2.4

The main sources of surface water pollution in the Azerbaijan part of the basin is the household domestic wastewater from the towns and other settled places, and agricultural run-off. The rivers are polluted mostly by biogenic substances. Trace levels of pesticides are not found.

Table 7. Annual Maximum Concentrations of Selected Constituents for R. Alazani and its Tributaries in Azerbaijan, 2000[13]

River – Point	Pollutant, mg/l												
	NH_3	NO_3	P	Fe	Pb	Zn	Al	Mn	BODs	Oil pro-ducts	Phenol		Surfactants
											Volatile	Non-volatile	
Ayrichay mouth	0.1	0.058	0.1	0.11	0.014	0.011	0.011	0.011	1.92	0.09	0.21	0.01	0.006
Balakenchay Balaken	0.08	0.013	0.128	0.25	0.016	0.013	0.016	0.009	1.69	0.08	0.008	0.005	0.05
Katekhchay Kabisdare	-	-	-	-	-	-	-	-	0.49	0.05	0.004	0.005	0.03
Talachay Zagatala	0.08	0.007	0.128	0.16	0.015	0.011	0.009	0.010	2.04	0.09	0.007	0.005	0.03
Kurmukhchay Kakh	0.12	0.02	0.098	0.17	0.012	0.013	16.6	0.013	1.92	0.10	0.005	0.004	0.04
Ayrichay Gupchal	0.07	0.007	0.033	0.13	0.014	0.07	7	0.006	1.83	0.16	0.004	0.003	0.03

Water quality monitoring. Traditionally, national HMSs conducted water quality sampling and analysis in Georgia and Azerbaijan. They maintained sampling points mostly coinciding with hydrological sites. The sampling was traditionally conducted periodically on a manual basis. Samples with custody of chain rules were delivered and analyzed and processed at the central analytical laboratories and information centers respectively. The combination of both wet chemistry and automatic methods were used for sample analysis. Over 50 physico-chemical parameters were measured.

12 Source: HMS of Azerbaijan

13 Source: HMS of Azerbaijan

Table 8. Water Quality Sampling Points in the Alazani River Basin[14]

#	Region	River-Observation Point	Year of Starting Operation	Description	Status
1	Kakheti	Alazani, v. Birkiani	1965	5 km above Birkiani	3[15]
2	Kakheti	Alazani, v. Chiauri	1957	1.25 km west of Chiauri, 30m above bridge	3
3	Kakheti	Alazani, v. Zemo Keda	1985	8 km below Zemo Keda, near the gauging site	3
4	Kakheti	Stori, v. Lechura	1966	0.26 km above Lechura, 16km above the outflow	3
5	Kakheti	Didkhevi, v. Artana	1967	5 km above Artana, near the gauging site	3
6	Kakheti	Duruji, c. Kvareli	1989	1km west of Kvareli, 8.6km above the outflow	3
7	Kakheti	Lagodekhi, Lagodekhi Reserve	1986	1km above Lagodekhi, near gauging site	3
8	Kakheti	Alazani canal, Kondoli	1986	7km east of Kondoli, 4.5 below headwork	3
9	Kakheti	Alazani canal, Zemo-Kedi	1986	3.5km north of Zemo Kedi	3
10	Sheki-Zagatala	Talachay- Zagatala	1970	0.5 km above the city Zagatala	1
11	Sheki-Zagatala	Balakanchay- Balakan	1970	0.5 kms above the city Balaken	1
12	Sheki-Zagatala	Ayrichay- Mouth	1969	Mouth. 12 km below the village Kipchak	1
12	Sheki-Zagatala	Katekhchay-Kabizdar	1969	0.8 kms are lower than village Kabizdara	1
14	Sheki-Zagatala	Kurmukhchay- Kakh	1970	0.5 kms above the city Kakh	1
15	Sheki-Zagatala	Alazani- Ayrichay	1970	1. 1.7 kms below the inflow of r. Ayrichay	1

At present, the Baseline Environmental Monitoring Center under the national HMS is responsible for water quality data collection, processing and reporting in Georgia. The center does not maintain stationary water quality measurement stations. In the Georgian part of the Alazani river-basin, data collection has diminished dramatically since 1990, and in the last two years sampling has not been conducted at all. In Azerbaijan, the Ministry of Nature Protection conducts water quality monitoring through its national HMS. Sampling is conducted on a regular basis (See figure 4 for the location of water monitoring points).

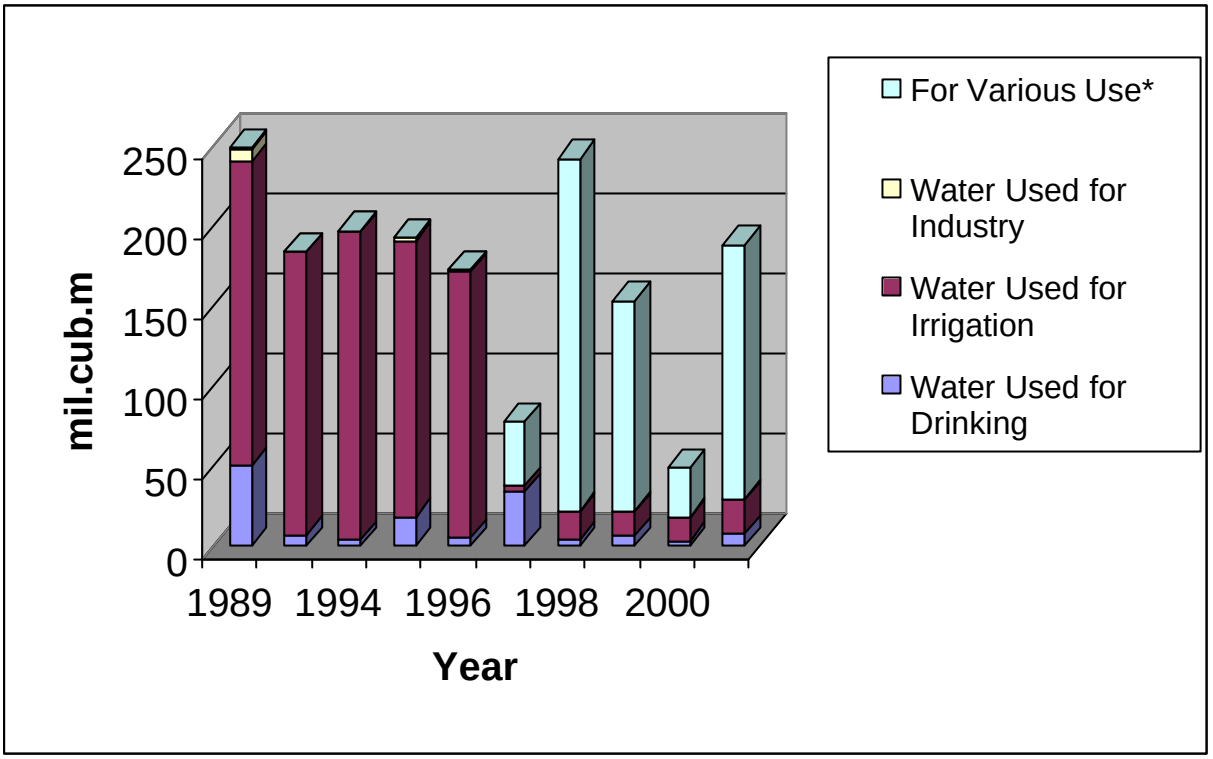
1.2.5 Water Uses

In 1970s and 80s, the Alazani river and its tributaries were intensively used for irrigation, drinking water supply and industrial usage. The river was also used for hydropower generation and recreation, to a lesser extent. Agricultural usage was the most intensive, since the region is largely agriculture based and most of agriculture lands need irrigation. In the early 1990s, all economic activities declined significantly due to the post-Soviet economic crisis. Consequently, water uses by all economic sectors have also declined relative to the 1980s.

[14] Source: USAID/DAI. Water Quantity and Quality in Armenia, Azerbaijan and Georgia. Analytical Report. Water Management in the South Caucasus.2000

[15] 1 – regular sampling; 2 – intermittent sampling; 3 - closed

Figure 5. Dynamics of Various Types of Water Uses in Georgian Side of the Alazani Basin[16]



Note*: Including water used for hydropower generation

Similarly, in the early 1990s total wastewater loads into surface waters have been reduced, especially from industrial activities. The share of domestic sewage in total discharges has increased. It is assumed that water pollution has not decreased with lower loads, because wastewater treatment and removal efficiency has also diminished. At present, some signs of economic revival can be observed that may be the reason for increased pressures on surface waters.

Currently, the major water users in the Alazani River Basin are as follow:

- Six (6) melioration units on the Georgian side, as well as four units on the Azerbaijan side of the basin;
- Water Units and Communal Services supplying potable water to population;
- Industries are not so developed as in other parts of Azerbaijan and Georgia. Moreover, during the last decade many industries were shut down or continue working at minimum capacity. Most of the industries on the Georgian side of the basin do not have licenses for water use and discharge, though some of the strongest factories are in the process of obtaining them.

Potable Water Supply. Water Units and Communal Services represent one of the major water users in the Georgian side of the Basin. The units extract drinking water from both surface, as well as ground water bodies. None of the water units has a water use license. All of these organizations have several problems in not only extracting potable water but also in discharging wastewater. Most of the cities, not mentioning the districts (villages) lack centralized water supply systems and the inhabitants from such areas are to fetch several liters from a distance approximately 1 - 7 km per day. Moreover, networks that already exist are very old and outdated and therefore, there is high loss of water in distribution networks. In some areas of the Basin the

[16] Source: MoE of Georgia. Statistical Reports (Water).

potable water supply intake facilities, (as well as water treatment, filtrating and disinfecting facilities) and pipe network are already destroyed and require rebuilding or searching for new sources for building new technical facilities. The water units and communal services have problems of water metering and have very low tax collection rate, which has become one of the major impediments for their work. In most of the areas of the Basin, potable water doesn't meet sanitary standards, as there are no water treatment, filtrating and chlorinating facilities at the intake facilities.

In the towns of Balaken, Zagatala, Kakh and Sheki drinking water supply is provided by separate water supply and sewerage systems, which are under public ownership. These four agencies do not have any license, either for water uses or for discharge; although, they are practically private structures, mostly maintained by self-finances. These four agencies will need to get their licenses in the near future.

The pipe networks, built 30-40 years ago, maintain drinking water supplies. That is why there are many accidents. The best conditions for water distribution networks are maintained at the district level, where the water pipe network is in a good status. In Balaken the whole system of 65 km is destroyed.

Drinking water is abstracted from surface and ground waters. As it was mentioned before, all four towns have centralized water-supply systems, which are fed by river waters. In the mountainous villages rivers as well as spring waters are used for drinking. In the valley, villages of the region artesian waters are also used for drinking.

In the towns, the water supply system needs rehabilitation works. There are many occasions when accidents occur in the pipes. For example, Balaken water supply pipe goes under the major motorway, and every time there is damage, the motorway is destroyed as well.

Among technical problems, poor condition of intake facilities is the largest. During the recent 3-4 years drinking water is not filtered and chlorinated. Because of less strong pollutants of water resources in the region the quality of drinking water still meets standards.

One of the largest problems exists in the collection of water use taxes, as well as in Georgian side, which is quite low, especially from individual households.

Irrigation. The main water uses of the River Alazani Basin are the irrigated agriculture.

In the Georgian side of the basin, the irrigation systems are still the largest water user, as was the case in the 1980s. According the MoE of Georgia, total irrigation water use in 2001 was about 21 million m^3, which is nine times lower relative to the 1990 level.

There are six irrigation systems, located in all districts of the Kakheti region. Of these, three systems: Kvarei, Lagodekhi and Dedoplistskaro are irrigation-drainage systems, while the others are only irrigation systems. These are the strongest organizations for the agricultural development in the region. At present, some parts of the systems, including intake facilities, and primary and secondary canals are already outdated and need rehabilitation. The World Bank is interested in financially supporting the rehabilitation of irrigation systems on the Lower Alazani, where new policies and rehabilitation activities are starting to take place. The rest of the system remains in extremely poor condition. Most of the primary and secondary canals are not lined with concrete, and approximately 50 % of water is lost every year. Many of the systems need mechanical pumping, that in many cases is not implemented due to power shortages. For example, one of the irrigation systems in Dedoplistskaro district, "Zilicha II", which used to irrigate 4,427 ha of agricultural lands is located on the plateau and needs intensive mechanical pumping to the reservoir. Due to the power shortage, the system does not work at present. The Irrigation District Management Offices have low rates of tax collection, which is the biggest

problem in regulating the water resources and systematic supply to the users. According to a Presidential decree, 1997, water-users associations need to be established to support the irrigation management offices in managing the water resources in the internal channels**.** Some of the water-user associations were established in the region, of which only one or two are legally registered. Others exist only as informal groups. These water user associations lack finances to register and jump-start their activities.

The Azerbaijan part of the basin pertains to the Sheki-Zagatala Economic District, which is one of the leading in the grain-crop, tobacco, and nut production, as well as vine and tea; pastures are also developed here. Nowadays, 54,484 ha are irrigated. Total irrigation use in 2000 was 61.24 million m^3, which is more than 90% of total water use in the region.

In the Sheki District, 22.4 % of irrigation lands are well supplied, while 77.6 % are in bad conditions. During the dry periods of the year, because of poor water supply, large portions of agricultural yields are destroyed.

In the Zagatala District, the first two water users associations were established, which has had a positive impact on water collection, distribution, and water tax collection among farmers, including small-scale farms. In the district, 81% irrigated lands are poorly supplied with irrigation water.

In the Balaken District, the situation is worse, while 97.8% of the lands have lack of irrigation water supply.

Wastewater Discharge and Removal. The major source of point source pollution within the Alazani basin is municipal wastewater. Most of the urban areas are covered by centralized sewerage systems, with little exception. There is only one city, Tsnori in Georgia, that does not have a sewerage system at all. None of the systems covers the entire municipal areas, and on average, their coverage rate does not exceed 50%. Only two municipal systems in Georgian part of the basin cover a maximum of 70- 80% of the town. Existing sewerage systems are outdated and their designed capacity is much lower than is required. None of the systems has wastewater treatment plants, and sewage is directly discharged either on agricultural lands or into the River Alazani and tributary rivers. Rural areas are not covered by centralized sewerage systems.

Table 9. Cities with Centralized Sewerage Systems

City	Existence of Sewerage System	Coverage Area in the City (%)	Wastewater Treatment Type	Wastewater Discharge in the Watershed	Volume of Wastewater Discharged (1000 m3/sec)	Current Status	Discharge License
Telavi	Yes	70	Used to be Biological Treatment Type.	River Alazani	118.4	Operational, in bad conditions. Needs major repair	No
Gurjaani	Yes	50	No	River Alazani	40	Operational. Needs small repairs	No
Kvareli	Yes	40	No	River Alazani	600	Operational. Needs to expand carrying capacity	No
Lagodekhi	Yes	80	No	River Shromiskhevi	300	Operational. In bad condition. Needs to expand carrying capacity	No
Signagi	Yes	20	No	River Anagiskhevi/ Alazani	8	Out of order	No
Tsnori	No	0	No	River Alazani			No
Dedoplistskaro	Yes	40	No	River Artsiviskhevi	6	Out of order	No
Balaken	Yes	40	No	River Balakenchay	80	Operational. In bad conditions. Needs major repair	No
Zagatala	Yes	60	No	River Talachay	150	Operational. Needs major repair	No
Kach	Yes	10	No	River Kurmuchchay	60	Operational. In bad conditions. Needs major repair	No
Sheki	Yes	50	No	River Kishchay	200	Operational. In bad condition. Needs to expand carrying capacity	No

Industrial pollution is quite low compared to years back in the Soviet era. Wastewater is discharged only from those facilities which are in operational condition. Apart from this, existing facilities work at minimum loads, hence discharging smaller quantities of wastewaters. However, the absence or obsolescence of wastewater treatment capacities might offset the situation. For example, the wineries in Georgia were major industries in the Kakheti region and used to have mechanical and biological wastewater treatment plants, which currently do not work. However, nowadays the wastewater from these wineries is discharged directly to the river, or to storm water channels, or to the municipal sewerage systems, or is discharged to the local ground surface.

As to the mini factories of lemonade and creameries, their designed capacity is very low and they are mostly located in private houses. Hence, wastewater is discharged into the sewerage systems of municipalities or in the nearest storm water channels.

Diffused sources: Among diffused sources, the most significant ones are agricultural run-off, drainage waters from legal waste disposal sites and illegal dumpsites, as well as urban run-off**.**

Agricultural run-off is quite high, because the main part of the Alazani Basin covers agricultural lands. Currently, irrigation systems are outdated and high amounts of water is lost from damaged channels. Besides, there are numerous unsystematic irrigation water channels through the agricultural territories, from where nutritional and chemical contaminates are washed down into the River Alazani or tributary rivers. Nevertheless, It can be assumed that current decreased loads of fertilizers and pesticides result in higher quality of irrigation drainage water, than used to be in the 1980s.

As to the waste disposal issues, wastes in municipal areas are disposed on specially arranged landfills that do not meet minimum health and environmental requirements. Some of the urban areas, for example, the towns of Lagodekhi and Kvareli in the Georgian side do not have legal landfill sites at all. There are no solid waste treatment plants in the basin. None of the existing landfill sites has defensive borders; therefore, the municipal waste is scattered all over the nearby territories and into riverbeds. The villages chaotically dispose of household solid waste in the storm water channels and in the nearest riverbeds.

Table 10. Solid Waste Disposal Sites in the Alazani Basin

City	Area (ha)	Location. Distance From the City (km)	Responsible Body	Type of Waste	Current Status
Telavi	2	13	Ltd. Municipal Service	Household	In bad conditions. No defensive borders. No waste treatment. 60m far from Turdo river.
Gurjaani	2	6	Ltd. Municipal Service	Household	In bad conditions. No defensive borders. No waste treatment. Near Akhtala river.
Lagodekhi	-	-	-	-	-
Signagi	0.5	6	Ltd. Municipal Service and Water Unit	Household	In bad conditions. No defensive borders. No waste treatment.
Tsnori	2	10	Ltd. Municipal Service and Water Unit	Household	In bad conditions. No defensive borders. No waste treatment. Surrounded by the water channel.
Dedoplistskaro	1	Nc	Ltd. Municipal Service	Household	In bad conditions. No defensive borders. No waste treatment.
Kvareli	-	-	-	-	-
Balaken	1.5	2.5	Management of water and sewer lines	Household	In bad conditions. No defensive borders. No waste treatment. 150m far from Balakenchay river.
Zagatala	1.5	3	Management of water and sewer lines	Household	In bad conditions. No defensive borders. No waste treatment. 200 m far from river Katekchay.
Kach	1	2	Management of water and sewer lines	Household	In bad conditions. No defensive borders. No waste treatment. 300 m far from river Kurmukchay
Sheki	2	9	Management of water and sewer lines	Household	In bad conditions. No defensive borders. No waste treatment. 60 m far from river Kishchay

Industries. Industry in the basin is not as developed as it used to be during Soviet times. Most of major industries producing silk, tobacco, tinned food, dairy, or timber and etc., are shut down. Nowadays, there are small sunflower-seed creameries and lemonade factories in a majority of the districts on the Georgian side of the Basin, though their production is so low that they haven't been visited, or interviewed by the Georgian team of the Alazani Consortium. Wine factories were identified as one of the major water-users on the Georgian side of the basin, and still some of them are not in operational conditions. According to 2001 data provided by MoE of Georgia, annual industrial water use is about 400,000-700,000 m^3, which is 11 times less than 1989 levels.

Most of the wine factories, in working condition extract the ground waters to secure permanent water flow in the factories. The factories do not use large amount of water in the production cycle, though, the rest of the water resources are either provided to the neighboring households, or just discharged into irrigation canals, storm water canals, local ground surface, or just in nearby riverbeds. Most of the factories have the economic ability to pay water use taxes and to purchase water use and discharge licenses, though in practice they do not. There are no metering systems in the factories to conduct the water use measurements and to make it possible for the authorities to control it. Moreover, the inspectors, responsible for controlling the water use patterns have difficulties by law to go in the enterprise and observe, or control (Laws on the Enterprise Control, #58 Ch. II and #60, Ch. VII').

The Sheki-Zagatala region is the famous rural region of Azerbaijan, where agriculture is very well developed, but industry is not significant. Main representatives of the industry sector are Zagatala tobacco factory, Zagatala timber factory, Sheki silk factory and tinned food factory. The latter are in all the towns of each district.

Unfortunately, none of these industries is operating with full capacity, and all of them work only during some seasons. All these industries are registered separately under the towns' mayor's offices. The water quantity used by industry is not significant. All the factories consume water from the central municipal water supply systems and all of them pay for water use.

Hydropower. The river Alazani and other rivers in the basin have great energy potential, which are both inefficiently used and under-utilized. There are five major hydropower plants, which can produce 12 MW of electricity, according to their designed capacity. However, existing hydropower generators are in such poor conditions, that they are able to produce only 4.86 MW electricity approximately. At present, two new hydropower plants: "Khadorhesi" and "Cheltihesi" are being constructed and one existing plant "Napareulhesi" reconstructed. These three hydropower generators are supposed to have a designed capacity in total 35.6 MW.

Table 11. Hydropower Plants in the Alazani Basin

Name	Location	Year of Exploitation	Designed Capacity (MW)	Current Capacity (MW)	Current Status
Chalahesi	Chala Reservoir (Kvareli)	2001	1.5	0.7	Operational/ Rehabilitation Needed
Intsobahesi	River Intsoba (Kvareli)	1999-2000	1.95	0.16	Operational/ Rehabilitation Needed
Alazanhesi	Vil.Vejini. Irrigation Channel (Gurjaani)	1948	5	2.5	Operational/ Rehabilitation Needed
Kabalhesi	River Kabal. Vil. Baisubani (Lagodekhi)	nc[17]	1.5	nc	Operational/ Rehabilitation Needed
Napareulhesi	Vil. Napareuli. River Lopota Telavi)	Under re-construction	2	1.5	Under re-construction
Khadorhesi	At the junction of Alazani and Samkura Rivers	Under construction	24	na[18]	Under construction

[17] nc – not clear
[18] na – not applicable

Cheltihesi	Vil. Shilda, Kvareli	Under construction	9.6	na	Under construction
Total			**11.95**	**4.86**	

In the Azerbaijan part of the basin, there aren't any hydro-power plants, as all electricity is provided to the population from the Mingechavir reservoir. The amount of electricity supplied is not enough for the whole region, and therefore necessitates building new hydro power plants in the region. All the rivers in the region are mountainous and have sufficient water. Consequently, the hydropower potential of the rivers is very high, though the perspective development is small. All the rivers in the region are characterized by flash flooding.

Recreation. The Alazani Basin is rich in recreational resources. However, poor infrastructure and lack of institutional set-up results in unsustainable use of the recreational resources. Nowadays, new projects are to be implemented in some parts of the Basin; one of the major projects is the establishment of national parks around the two natural reserves in the Basin (Georgian side). Another major project is to establish hunting farms in the groves of the river Alazani**.**

The Azerbaijan part of the Alazani Basin is one of the picturesque districts of Azerbaijan. Mountainous relief, mountainous forests, waterfalls, rivers - all of these are attractive for tourists. During recent years new tourist bases were opened in all four districts. Recreational resources are good for promoting tourism development. There are many mineral springs, one of them, the very famous "Ilisu" in the District. All the tourism bases are supplied by water from springs. In choosing new locations for tourism development springs are very significant.

Fisheries. On the Georgian side of the Alazani Basin there are approximately 34 ponds covering 1,304 hectares of agricultural lands on the Alazani Valley. Some of these ponds are used for fisheries, and they have medium production**.**

There is one water-reservoir and 15 ponds in the Azerbaijan side of the basin**.** Currently they are not used for fisheries, though one of the largest among the business undertakings on these ponds can be a fishery.

2.0 PRIORITY WATER FUNCTIONS AND ISSUES

2.1 Criteria and Methodology for Setting Priorities

Planning is an initial step of the management process, which implies the collection of baseline information, identification of major issues and needs and the development of a detailed plan with appropriate remedial measures, costs and timelines.

As far as the time and available resources are concerned, it is not possible to address all the water functions and issues in river-basin plan. Because of that, the prioritization of major water functions and issues is needed in order for the plan to be realistic and viable.

In order to identify priority water functions and issues the Alazani Consortium widely used experts' elicitations. For this, three sessions with local stakeholders, two at local level and one at regional level were held.

Water functions and issues were ranked based on environmental, social, economic and geographic criteria. Each water function was assigned a separate score on an increasing importance basis.

For prioritizing issues, both quantitative and qualitative analyses were conducted. Under quantitative analysis, the number of functions with similar issues was identified (The highest priority was given to the issue, which was involved in all water functions) (See appendix 1).

In the qualitative analysis, the experts tried to identify the causal relationship between issues of different functions. This is a relationship in which a change in one-event forces, produces, or brings about a change in another. The experts prioritized issues, based on the number of correlations with other issues (See appendix 1).

Below water functions and issues are listed in a prioritized way.

2.2 Drinking Water Supply

Drinking, or potable water supply issues were identified the major issue in all Georgian, as well as Azerbaijan districts. Each urban area has appalling conditions in technical facilities and pipe networks. Similarly, some centralized rural systems, which do not depend on the urban water units, face the same problems. Meanwhile, the legal-institutional capacity of all the managerial units is extremely low.

However, there have been several loan and grant programs financed by the WB and Social Investment Fund (SIF) in the Georgian side of the basin for rehabilitation of technical facilities. For example, the WB financed the rehabilitation of a major drinking water pipeline in the city of Telavi, while SIF financed rehabilitation of intake facilities in Kvareli, Signagi and Lagodekhi Districts.

2.2.1 Priority Issues

The following major issues were identified under drinking water supply:

Water-related Issue:

- *Water shortage* issue has been given first priority. It consists of three sub-issues, such as:
    - Uncontrolled use for irrigation, which is identified mainly in Balaken;

- Lack of natural water resources, identified in Telavi, Signagi, and Dedoplistskaro, as in one of the driest districts of the basin;
- Intermittent supply of water resources due to power shortages, mainly caused by the energy crisis in Georgia plus complicated geographical patterns and lack of natural water resources, that were identified in Signagi, Dedoplistskaro and Gurjaani districts;

- *Water turbidity* is mainly resulted by geomorphologic, geologic and seasonal hydrological characteristics of the Great Caucasian rivers and is well identified in Lagodekhi, Kvareli and Balaken districts of Basin;
- *Drinking water pollution*, is the third most significant water issue, which is caused from the point sources - households, industries and hospital discharges, and diffused sources - agriculturale run-off, dumpsites, urban run-off, etc. The pollution is significant in all the districts of the Azerbaijan side, as well as in Gurjaani and Dedoplistskaro in the Georgian side.

Technical Issues:

- *Underdeveloped and obsolete infrastructure* is one of the most problematic issues in the basin that covers the following sub-issues:
  - Chlorinating facilities, which are identified damaged or absent in all districts of the basin except in Telavi and Gurjaani;
  - Water intake facilities in all districts of the basin are in deplorable conditions;
  - Distribution networks are also underdeveloped and obsolete;
  - Water metering systems do not exist in the whole basin, and therefore water supply regulations and control is nearly impossible

Legal-Institutional Issues:

- *Institutional weakness* is also a major problem in all districts of the basin and is divided into the following sub-issues:
  - Lack of expertise and professional staff, caused by financial scarcity as well, while the agencies cannot attract the experts and professionals needed;
  - Lack of office and laboratory equipment - as the old equipment is out of date and most of the offices have been robbed or destroyed, while new office and laboratory equipment are not provided;
  - Lack of finances, caused by the overall financial scarcity of both countries;
  - Low level of interagency and regional cooperation, which causes problems in information exchange mostly among the agencies working in related fields;
  - Low tax collection is the result of the inherited mentality of population from the Soviet Union, when nobody paid water use fees.

2.3 Public Health and Ecosystem Support

Public health support is the second major function of the Alazani River, since it provides drinking water for population as well as supports the maintenance of proper sanitary-hygienic conditions.

Regarding ecosystem processes support, the basin is rich in biodiversity and has high ecological and aesthetic value. Two natural reserves are located on the Georgian side and two on the Azerbaijan part. Therefore, rich flora and fauna, aquatic and riparian biodiversity, characterize the basin. The forest degradation process also impacts endemic and threatened species. Moreover, riparian forests in the Alazani Valley are convenient wintering places for migrant

waterfowl and the riparian degradation itself causes the decrease in the amount of waterfowl migrations. Riparian flora itself is quite unique with its endemic composition of flora and breeding places for various species like raptors, owls, etc. The Alazani River is rich with aquatic fauna of endemic species.
Recently, several fish farms have been allocated in the Valley, but only in the Georgian side of the basin, though, actual potential in Azerbaijan persuades to the fishery development for the future as well. (See Technical Report 2, chapter 4).

Difficult socio-economic conditions of the district residents of the basin persuade to the intensive forest cut, followed by soil degradation, erosion, landslides, riparian forest degradation, water debit, etc in the basin. Forest management units have low capacities to impede this process. Although, in some districts forest degradation has become one of the priority issues for the residents.

2.3.1 Priority Issues

The following issues were identified under this function:

Environmental Issues

- *Riverbed erosion and sedimentation* occur in all districts
- *Water shortage and thus, impossibility to maintain minimum run-off*. As it was mentioned, this has been evaluated as the second most significant issue and is identified in all districts of the basin
- *Deforestation* has become a significant problem after the collapse of Soviet Union, when energy crisis and poverty led inhabitants towards forest intensive cutting. Therefore, Telavi, Kvareli, Lagodekhi, Gurjaani, in Georgia and all districts of the Azeri side have been identified with zones of deforestation processes
- *Surface and Ground water pollution* has been identified as the most significant issue common to all districts of the basin, which is divided into the following sub-issues:
  - Point source pollution from households, industries and hospitals, resulting from the non-existence and obsolescence of water supply and sewerage systems, such as intake facilities, distribution networks, sewage treatment facilities, etc. and is distributed in all districts of the basin;
  - Diffused source pollution, which is caused by the overloaded and out-of-date landfills, illegal dumpsites and agricultural run-off and also covers all districts of the basin;
- *Uncontrolled flooding and mudflows* has been identified as the fourth most significant water issue in all districts of the basin, especially for the river Durudji in Kvareli district of the Georgian side.

Health Issues

- *Drinking and Irrigation Water Pollution*, which are the main problems in the basin, consist of sub-issues:
  - *Absence and lack of chlorinating facilities* in all districts of the basin except Telavi and Gurjaani;
  - Absence of capacity to control drinking and irrigation water quality;
- *Goiter and the lack of Iodine in the drinking water* have been identified as one of the painful problems of the basin population (the basin is an endemic zone for Goiter). Moreover, there is the lack of medication and fewer financial possibilities in both countries to fight against it;
- *Malaria* is also a significant problem in Lagodekhi, Kvareli, Signagi as well as in all Azeri side districts. The cases of malaria in population increase annually.

Legal-Institutional Issues

- *Institutional weakness* is acknowledged to have the following sub-issues:
  - Lack of integrated management of ecosystems is caused by the lack of people who have relevant knowledge and education in environmental and ecological issues;
  - Lack of professional staff in the fields of public health protection and environmental management;
  - Lack of finances, identified in both countries in all fields of activities

2.3 Irrigation Water Use

Irrigation is the largest water use in the pilot area since the region is heavily agriculture-based and most of agricultural lands need to be irrigated. During the last decade total areas of irrigated lands have been significantly reduced due to various issues of technical, economic, institutional, etc. character.

2.3.1 Priority Issues

Environmental Issues

- *Poor water quality* is identified in Kvareli and Lagodekhi districts;
- *Water shortage* is common in Signagi, Dedoplistskaro and Sheki and, as it was mentioned before, is the second most significant problem;
- *Inefficient use of water resources* appear in Kvareli and Lagodekhi mostly, its sub-issue is:
  - High losses in the distribution network, which is practically caused by the obsolescence of infrastructure is significant in all districts of basin;
- *Water pollution from irrigated lands* is the most significant issue pertaining to surface and groundwater pollution, in all districts of the basin

Technical Issues

- *Obsolescence of infrastructure* is the problem in all functions and consists of the following sub-issues:
  - Irrigation network
  - Water intake facilities, damaged and out of date in all districts of the basin;
  - Pumping stations appear as problems in Dedoplistskaro and Gurjaani mostly;
- *Lack of irrigation reservoirs* are the issues in all districts of the basin;
- *Power shortage for water pumping* is significant in Signagi, Dedoplistskaro and Gurjaani;
- *Non-existence of water metering systems* in any of the districts

Legal-Institutional Issues

- *Weak institutional capacity* is common not only for all districts of the basin but also for all four functions too, with the following sub-issues:
  - Lack of finances;
  - Need for establishment and strengthening of irrigation associations that are essential for better management of irrigation systems;
  - Low water tax collection rate;
  - Lack of expertise
- *Lack of Office Equipment*

2.5 Hydropower Generation

The theoretical energy capacity of the Alazani River is 258.8 MW, while only 12 MW of hydropower is developed in the Georgian side of the river. At some point, it is an indicator of the inefficient use of hydro-resources, especially in the districts where the water energy capacity is quite high. In the Azerbaijan part of the basin, there aren't any hydropower plants, as all electricity is provided to the population from Mingechavir reservoir.

Besides hydropower, various reservoirs and dams are used for irrigation purposes, as well as recreation for nearby residents.

2.5.1 Priority Issues

The following issues were identified under this function:

Technical Issues

- *Obsolescence of technical facilities* is identified in Telavi, Kvareli, Lagodekhi and Gurjaani
- *Insufficient utilization of hydro resources* is also significant in all districts is a problem because of the existence of potential for micro-power plant generation

Legal-Institutional Issues

- *Lack of finances for hydropower sector development* requires high financial input, which neither country can provide. The hydro-power sector has chances to develop in all districts of the basin, except Signagi and Dedoplistskaro;
- *Excessive centralization of hydropower distribution and* n*on-existence of basin-wide power grids* is a problem. In the Azerbaijan part of the basin, as it was mentioned before, there are no hydropower plants. In the Georgian part of the basin, all the electricity that is produced within the basin goes into the central grid, from where it is spread to the whole country. The local producers have little access to it.

3.0 RIVER-BASIN ACTION PLAN

In general, while planning future activities, it is necessary to take into consideration the time-frame for planned activities and available resources both financial and technical. Whether an activity is planned for short, medium or long-term period is pretty much dependant on the "hard" data on current situation. If there are many uncertainties, it is more rational to design and formulate a plan to meet short to medium term, rather than long-term objectives.

Taking into account the current volatile situation in the pilot area and the extreme lack of information, the Alazani Integrated River Basin Plan has been developed to address short to medium term objectives covering the next ten-year period from 2003 to 2013.

The plan consists of parallel or consistent short to medium-term measures to be implemented to meet the demands of four major water use sectors: drinking water supply; irrigation; public health and ecosystem support and hydropower generation. The measures are structural (physical investments in different water use sectors) and non-structural (legal-institutional, public outreach, etc) types.

3.1 No Action Plan

Although separate data on socio-economic indicators for the Alazani River Basin are not available, it can be assumed that they go in line with countrywide trends. Analyzing social-economic development trends for both countries, it is clear that pressures on water resources in terms of water quantity and quality reached their peaks in the late 1980s and declined dramatically in the early 90s, due to a general economic decline. Pressures from economic sectors have been reduced while they increased from municipal sector due to the extreme deterioration of centralized water supply and sewerage systems.

It is worth noting that socio-economic trends as well as trends of environmental impacts are somewhat different for the Georgian and Azerbaijan sides. The post-Soviet crisis hit Georgia's economy more than that of Azerbaijan's, which had enough fuel reserves. Georgia in turn faced a severe fuel crisis that resulted in dramatically declined economic activities, especially industrial activities. Public expenditures for health and environmental activities have also been dramatically reduced. Sanitation infrastructure in Georgia deteriorated more severely than in Azerbaijan. The current level of financing including water use fees is not enough for proper operation and maintenance of water supply and sanitation systems.

Real GDP growth for Azerbaijan outpaces that for Georgia. For the years 1990-2000, it was 7.1% for Azerbaijan and 5.8% for Georgia. According to estimates, 2001 GDP growth was 8.1% for Azerbaijan and 3.9% for Georgia[19].

As for social pressures, here we have two extremely different trends. According to different estimates negative population growth rate (approx. – 1%) was observed in Georgia during the last decade, which is also typical for the districts located in Alazani River Basin, while the figure was + 9.2% for Azerbaijan side of the basin.

The “No Action Plan” (“business as usual”) scenario with ten year-scenario period (a time-frame for IRBP) was developed for the Alazani River Basin in order to show what would happen without adopting and implementing any river basin action plan, assuming that current socio-economic trends would be maintained during the next 10 years. Following was forecasted for the river basin under the "No Action Plan":

[19] International Monetary Fund. World Bank. Poverty Reduction, Growth and Debt Sustainability in Low-Income CIS Countries. 2002

Almost all districts will face water shortage in both sides of the basin. The reason will be different for the Azeri and Georgian sides. Whereas it will be linked to deteriorated infrastructure and continued energy crisis for Georgian side, for the Azeri side it will be linked to both insufficient capacities of water supply systems to satisfy the demand of almost doubled population as well as deteriorated infrastructure. For example, while the estimated 1999 demand for the urban population for the Azeri side was about 561.4 l/s, given the population size of 115,489 inhabitants, and 420 l/day/capita water demand norm, it will increase to 1218.3l/s in 2013. For the rural population, given 250 l/day/capita water demand norm, and the 1999 population size of 289,174, the demand will increase from 836.7 l/s in 1999 to 1815 l/s in 2013. For the Georgian side, water demand will not increase since about a 10% reduction of population size is expected during the next 10 years.

Apart from this, in the light of climate change, which is predicted to be a 1.5-2.0 C^0 increase for the Caucasus region, droughts will be more frequent and severe, reducing the water regime greatly and accelerating currently observed desertification processes. This water shortage may cause the abandonment of many rural settlements, and may cause various social tensions between upstream and down-stream users.

Water pollution will increase basically from domestic sewage, due to the increased population for the Azeri side and hence, increased domestic waste-water generation on the one hand, and decreased wastewater collection and removal capacity on the other hand for both sides of the basin.

Predictions conducted by COWI[20] consultants in the field of water supply and sewerage systems in Georgia showed significant financing gap (shortage) in the years to come comparing baseline expenditure supply and demand. If present trends of financing continue (low public financing, low tax rate and level of tax collection, etc.) there will be not enough money to maintain even present, low level of water and sanitation services. According to model simulations, the finance under "business as usual" scenario, will not be even sufficient to cover the costs of proper operation of existing systems until 2014 assuming high real GDP growth rate (8%) and after 2020 assuming low GDP growth rate (4%)[21]. Therefore, if no more finance is provided the existing infrastructure will deteriorate further and it will not be possible to provide even current level of services. This will be characterized for example in less that 24 hours water supply in many places, persisting occurrences of low pressure of water due to the inability to pay for electricity for pumps and poor water quality due to the lack of money for treatment chemicals (DANCEE[22], OECD EAP-TF[23] Secretariat, 2000).

This itself will aggravate the health status of local populations. Outbreaks of water born infectious diseases will be frequently recorded in the pilot area, while health authorities, lacking financial and technical resources won't be able to implement preventive or mitigation measures.

Industrial pollution will grow due to increased production capacities on the one hand and decreased pollution abatement efficiency on the other hand. However, they will hardly reach the 1970s and 80s levels. Still, industry will be an insignificant driving force for the region's environmental degradation since the region is largely agriculture-based.

Water pollution from diffused sources of pollution will stay high. Firstly, proper management practices of existing landfills or building new ones will be absent and waste treatment and

[20] COWI - Danish environmental consultancy firm
[21] Ministry of Environment and Energy DANCEE OECD EAP Task Force Secretariat. Environmental Expenditures, Environmental Financing Strategies and Use of Economic Instruments in NIS Countries. Municipal Water and Wastewater Sector in Georgia: Background Analysis for Financing Strategy. Municipal Water and Wastewater Sector in Georgia: Background Analysis for Financing Strategy
[22] DANCEE – Danish Ministry for Energy and Environment
[23] EAP-TF – Environmental Action Plan Task Force

utilization capacities will remain extremely low. Second, illegal waste dumping will continue that will impose high threat to surface and ground waters. Return flow from agricultural lands will significantly pollute surface water bodies. The use of fertilizers and pesticides will grow gradually with GDP growth rate at about 4% for Georgia and 8% for Azerbaijan.

Irrigation infrastructure in the region will further deteriorate in areas which are not covered by the 12-year WB irrigation and drainage rehabilitation project. This may lead to extensive soil salinization and creation of hundreds of hectares of wastelands.

Power shortage will be felt throughout the scenario period in both sides of the Alazani river-basin (especially on the Georgian side) due to under-utilization of energy resources, relatively high energy prices and widespread poverty. Rural populations will continue cutting of riparian forests and forests in easily accessible areas for fuel wood. Reforestation will be inadequate or totally absent. This will increase soil erosion and river sedimentation and add to already existing desertification processes, leading to abandonment of valuable agricultural lands. It will also cause a deficit of drinking water, especially in rural areas.

Tourism opportunities will diminish greatly due to the limited supply of drinking water on the one hand, and absence and obsolescence of sanitation infrastructure on the other hand.

Agricultural land use will also shrink throughout the region because of desertification processes, degradation of irrigation systems and outdated agricultural practices.

Floods will incur high economic and environmental losses due to the non-existence of flood forecasting, control, and mitigation capacities. The efforts that local authorities have made to mitigate the negative consequences of recent floods occurred on the Georgian side of the basin, have revealed the poor local institutional capacity. Many of these negative consequences could have been avoided or mitigated if there would be enough local capacity to control floods, and implement mitigation measures. If the current rate of financing is continued, the local capacity pertaining to flood forecasting, control and mitigation will not increase in the next ten years.

The capacity of institutions engaged in water resources management and protection will stay low. With the existing level of financing available, the authorities will lack appropriate information, financial and technical resources to plan, manage and develop water resources; formulate and implement appropriate regulations, policies, programs and projects and assure compliance with them. Inter-agency and cross-border cooperation will stay low, that in separate cases may result in various social conflicts. Some capacity building activities will be conducted via international donor assistance. However, these activities will be episodic and of limited character. Moreover, while currently there is still enough technical expertise mostly concentrated in Soviet time specialists, there will be a reduction of expertise due to the deteriorated education system and low level of technical training.

3.2 River-Basin Action Plan

3.2.1 Planned Activities and Identified Projects

In order to resist the negative trends described in the “No Action Plan” above, and to create a precedent of efficient management of water resources on the example of the Alazani River basin, different remedial measures have been identified and priorities have been set. In case of their successful realization, these measures promise to dramatically improve the situation existing in the basin.

Along with remedial measures, drafts of specific (longer-term) project proposals have been submitted by local stakeholders (See table 7 in appendix 2 for project briefs and figure 6 for

project locations). These proposals are mostly consistent with the measures identified by the project consultants. However, there is a small number of measures left without proposals of corresponding projects. For example, very few proposals were submitted to combat point and non-point source pollution (construction of wastewater treatment plants, building of new landfill sites) as well as to monitor and assess water resources. The number of proposals corresponding to each of the measures can be regarded as one of the indicators of importance of the measures, although maturity of public understanding of specific measures should also be considered.

The measures and projects have been classified: (1) Investment Measures, (2) Technical Assistance Measures, (3) Public Awareness Raising, and (4) Monitoring and Assessment. Each of the measures and projects is concerned with one of the four major water sectors (functions): Drinking Water, Irrigation, Public Health and Ecosystem Support, and Hydropower Generation. However, some projects are common to several water sectors and are concerned with multiple water uses.

The prioritization of planned measures and project proposals was conducted by using a multi-criteria analysis method developed by the Khrami Consortium and adapted by the Alazani Consortium (See appendix 2 for the methodology and results of prioritization of planned measures and project proposals).

After being evaluated and prioritized, all the measures and projects with corresponding indication of goals, planned activities, locations, costs and possible sources of financing were combined in a summary table and grouped according to water use category and activity type (See table 1 in appendix 3 for summary table).

Investment Measures (IM). Investment measures and projects include activities that need physical investments. These include, but are not limited to infrastructure rehabilitation and construction and different nature conservation and environmental protection measures (reforestation, flood control, construction of new waste disposal sites, wastewater treatment, etc). The following measures have been identified under the IM category:

Drinking Water

- Rehabilitation and construction of pipe networks
- Rehabilitation and construction of intake facilities
- Rehabilitation and construction of treatment and laboratory facilities
- Installation of water metering systems
- Rehabilitation and constructing pumping stations

Irrigation

- Rehabilitation and construction of irrigation network
- Rehabilitation and construction of irrigation reservoirs
- Installation of water metering systems
- Rehabilitation and construction intake facilities
- Rehabilitation and construction pumping stations
- Rehabilitation and construction canal desilting facilities

Public Health and Ecosystem Support

- Building landfill sites
- Rehabilitation and construction of wastewater treatment plants
- Rehabilitation and construction of sewerage systems/collectors
- Rehabilitation and construction river bank reinforcements and riverbed cleaning
- Rehabilitation and construction of medium and small building material factories

Hydropower Generation

- Building of micro power generators

- Rehabilitation and construction of medium hydropower generators
- Construction of river-basin wide transmission and distribution networks

Technical Evaluation and Assistance (TE&A). Technical evaluation and assistance measures and projects include capacity building for river-basin management (establishment and capacity building of river-basin organizations and strengthening of existing water-management authorities) and different kinds of technical evaluations, studies, surveys, etc. The following measure were identified under the TE&A category:

General measures (common to all water functions)
- Establishment of river-basin organizations and capacity building for them;
- Establishment of technical training center (s) and training of trainers;
- Development of water database

Drinking Water
- Supplying water units with office equipment and communications
- Equipping offices and analytical laboratories of sanitary inspectorates with: office and laboratory equipment, and communications

Irrigation
- Establishment/strengthening water users' associations capacities
- Equipping melioration offices with: office equipment and communications

Public Health and Ecosystem Support
- Supplying local MoE offices with office equipment, communications and measurement equipment for conducting inspections
- Capacity building for healthcare services to avoid malaria problems
- Capacity building to protect biodiversity and natural ecosystems
- Scientific investigation of the current state of rivers and nearby ecosystems; publishing technical studies and books, etc.

Hydropower Generation
- Study of hydropower potential of small rivers
- Improvement of power grid: feasibility study for establishing basin-wide power grid (joint exploitation of hydro resources).

Public Awareness and Education (PA&E). This type of action includes different kinds of information campaigns through mass media, regular public meetings, building of user oriented water database, etc. In addition, this category includes environmental education activities, such as: trainings, preparation of environmental protection handbooks and manuals, etc.

River basin councils will have a public awareness raising function and implement it via information resources, PR and environmental education specialists. Under PA&E category, the following activities will be conducted:
- Establishment of information centers in each council;
- Preparation and issuance of monthly newsletters;
- Preparation and issuance of information leaflets and posters;
- Regular meetings with local stakeholders in order to communicate on-going activities and progress achieved. This may include the establishment of public advisory councils;
- Mass-media coverage

Monitoring and Assessment (M&A). The monitoring and assessment category pertains to the monitoring of surface and ground water quantity and quality and effluent discharges.

The following major measures are suggested under the M&A category:

Water Quality

- Conducting preliminary assessments of water quality, existing technical capacities and missing necessary equipment by using:
  - ? experts elicitation;
  - ? indicative measurements;
  - ? pollution sources and emission inventory;
  - ? environmental quality modeling;
- Developing sampling and analysis protocols;
- Developing QA/QC procedures;
- Supplying monitoring laboratories with modern analytical equipment;
- Establishing modern communication systems between stations and central office;
- Conducting operators training in measurement and analysis procedures;
- Developing user-oriented quantitative and qualitative electronic database:
  - assessing current status of data flow and information needs;
  - specifying design criteria for information system and data exchange;
  - specifying representative environmental indicators and data presentation tools that sufficiently support decision-making;
  - building up of database by digitizing current and historical water quantity and quality data;
  - expanding the water database by including effluent discharge and ground water data
  - making available data for decision-making institutions and other users through computer network or over internet;
  - creating links with other databases
  - conducting staff training in data handling and analysis

Water quantity

- Rehabilitation of existing water quantity monitoring stations starting with the following sites:

Alazani –Ayrichay (Azerbaijan)
Alazani – Shakriani (Georgia)
Alazani - Zemo Keda (Georgia)

These sites partially or fully satisfy the criteria listed below

1. Basin representation
2. Existence of long-term record
3. Information need for energy generation
4. Information need for irrigation
5. Information need for water supply
6. Information need for commercial use
7. Relation to the water quality sampling points
8. Transboundary criteria
9. Security aspects

- Establishment of information system for exchange of monitoring and accepting a joint methodology for monitoring;
- Rehabilitation, re-equipping of national monitoring centers and laboratories
- Staff training

3.2.2 Pilot Project

In addition to remedial measures and specific (longer-term) projects, pilot projects concerning community-based actions to mitigate water-related environmental problems, with costs less than $US 5,000 and durations less than three months have been identified and evaluated (See table 1 in appendix 4 for pilot project briefs and figure 7 for pilot project locations). If implemented, these projects will serve for local capacity building and give an impetus to local stakeholders to get involved in the IRBM process.

In total, 23 project proposals were collected. Of these, seven projects were submitted from the Azeri side and 15 projects from the Georgian side. Total of fifteen projects fall under the category of Training and Awareness (T&A) and are concerned with public awareness raising, environmental training and education. The rest fall under the Technical Measures (TM) and consist of different technical studies and evaluations, and certain small-scale actions that need physical investments (infustructure rehabilitation, cleaning of river beds, planting of trees etc.). One joint project proposal concerning secondary school students exchange between two sides of the basin was submitted from Little Town, Georgian NGO and Ecorez, Azerbaijani NGO.

Pilot projects were evaluated and prioritized based on a multi-criteria analysis method (See tables 2 and 3 in appendix 4 for project evaluation criteria and methodology). Of ten top projects, seven projects are suggested by the Georgian side and two by the Azeri side. Of these, six projects are of T&A and the rest of TM category. The joint project is also within the ten priority projects (See table 4 in appendix 4 for evaluated pilot projects).

4.0 INSTITUTIONAL SETTING FOR INTEGRATED RIVER-BASIN MANAGEMENT

Uncoordinated sector-based water resources management, which is still conducted in the Alazani river-basin, often results in emergence of issues that can only be resolved by joint efforts using an integrated management approach. Whereas various national level and local agencies operate in the river basin, they have little or no coordination with each other, frequently creating conflicting situations among water users or water-related agencies or between water users and water-related agencies. In addition, lack of awareness about the behavior of the river basin system results in downstream impacts from upstream users. Practically, water resources are allocated with paying little or no attention to real demand and without due consideration of all the needs and requirements of different sectors. Although, some formal setting in the form of *Inter-agency licensing Board* exists at least for Georgia, for application of integrated approach during licensing process, in practice, the approach is not applied at all.

In order for any management system to be established and being operational, there is a need for existence of sound institutional framework. For integrated river-basin management, setting-up of some basin-wide institution with participation of all stakeholders would be the ideal for the co-ordination of parallel processes involved in river basin management.

Thus, the establishment of river basin organization within the Alazani basin would be the foundation for IRBP&M.

In an ideal case, one bi-lateral "River Basin Council" (commission) will be a singular body, which will represent a basin-wide authority in a real sense of this word. This body should necessarily have policy development and coordination and some of the executive and management functions, as follow:

a. Establishment of ideal plan for river basin management – a “Master Plan”
b. Implementation and monitoring of IRBP
c. Formulation and implementation of specific projects
d. Monitoring of water courses (quantity and quality)
e. Water allocation
f. Funding (issuance of grants, loans, etc.)
g. Communication and public awareness raising
h. Arbitrating water-related relations (conflict resolution)
i. Legal initiatives and lobbying
j. Training
k. Operation and maintenance[24]

The following financial mechanisms may be used for supporting the organization:

a. Government budgets
b. Water charges (beneficiaries pay, river basin resident levies, government subsidies, environmental costs of degradation/ "impacter pays")
c. Multi-lateral financial assistance (grants, loans, etc)
d. Project funds
e. Private donations
f. Transaction fees for playing brokerage function between donors and beneficiaries
g. Consulting fees
h. Arbitration fees

[24] After gaining public support and trust as well as developing sound financial mechanisms, the council may undertake (infrastructure) operational functions as well. However, this will require an office with large well-equipped and trained technical staff.

The organization could have bi-national board of directors, represented by pair numbers of major stakeholders: water users, water protection and management authorities, NGOs, etc. from each side of the basin as well as two local executive offices.

The establishment of bi-lateral authority with well-equipped offices, qualified technical staff and a wide array of functions, requires the preparation and signing up of international agreement between two countries as well as sound financial mechanisms for supporting it. This process itself may be lengthy and require high level efforts from policy-makers (preparation of an agreement, its justification, lobbying, inter-governmental negotiations, development of financial mechanism, etc.).

Taking into consideration that Azerbaijan and Georgia have different legal-institutional settings, which do not support the establishment of river basin authorities, it is feasible to proceed with small steps towards setting up a bi-national river basin authority.

Initially, two separate river basin organizations could be established under existing national laws. These organizations will work on the establishment of a Joint Steering Committee (coordination unit): prepare and sign an agreement on cooperation between two basin organizations and set transboundary steering committee. Gradually, this committee may be given a status of river basin council or international commission.

The following activities may be implemented for establishing an institutional framework for river-basin management:

1. **Establishment and capacity building for basin organizations**

This process requires several steps:

- Establishment of two basin organizations in accordance to legal requirements of Azerbaijan and Georgia;
- Installation of appropriate office and communications facilities (Two offices will be established for each sub-basin council with appropriate equipment – PCs, phone, fax, internet, etc. The training will be provided to use this equipment as needed);
- Training sessions/workshops, including joint sessions/workshops for basin council members on their duties and powers, on advanced experience on integrated river-basin planning and management;
- Short-term study tours in countries having such experience either within CIS or other areas.

2. **Establishment of transboundary steering committee**

- Preparation of an agreement document on creation of a transboundary steering committee (basin coordination unit by the basin councils including the charter, structure, and strategy);
- Establishment of transboundary steering committee (basin coordination unit)

3. **Communication and public outreach program**

- <u>Information database and web-page development</u>

  The database initiated by the USAID/DAI Water Management in the South Caucasus Project will be expanded to include: water quantity and quality data for Alazani Basin, information on key agencies and stakeholders, planned and ongoing investment projects,

socio-economic data, etc. Besides, a web-page of the Alazani River Basin council can be created. The information management experts will initiate this activity and the council staff will continue it. Trainings will be arranged for the councils to use and update the information database.

? Public Outreach

This program will include the following activities: preparation, publication and distribution of Information leaflets and posters, Mass-media coverage, seminars, summer camp for students, Campaigns for public participation, etc. The councils will implement this component with coordination and oversight of PR and environmental education specialist.

? Newsletter

The publication of a monthly newsletter will be initiated. The newsletter will include Basin level information on ongoing activities, introduction of different agencies, international water news, reviews of environmental and water legal acts of Azerbaijan and Georgia, funding opportunities, etc. The newsletter will be distributed mainly electronically, but also as hard copies to targeted audiences. This activity will be implemented by the Council staff with coordination from environmental policy and management specialist.

4. Preparation of an international agreement on establishment of bi-national River Basin Council" (Commission)

All three steps mentioned above will establish a framework for the joint management of shared water resources.

Under this step, an international agreement on joint management of water resources of Alazani River Basin will be prepared by involvement of legal experts, Basin organization members, government officials, independent experts, etc.

5 & 6 Establishment of Alazani River Basin Council (Commission) and Capacity Building

Azerbaijan and Georgia will sign an agreement on joint management of the Alazani basin, under which Alazani River Basin Council (Commission) will be established.

Milestone for Ten-year Planned Period

#	Activity	Years (2003-2013)									
		I	II	III	IV	V	VI	VII	VIII	IX	X
1	Establishment and capacity building for river basin organizations in each side of the basin										
2	Establishment of transboundary steering committee										
3	Communication and Public Outreach										
4	Preparation of an international agreement on establishment of bilateral River Basin Council (Commission):										
5	Establishment of Alazani River Basin Council (Commission)										
6.	Capacity building for River Basin Council										

Several alternative models can be suggested for establishing river basin organizations.

1. Basin organizations can be set-up as informal organizations (associations/unions/committees), which will have only research, consulting and advisory functions. Specifically, they will carry out studies, monitoring activities, draw recommendations, etc.

The advantage for such setting is that it does not require any formal procedures and much time. However, informal entities do not have power to use sticks (set and enforce rules and regulations) and carrots (provide incentives). Probably, they will not have much credibility from governmental authorities and public as well as may be very weak in term of financial support. They could be supported largely from private donations and membership payments. They would have limited access to grant programs, since many donors finance only legal entities. Apart from this informal organizations are not eligible for public funds and water use fees.

2. Basin organizations may be set-up as legal (registered) public organizations: associations/unions, having coordination, consulting, advisory, research, training etc. functions.

The advantage for this type of setting is that formal public organizations have legal status and may gain credibility from different interest groups. In terms of financing, these organizations, in addition to receiving membership payments and private donations may conduct fund raising and apply for grant programs as well as conduct non-profit making commercial activities (consultancy job, brokerage role, etc.).

However, the disadvantage for formally set public organizations is that they may have only research, training, consulting and advisory functions, not being basin authorities in a real sense of this word. In addition, the process of the basin organization registration may take much time for Azerbaijan side, due to existing complicated legal procedures. In terms of financing, membership payments and grants, which are major sources for NGO financing, are not sustainable financial sources. Government budgets or water use and pollution fees, which are usually the most stable financial sources, cannot be used for financing this type of organizations.

3. Basin organizations may be set-up as public foundations, which according to existing Civil Codes are public non-profit organizations.

The advantage of this type of entity is that it provides financing (makes grants) for different activities. In addition, it may have all the functions that public organizations entertain.

The disadvantage is that the foundation is non-profit public organization and cannot play a basin authority's role. Further, it needs initial capital, the amount of which depends on the goals and objectives of this organization. This type of setting is not sustainable in terms of financing. It continuously needs fund raising and the amount of funds raised is not predictable. This type of entity may still encounter problems during registration in Azerbaijan, since it needs registration through Ministry of Justice, which is lengthy process due to complicated legal procedures.

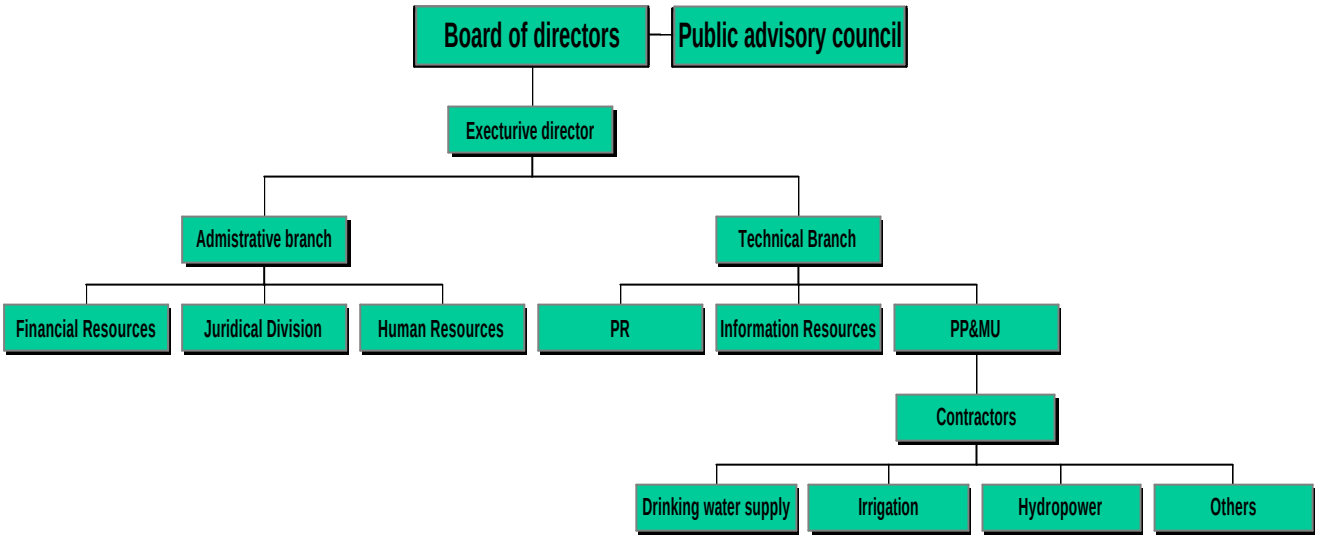
4. Basin organizations may be set up as quasi-autonomous legal entities either "state companies" under any governmental organization, which is directly or indirectly engaged in water resources management or "corporations" based on membership of several state agencies. For example, basin organization could be established under local authorities (governor's office; president's representative office) or as local offices of environmental agencies.

The advantage for the public company is that it is an authority type organization representing basin wide entity in real sense of this word, with a right to have management and executive tasks. In addition, it has a commitment from government in terms of providing overall policy as well as workspace and other assets. Hence, this type of entity has credibility from government side. In terms of financing, the organization may become an autonomous body, because it may have its own sources of financing other than public funds. This factor may help the public company to avoid high pressures from government side. Regarding the sources of financing, the entity may be eligible for public financing and may be financed from both government budget and independent commercial activities.

If the entity is established as public corporation based on membership, it could also be financed from membership payments. User fees may be used for its financing as well. Finally, the entity may be eligible for donor financing.

The disadvantage for this kind of setting is that its establishment needs an enactment (drafting, public hearings, consent from different governmental agencies and approval) of specific regulations (decrees, ordinances, etc.), which usually take one to three months. The second disadvantage is that NGOs and private sector cannot be directly represented in this kind of organizations.

Regardless of the status of the "early" entity, it should be highly participatory and consist of representatives of major stakeholders: water users, water management and conservation bodies, concerned NGOs, etc. The organizational chart of the river basin organization may be as follow:



The organization in each side of the basin may have a board of directors composed of 12-15 stakeholder representatives from major water user sectors, local governments, environmental and health authorities, concerned NGOs and CBOs. The board of directors will be the unit, developing major strategies, policies, and oversighting their implementation. Executive branch will be headed by executive director and will consist of administrative and technical branches. This unit will conduct direct execution of tasks and responsibilities. Special mention has to be given to Project Preparation & Monitoring Unit (PP&MU) under technical division, which will identify and prepare project proposals for donor financing as well as supervise its implementation.

In addition, the basin organization may have a public advisory council, which will represent public interests within the organization.

5.0 NEXT STEPS

In order to implement IRBP, the appropriate financing should be looked for. Under current social and economic conditions, donor assistance can be considered the most appropriate source for financing, since the Azeri and Georgian governments experience severe budget constraints and cannot afford to spend money on activities, other than national priorities. For donor financing, the projects should satisfy all the criteria and requirements, suggested by each donor. Hence, the project proposals should be prepared based on these criteria and requirements.

Many of project proposals suggested under this plan are only short draft proposals and need further development. In addition, many of them are just alternatives for each other and it is possible to combine them in an integrated way. As mentioned in previous sections, some of the remedial measures are left without project proposals, although these measures are of high importance, hence needing the development of specific project proposals.

In order to prepare projects it will be necessary to set up a project preparation unit (PPU) (see section 4.0 for more information), which will review, select and prepare details of existing project proposals for donor financing.

Other activities that can be undertaken as a series of next steps are as follow:

- Additional and more detailed studies of surface water, ground water and water quality
- Additional and more detailed studies of institutional needs for IRBP in a bi-national setting
- More detailed evaluations of alternative integrated river basin plans, optimization studies
- Implementation of priority pilot projects
- Raising example of Alazani IRBP to higher level, for broader exposure at higher government level

APPENDICES

Appendix 1 - Issues Prioritization

Table 1. Drinking Water Supply

				Water-related Issues					Technical Issues				Legal Institutional Issues				
Functions	Issues	Sub-issues	Sub-issues	Drinking Water pollution	Water turbidity	Water shortage			Underdeveloped and obsolete infrastructure				Institutional weakness				Totals:
						Uncontrolled use for irrigation	Lack of water resources	Intermittent supply of water resources due to power shortage	Water Intake Facilities	Distribution networks	Chlorinating facilities and water treatment	non-existence of water metering systems	Lack of finances	Lack of office and laboratory equipment	Lack of expertise	Low tax collection	
Irrigation Usage	Water-related Issues	Poor water quality		■	■						■			■			4
		Inefficient use of water resources	High losses in the distribution network			■											2
		Water pollution from irrigated lands				■											1
	Technical Issues	Obsolescence of infrastructure	Water intake facilities		■												1
			Irrigation network		■	■											2
			Pumping stations		■												1
		Lack of irrigation reservoirs					■										1
		Non-existence of water metering systems				■											1
		Power shortage for water pumping														■	1
																	17

	Legal-Institutional Issues	Weak institutional capacity	Need for establishment and strengthening of irrigation associations			■												1	
			Lack of finances															0	
			Lack of expertise			■												1	
			Lack of office equipments			■												1	
			Low water use fee collection rate															0	
Public Health and Ecosystem support	Environmental Issues	Surface and Ground Water Pollution	Point source pollution from households	■					■	■	■			■	■			6	37
			Diffused source pollution	■		■			■	■	■			■	■			7	
		Uncontrolled flooding/mudflows			■	■									■			3	
		River bed erosion/sedimentation			■	■												2	
		Deforestation					■											1	
		Water shortage and minimum run-off				■	■	■										3	
	Health Issues	Drinking water pollution	Absence/lack of chlorinating facilities					■	■	■	■	■	■	■	■			8	
		Goitre and the lack of Iodine in the drinking water		■							■		■					3	
		Malaria																0	
	Legal-Institutional Issues	Institutional Weakness	Lack of professional staff														■	1	
			Lack of integrated management of ecosystems	■	■		■											3	

			Lack of finances															0	
Hydropower generation		Lack of finances for hydropower sector development																2	11
		Obsolescence of technical facilities																2	
		Excessive centralization of hydropower distribution and non-existence basin wide power grids																2	
		Insufficient utilization of hydro resources																5	
				5	8	12	6	3	3	3	5	2	3	4	5	3			
		Totals:		34					13				15						

Table 2. Irrigation Usage

				Water-related Issues			Technical Issues						Legal Institutional Issues						
Functions	Issues	Sub-issues	Extra Sub-issues	Poor water quality	Inefficient use of water resources	Water pollution from irrigated lands	Obsolescence of infrastructure			lack of irrigation reservoirs	Non-existence of water metering systems	Power shortage for water pumping	Weak Institutional capacity					Totals:	
					High losses in the distribution network		Water Intake Facilities	Irrigation network	Pumping stations				Need for establishment and strengthening of irrigation associations	Low water use fee collection rate	Lack of finances	Lack of expertise	lack of office equipment		
	Water-related Issues	Drinking water pollution		■	■	■												3	
		Water turbidity		■														1	
Drinking Water Supply		Water shortage	Uncontrolled use for irrigation		■	■		■			■		■		■	■	■	8	
			Lack of water resources		■					■		■						3	
			Intermittent supply of water resources due to power shortage	■					■	■		■		■	■			6	
	Technical Issues	Underdeveloped/ obsolete infrastructure	Water intake facilities															0	24
			Distribution networks															0	
			Chlorinating facilities and water treatment	■		■												2	
			non-existence of water metering systems															0	
	Legal-Institutional Issues	Weak institutional capacity	Lack of finances															0	
			Lack of office and laboratory equipment	■														1	
			Lack of expertise															0	
			Low tax collection															0	

Public Health and Ecosystem support	Environmental Issues	Surface and Ground Water Pollution	Point source pollution from households	■			■	■										■	4	33					
			Diffused source pollution	■	■	■	■	■										■	6						
		Uncontrolled flooding/mudflows		■						■							■		3						
		River bed erosion/sedimentation		■	■			■					■						4						
		Deforestation																	0						
		Water shortage and minimum run-off						■		■									2						
	Health Issues	Drinking water pollution	Absence/lack of chlorinating facilities	■		■													2						
		Goitre and the lack of Iodine in the drinking water		■		■											■		3						
		Malaria		■	■		■	■									■	■	6						
	Legal-Institutional Issues	Institutional Weakness	Lack of professional staff											■					1						
			Lack of integrated management of ecosystems	■		■													2						
			Lack of finances																0						
Hydropower generation		Lack of finances for hydropower sector development												■	■				2	11					
		Obsolescence of technical facilities						■		■		■	■						4						
		Excessive centralization of hydropower distribution and non-existence basin wide power grids							■			■							2						
		Insufficient utilization of hydro resources			■					■			■						3						
Totals:				13	7	7	3	7	2	6	1	4	4	3	5	3	3								
				27			23						18												

Table 3. Public Health and Ecosystem Support

				Environmental Issues						**Health Issues**			**Legal -institutional Issues**				
Functions	**Issues**	**Sub-issues**	**Extra Sub-issues**	Surface and Groundwater pollution		Uncontrolled flooding/mudflows	River bed erosion/ sedimentation	Deforestation	Water shortage and minimum run-off	Drinking water pollution	Goiter and the lack of Iodine in the drinking water	Malaria	Institutional Weakness				
				Point source pollution from households	Diffused source pollution					Absence/lack of chlorinating facilities			Lack of Professional Staff	Lack of integrated management of ecosystem	Lack of finances		Totals:
Drinking Water Supply	Water-related Issues	Drinking water pollution		■	■	■		■		■	■		■	■	■	9	43
		Water turbidity			■	■	■	■		■	■					6	
		Water shortage	Uncontrolled use for irrigation		■	■						■				3	
			Lack of water resources					■	■				■	■		4	
			Intermittent supply of water resources due to power shortage						■							1	
	Technical Issues	Underdeveloped/obsolete infrastructure	Water intake facilities				■									1	
			Distribution networks	■			■		■							3	
			Chlorinating facilities and water treatment							■	■					2	
			Non-existence of water metering systems											■		1	
	Legal-Institutional Issues	Weak institutional capacity	Lack of finances				■			■	■					3	

			Lack of office and laboratory equipment	■	■			■		■	■		■			6	
			Lack of expertise				■			■	■		■			4	
			Low tax collection													0	
Irrigation Usage	Water-related Issues	Poor water quality		■	■	■	■	■		■	■			■	■	9	37
		Inefficient use of water resources	High losses in the distribution network		■		■		■	■		■		■		6	
		Water pollution from irrigated lands			■		■	■		■				■		5	
	Technical Issues	Obsolescence of infrastructure	Water intake facilities														
			Irrigation network		■		■		■	■		■				5	
			Pumping stations						■							1	
		Lack of irrigation reservoirs					■							■		2	
		Non-existence of water metering systems												■		1	
		Power shortage for water pumping							■							1	
	Legal-Institutional Issues	Weak institutional capacity	Need for establishment and strengthening of irrigation associations			■										1	
			Lack of finances				■									1	

			Lack of expertise															2	
			Lack of office equipments															4	
			Low water use fee collection rate																
Hydropower generation		Lack of finances for hydropower sector development																3	
		Obsolescence of technical facilities																5	
		Excessive centralization of hydropower distribution and non-existence basin wide power grids																3	
		Insufficient utilization of hydro resources																2	
				5	9	6	12	10	11	12	7	3	6	9	3				
Totals:				53				22				18							

Table 4. Hydropower Generation

Functions	Issues	Sub-issues	Extra Sub-issues	Lack of finances for hydropower sector development	Obsolescence of technical facilities	Excessive centralization of hydropower distribution and non-existence basin wide power grid	Insufficient utilization of hydro resources	Totals:	
Irrigation Usage	Water-related Issues	Poor water quality		■				1	14
		Inefficient use of water resources	High losses in the distribution network		■		■	2	
		Water pollution from irrigated lands						0	
	Technical Issues	Obsolescence of infrastructure	Water intake facilities					0	
			Irrigation network		■		■	2	
			pumping stations	■		■		2	
		Lack of irrigation reservoirs			■		■	2	
		Non-existence of water metering systems						0	
		Power shortage for water pumping		■		■		2	
	Legal-Institutional Issues	Weak institutional capacity	Need for establishment and strengthening of irrigation associations	■	■			1	
			Lack of finances					0	
			Lack of expertise					0	
			Lack of office equipments	■		■		2	
			Low water use fee collection rate					0	
Drinking Water Supply	Water-related Issues	Drinking water pollution		■				1	10
		Water turbidity			■			1	

		Water shortage	Uncontrolled use for irrigation				■	1	
			Lack of water resources		■			1	
			Intermittent supply of water resources due to power shortage	■		■		2	
	Technical Issues	Underdeveloped/obsolete infrastructure	Water intake facilities					0	
			Distribution networks	■	■			2	
			Chlorinating facilities					0	
			non-existence of water metering systems					0	
	Legal-Institutional Issues	Weak institutional capacity	Lack of finances					0	
			Lack of office and laboratory equipment	■		■		2	
			Lack of expertise					0	
			Low tax collection					0	
Public Health and Ecosystem support	Environmental Issues	Surface and Ground Water Pollution	Point source pollution from households	■				1	12
			Diffused source pollution	■				1	
		Uncontrolled flooding/mudflows			■			1	
		River bed erosion/sedimentation			■			1	
		Deforestation		■				1	
		Water shortage and minimum run-off			■			1	
	Health Issues	Drinking water pollution	Absence/lack of chlorinating facilities					0	
		Goitre and the lack of Iodine in the drinking water		■		■		2	

		Malaria						2	
	Legal-Institutional Issues	Institutional Weakness	Lack of professional staff					1	
			Lack of integrated management of ecosystems					0	
			Lack of finances					1	
		Totals:		13	12	7	4		

Table 5. Priority List of Issues based on Quantitative Analysis of Issues under the Four Functions

#	Issue	# Of Functions Involved	Functions
1	Obsolescence of Infrastructure	4	DW Supply Irrigation Public Health and Ecosystem Support Hydro Power Generation
2	Institutional Weakness	4	DW Supply Irrigation Public Health and Ecosystem Support Hydro Power Generation
3	Water Pollution	3	DW Supply Irrigation Public Health and Ecosystem Support
4	Water Shortage	3	DW Supply Irrigation Public Health and Ecosystem Support
5	Uncontrolled flooding/mudflows	3	DWS, PHES, IU
6	Health problems (Goitre, lack of I2, malaria)	3	DWS, PHES, IU
7	River bed degradation (Erosion, sedimentation, deforestation)	2	DWS, PHES

Table 6. Priority List of Sub-Issues

#	Issue	Sub-Issue	# Of Functions Involved	Functions Involved
1	Obsolescence of infrastructure	Water intake facilities	2	DWS, IU
		Distribution Networks	2	DWS, IU
		Chlorinating and other treatment facilities	2	DWS, PHES
		Lack of water metering systems	2	DWS, IU
		Pumping stations	3	DWS, IU, HG
		Re/construction of Medium and Micro Hydropower Generators	1	HG
2	Institutional weakness	Lack of finances	4	DWS, PHES, IU, HG
		Lack of expertise	4	DWS, PHES, IU, HG
		Lack of equipment	4	DWS, PHES, IU, HG
		Lack of integrated management	4	DWS, PHES, IU, HG
		Low tax collection	3	DWS, IU, HG
		Excessive centralization of distribution	1	HG
3	Water pollution	Point source pollution (households, industrial & hospital discharges)	3	DWS, PHES, IU
		Diffused source pollution (agricultural and urban run-off, dumpsites)	3	DWS, PHES, IU
4	Water shortage	Careless/non-functional use of water resources	3	DWS, PHES, IU
		Natural lack of water resources (droughts)	4	DWS, PHES, IU, HG
		Power shortage for supply	3	DWS, IU, HG
5	Uncontrolled flooding/mudflows	Ecological misbalance	3	DWS, PHES, IU
		Lack of river-coast constructions	3	DWS, PHES, IU
6	Health problems	Lack of iodine; Goitre	2	DWS, PHES
		Malaria	1	PHES
7	River bed degradation	Deforestation	4	DWS, PHES, HG, IU,
		Sedimentation	3	DWS, PHES, HG
		Erosion	3	DWS, PHES, HG

Appendix 2

Evaluation of Planned Measures and Project Proposals

(Based on and adapted from methodology developed by Khrami Consortium)

The methodology is based on evaluation criteria representing five major fields:

1. Engineering and Technical
2. Environmental
3. Social
4. Economic
5. Management

The criteria representing each of these fields in details were discussed and assigned importance factors, ranging from 1 to 10 and expressing relative importance of each criterion in meeting the basic goals of integrated river basin management.

Table1. Weighted Importance Factors Assigned to Evaluation Criteria for Planned Measures

Evaluation Criteria	Importance Factors
1	2
Engineering and Technical Criteria	
1. Population	8
2. Geographic Scale	6
2. Water quantity (consumptive)	10
3. Water quality	10
Environmental Criteria	
1. Reduction of water resources pollution	10
2. Impact on Ecosystems	8
3. Saving of water resources	9
Social Criteria	
1. Social conflicts	7
2. Healthcare	10
3. Social condition improvement	5
Economic Criteria	
1. Investment cost	5
2. Impact on electric energy crisis	5

Table 2. Weighted Importance Factors Assigned to Evaluation Criteria for Project Proposals

Evaluation Criteria	Importance Factors
1	2
Engineering and Technical Criteria	
1. Population	8
2. Water quantity (consumptive)	10
3. Water quality	10
Environmental Criteria	
1. Reduction of water resources pollution	10
2. Impact on Ecosystems	8
3. Saving of water resources	9
Social Criteria	
1. Social conflicts	7
2. Healthcare	10
3. Social condition improvement	5
Economic Criteria	
1. Investment cost	5
2. Impact on electric energy crisis	5
Management Criteria	
1. Organization of the Proposal	7

Rating Factor

Rating factors were developed for each of the evaluation criteria. The "rating factor," which normally ranges from –1 to 2 for general measures and –2 to 2 for specific project proposals is a measure of how well a specific project proposal satisfies each evaluation criterion. Rating factor 2 indicates that the proposal fully meets the underlying objective of the criterion, while rating factor –1 (–2) indicates that the proposed project may have a strong negative impact on the objectives represented by the criterion. The only exception is – rating factors concerned with number of involved population and organization of the proposal (for project proposals). In this case rating factors range from 1 to 3, with 1 corresponding to the lowest standards and 3 – to the highest. Rating factors and corresponding standards are presented in Table 2.

Table 3. Evaluation Criteria and Factors for Planned Measures

Evaluation Criteria	Rating Factors
1	2
I Engineering and Technical Criteria	
Involved Population	Factor 1 – Number of using population up to 3000 persons Factor 2 – Number of using population up to15000 persons Factor 3 – Number of using population more than 15000 persons
Water quantity (water use)	Factor –2 – Significant decrease of water quantity is possible Factor –1 – Some decrease of water quantity is possible Factor 0 – The project will not affect water quantity
	Factor 1 – Certain increase of water quantity is planned Factor 2 – Significant increase of water quantity is planned
Geographic Scale	Factor 1 – Low: <30% Factor 2 – Medium: 30-60% Factor 3 – High: 60-100%
Water quality	Factor –1 – Decline of water quality is possible Factor 0 – Water quality is not affected Factor 1 – Certain improvement of water quality is planned
	Factor 2 – Significant improvement of water quality is planned
II Environmental Criteria	
1. Reduction of water resources pollution	Factor –1 – Increase of water pollution is possible Factor 0 – Reduction of WR pollution is not planned Factor 1 – Certain reduction of WR pollution is planned Factor 2 – Leads to significant reduction of WR pollution
2. Impact on Ecosystems	Factor –2 –Strong negative impact Factor –1 – Certain negative impact Factor 0 – Absence of a positive or negative impact Factor 1 – Certain positive impact Factor 2 – Significant positive impact
3. Saving of water resources	Factor –1 –Lose of water resource is possible Factor 0 – Saving of water resources is not planned Factor 1 – Certain saving of water resources is planned Factor 2 – Significant saving of water resources is planned
III Social Criteria	

1. Social Conflicts	Factor –1 – Increase in social conflicts Factor 0 – No effect on social conflicts Factor 1 – Social conflicts can be reduced to some extent Factor 2 – Significant reduction of social conflicts is planned
2. Healthcare	Factor –1 – May contribute to some increase in epidemics Factor 0 – Does not affect diseases and epidemics Factor 1 – Certain reduction of diseases and epidemics is planned Factor 2 – Significant reduction of diseases and epidemics is planned
	Factor –1 –Negative impact on social conditions is possible Factor 0 – Changes in social conditions are not planned Factor 1 – A certain improvement of social conditions is possible Factor 2 – Significant improvement of social conditions is planned
IV. Cost (Economic) Criteria	
1. Investment cost	Factor 1 – Low cost: < 100 000 USD Factor 2 – Medium 100 000 - 1 million USD Factor 3 – High: 1 million <

Table 4. Evaluation Criteria and Factors for Project Proposals

Evaluation Criteria	Rating Factors
1	2
I Engineering and Technical Criteria	
Involved Population	Factor 1 – Number of using population up to 3000 persons Factor 2 – Number of using population up to15000 persons Factor 3 – Number of using population more than 15000 persons
Water quantity (water supply)	Factor –2 – Significant decrease of water quantity is possible Factor –1 – Some decrease of water quantity is possible Factor 0 – The project will not affect water quantity Factor 1 – Certain increase of water quantity is planned Factor 2 – Significant increase of water quantity is planned
Water quality	Factor –2 – Significant decline of water quality is possible Factor –1 – Certain decline of water quality is possible Factor 0 – The project will not affect water quality Factor 1 – Certain improvement of water quality is planned Factor 2 – Significant improvement of water quality is planned
II Environmental Criteria	
1. Reduction of water resources pollution	Factor –2 – Significant increase of water pollution is possible Factor –1 – Some increase of water pollution is possible Factor 0 – Reduction of WR pollution is not planned Factor 1 – Certain reduction of WR pollution is planned Factor 2 – Leads to significant reduction of WR pollution
2. Impact on Ecosystems	Factor –2 – Strong negative impact on ecosystems is possible Factor –1 – Certain negative impact on ecosystems is possible Factor 0 – Absence of a positive or negative impact on ecosystems Factor 1 – Certain positive impact on ecosystems is planned Factor 2 – Significant positive impact on ecosystems is planned
3. Saving of water resources	Factor –2 – Significant loss of water resource is possible Factor –1 – some loss of water resource is possible Factor 0 – Saving of water resources is not planned Factor 1 – Certain Saving of water resources is planned Factor 2 – Significant Saving of water resources is planned
III Social Criteria	
1. Social conflicts	Factor –2 – Strong negative effect on social conflicts Factor –1 – certain negative effect on social conflicts Factor 0 – No effect on social conflicts Factor 1 – Social conflicts can be reduced to some extent Factor 2 – Significant reduction of social conflicts is planned

2. Healthcare	Factor –2 – May contribute to significant increase in epidemics Factor –1 – May contribute to some increase in epidemics Factor 0 – Does not affect diseases and epidemics Factor 1 – Certain reduction of diseases and epidemics is planned Factor 2 – Significant reduction of diseases and epidemics is planned
3. Social condition improvement	Factor –2 – Significant negative impact on social conditions is possible Factor –1 – Some negative impact on social conditions is possible Factor 0 – Changes in social conditions are not planned Factor 1 – A certain improvement of social conditions is possible Factor 2 – Significant improvement of social conditions is planned
IV. Cost (Economic) Criteria	
1. Investment cost	Factor – 2 –Investment cost is more than $100 million Factor –1 –Investment cost is in a range of $ 1—100 million Factor 0 – Investment cost ranges $ 100 000 – 1 million Factor 1 – Investment cost ranges $10 000 – 100 000 Factor 2 – Investment cost is up to $10 000
2. Impact on electric energy crisis	Factor –2 – Strong negative impact on electric energy crisis is possible Factor –1 – Some negative impact on electric energy crisis is possible Factor 0 – No impact on electric energy crisis Factor 1 – Some positive impact on electric energy crisis is planned Factor 2 – Strong positive impact on electric energy crisis is planned
V. Management	
Organization of the Proposal	Factor 0 – Bad Factor 1 – Fair Factor 2 – Good

Measure/Project Evaluation Tabulation

Evaluation criteria standards are applied to each alternative proposal and rating factors are assigned. Weighted score is obtained for each of the proposals by multiplying the rating factors by the corresponding importance factors. The total points for each alternative proposal is the sum of its weighted score, with the highest number of points receiving the highest priority.

Table 5. Evaluation of Planned Measures

Function	Measure	Criteria											Score
		Engineering and Technical				Environmental			Social			Cost	
		Population	Geographical Scale	Water quantity	Water quality	Reduction of Water pollution	Impact on Ecosystems	Water resource saving	Social Conflicts	Healthcare	Social Condition Improvement	Investment	
		8	6	10	10	10	8	9	7	10	5	5	
Drinking Water Supply	Rehabilitation/construction of chlorinating and laboratory facilities; Fencin g of intake facilities	3	3	0	2	2	0	0	2	2	2	2	136
	Rehabilitation/construction of filtrating facilities	2	2	0	2	2	1	0	2	2	2	3	135
	Building new intake facilities	2	2	2	2	0	-1	0	2	2	2	2	114
	Rehabilitation/construction of water pumps	2	2	2	0	0	-1	0	2	0	2	2	74
	Reconstruction/construtio n of intake facilities and trunk pipes	3	3	2	2	2	-1	1	2	2	2	3	162
	Reconstruction/construction of distribution networks	3	3	2	2	2	-1	2	2	2	2	3	171
	Installation of water metering systems	3	3	0	0	0	1	2	2	0	2	3	107
	Equipping Water Units with office equipment and communications	3	3	0	0	0	0	2	2	1	2	2	104
	Equipping Sanitary Inspection Laboratories with office, analytical equipment and communications	3	3	0	0	1	0	0	1	1	1	2	84
	Training of specialists	3	3	0	0	2	0	1	1	1	1	1	98
	Establishment of Technical Training Centre[4]	3	3	0	0	2	0	1	1	1	1	1	98
	Capacity building for river basin management	3	3	0	0	2	2	2	2	2	2	2	150
	Scientific and technical studies	3	3	0	0	1	1	1	1	1	1	2	111
Irrigation Water Supply	Reconstruction/construc tion of desilting facilities	3	3	0	2	2	1	2	1	2	2	2	155
	Reconstruction/construction of irrigation networks	3	3	2	2	1	-1	2	2	1	2	3	151
	Reconstruction/construction of pump stations	3	3	2	0	0	-1	1	1	0	2	2	90
	Rehabilitation/building of irrigation reservoirs	3	3	2	0	0	-2	2	2	1	2	2	108
	Installation of water metering systems	3	3	0	0	0	1	2	2	2	2	2	122

[4] ***Center*** will include training the specialists from other units as well, e.g. melioration, irrigation offices

	Equipping irrigation management offices with office equipment and communications	3	3	0	0	1	1	1	1	1	1	1	96
	Training of specialists	3	3	0	0	2	1	1	1	1	1	1	106
	Public awareness campaigns	3	3	0	0	2	2	2	2	2	2	1	145
	Establishing and strengthening water user associations	3	3	0	0	2	0	2	2	2	2	1	129
	Capacity building for integrated river basin management	3	3	0	0	2	2	2	2	2	2	2	150
	Scientific and technical studies	3	3	0	0	1	1	1	1	1	1	2	101
	Establishing of water database center	3	3	0	0	1	1	1	1	1	1	1	96
Public Health and Ecosystem support	Rehabilitation/construction of sewerage systems	3	3	0	2	2	2	0	2	2	2	3	157
	Construction of wastewater treatment plants	3	3	0	3	3	0	0	2	3	3	3	176
	rehabilitation/building of sanitary landfills	3	3	0	2	2	2	0	2	2	2	2	152
	Rehabilitation of water quantity and quality monitoring sites	3	2	0	0	1	0	0	0	0	1	2	61
	Equipping communal offices with office, laboratory equipment and communications	3	3	0	1	2	0	2	2	2	2	2	144
	Reconstruction/construction of dikes and levees	3	3	0	0	1	2	2	2	2	2	2	140
	Riverbed cleaning	3	3	1	2	2	2	1	2	2	2	1	166
	Reconstruction/construction of small construction materials manufacturing plants	3	3	0	0	0	-1	0	2	0	2	2	68
	Equipping MoE regional offices with office and analytical equipment and communications	3	3	1	1	2	1	0	2	2	2	1	139
	Training of MoE staff in compliance assurance monitoring and control	3	3	1	1	1	1	0	2	2	2	1	129
	Capacity building for integrated river basin management	3	3	0	0	1	1	2	2	1	2	2	122
	Public awareness campaign	3	3	1	1	1	1	1	1	1	1	1	116
	Cleaning drinking water and enriching them with various elements	3	3	0	2	2	0	0	2	2	2	1	131
	Increasing capacity of healthcare systems to fight against malaria	2	2	0	0	0	0	2	2	0	2	1	75
	Conducting scientific researches and technical studies	3	3	0	0	1	1	1	1	1	1	2	111
	Planting trees/reforestation	3	2	2	2	0	2	2	2	2	2	2	164
Hydropower Generation	Improvement of power grid and establishment of regional power grid	3	3	0	0	0	0	0	3	2	3	3	113
	Reconstruction/construction of small to medium HPPs	3	3	0	0	0	0	0	2	2	3	2	101
	Development of micro HPPs	3	3	1	0	0	0	0	1	1	1	1	79
	Conducting scientific researches and technical studies	3	3	0	0	1	1	1	1	1	1	2	111

	Capacity building for river basin management	3	3	0	0	2	2	2	2	2	2	2	150
	Public awareness campaign	3	3	0	0	2	2	2	2	2	2	1	145
	Establishing water database center	3	3	0	0	1	1	1	1	1	1	1	96
	Training of specialists	3	3	0	0	2	1	1	1	1	1	1	106

Table 6. List of Prioritised Measures

Functions	No	Measure	Scores
Drinking Water Supply	1	Reconstruction/construction of distribution networks	171
	2	Reconstruction/construction of intake facilities and trunk pipes	162
	3	Capacity building for river basin management	150
	4	Rehabilitation/construction of chlorinating and laboratory facilities; Fencing of intake facilities	136
	5	Rehabilitation/construction of filtrating facilities	135
	6	Public awareness campaign	116
	7	Building new intake facilities	114
	8	Scientific and technical studies	111
	9	Installation of water metering systems	107
	10	Equipping Water Units with office equipment and communications	104
	11	Training of specialists	98
	12	Establishment of Technical Training Centre[4]	98
	13	Equipping Sanitary Inspection Laboratories with office, analytical equipment and communications	84
	14	Rehabilitation/construction of water pumps	74
Public Health and Ecosystem Support	1	Construction of Wastewater Treatment Plants	176
	2	Riverbed cleaning	166
	3	Planting trees/reforestation	164
	4	Rehabilitation/construction of sewage systems	157
	5	Rehabilitation/building of sanitary landfills	152
	6	Equipping communal offices with office, laboratory equipment and communications	144
	7	Reconstructio n/construction of dikes and levees	140
	8	Equipping MoE regional offices with office and analytical equipment and communications	139
	9	Cleaning drinking water and enriching them with various elements	131
	10	Training of MoE staff in compliance assurance monitoring and control	129
	11	Capacity building for integrated river basin management	122
	12	Public awareness campaign	116
	13	Conducting scientific researches and technical studies	111
	14	Increasing capacity of healthcare systems to fight against malaria	75
	15	Reconstruction/construction of small construction materials manufacturing plants	68
	16	Réhabilitation of water quantity and quality monitoring sites	61
Irrigation Usage	1	Reconstruction/construction of desilting facilities	155
	2	Reconstruction/construction of irrigation networks	151
	3	Capacity building for integrated river basin management	150
	4	Public awareness campaigns	145
	5	Establishing and strengthening water user associations	129
	6	Installation of water metering systems	122
	7	Rehabilitation/building of irrigation reservoirs	108
	8	Training of specialists	106
	9	Scientific and technical studies	101
	10	Establishment of water database center	96
	11	Equipping irrigation management offices with office equipment and communications	96
	12	Reconstruction/construction of pump stations	90
Hydropower Generation	1	Capacity building for river basin management	150
	2	Public awareness campaign	145
	3	Improvement of power grid and establishment of regional power grid	113
	4	Conducting scientific researches and technical studies	111
	5	Training of specialists	106
	6	Reconstruction/construction of small to medium HPPs	101
	7	Establishing water database center	96
	8	Development of micro HPPs	79

[4] ***Center*** will include training the specialists from other units as well, e.g. melioration, irrigation offices

Table 7. Brief Description of Project Proposals

No	Code[1]	Proposal Title	Brief Description	Location	Implementing Organization	Cost (USD)
INVESTMENT MEASURES (IM)						
1	GE.IM.3	Restoration of the Irrigation System "Zilicha-I" to its Design Capacity (5221 hectares of irrigated area)	***Objective:*** Rehabilitation of "Zilicha I" irrigation system to its designed capacity and irrigating 5,221 ha of agricultural lands ***Planned Activities:*** - Restoration and reconstruction of floating pontoon of the first-lift pumping station and installation of pumps. - Repair of the building of the second-lift pumping station. - Putting in order pumping stations - Canal cleaning - Repair of main canal and siphons (tunnels), repair of wells and bolts (bars) in water-release units -Repair of internal network	Dedoplistskaro District (villages Samtatskaro, Pirosmani, Sabatlo, Kvemokedi and Arkhilo Kalo)	Dedoplistskaro district irrigation management Association "Information Company Hereti"	165 000
2	GE.IM.4	Bank Reinforcement of the river Alazani	***Objective:*** Protection of communication right of ways, settled areas, houses, etc against floods and mudflows ***Planned Activities:*** - Cleaning the gorges from large trees, bushes and solid sediments along 15-20 km section - Building concrete reinforcements - Restoration of the Alazani bank reinforcement constructions along 420 m section	Dedoplistskaro District	Land Management Office of Dedoplistskaro	120 000
3	GE.IM.7	The use of mountainous rivers for hydropower generation	***Objective:*** Improving power supply for Kakheti district ***Planned Activities:*** - Development of project proposals on rehabilitation of existing HPPs and building new ones; - Taking of project design works - Taking construction works - Finding sources of finances	Georgian side of the basin	Hydro Porject Design Institutes: "Hydro Project", "SakTskalProekti" Construction organizations; "HydroEnergoMsheni", "SakTskalMsheni"	80-100 000
4	GE.IM.11	Rehabilitation of Kasristskali drinking water pipeline	***Objective:*** Meeting the demands of drinking and industrial water in the villages Pirosmani and Kasristskali and providing water to 8,225 ha pastures. ***Planned Activities:*** - General repair of pumps - Installation of new pumps - Supply of power generator - Repair of pipeline and compressors - Renovation of sanitary protection zone - Construction of chlorinating facility	Dedoplistskaro district (Villages Pirosmani and Kasristskali)	Dedoplistskaro district irrigation management	38 000
5	GE.IM.12	Rehabilitation of "Shavimta" water-line	***Objective:*** Meeting the demands of drinking and industrial water for the inhabitants of village Sabatlo and supplying water to Shavimta pastures ***Planned Activities:*** - General repairs of pump station	Dedoplistskaro District (v Sabatlo)	Dedoplistskaro Water Unit	46 000

[1] Code: GEO- country, IM – project type, No – project number

			- Installation new hydro-mechanic, electro-mechanic equipment and power generators - Laying 1 500m electric transmission line and construction of transformer sub-station - Repairs of force-pumping pipeline and pressure-regulating tanks - Renovation of sanitary protection zone - Cleaning and disinfecting of pipelines and storage t anks - Restoration of operation roads		Kakheti district HYdromet center	
6	GE.IM.13	Restoration of Irrigation System "Zilicha-II" to its Design Capacity (4 427 hectares of irrigated area)	***Objective:*** Rehabilitaon of Zilicha II irrigation system to its designed capacity and irrigation of 4 427 ha agricultural lands in extremely arid zone ***Planned Activities:*** - Repair of existing pump and installation of new unit together with power generator - Canal cleaning and repair - Repair of electricity transmission line - Road repair - Repair of main canal and distribution network	Dedoplistskaro district	Dedoplistskaro district irrigation management	538 000
7	GE.IM.14	Extraction of drinking water from Lagodekhi artesian wells	***Objective:*** Meeting the drinking water demands of local populations as well as to sells 6 kilometers south to the town of Lagodekhi the sanitary protection zone of "Lagodekhi District Tskalkanali", Ltd., with 200 hectares total area is located. In case of putting into operation artesian wells located there, it is possible to extract 3.0 cub.m/sec. of fresh water for drinking purposes. ***Planned Activities:*** - Laying of high and low voltage electric networks; - Installation of 36 transformers of 100-160 Kilowatt capacity each; - Installation of ECV-12 type deep pumps with engines; - 10 engines of 500-1000 Kilowatt capacity with pumps; - Generation of 4 500-5 000 Kilowatt electric power.	Lagodekhi District	Not specified. Will be revealed through bidding	800 000
8	GE.IM.15	Improvement of environmental and health conditions	***Objective***: Improvement of environmental and health status ***Planned Activities:*** - Planting trees - Treatment of drinking water with the support of local population and authorities	Telavi district	Environmental Protection Services, Municipality with the support of "Tanamgzavri", TV company	100 000
9	GE.IM.17	Restoration of Chiaura Forest Ecosystems Investigation of the waters and the rivers of Kakheti	***Objective:*** Prevention of formation of marshes in Chiaura Forest through the elimination of the breeding ground (hearth) of malaria and saving the unique endemic flora and fauna. ***Planned Activities:*** - Putting gravel on the operation road leading to the riverbeds. - Cleaning Kabali riverbed - Reinforcing river banks - Restoration of old natural beds of the Apeni and Areshi rivers for the reduction of water debit in the Kabli riverbed.	Lagodekhi district	Lagodekhi Department of Reclamation and Water Resources, Lagodekhi District Management (Gamgeoba), Ulianovka and Vardisubani community Sakrebulos, Lagodekhi mass-media and NGOs.	75 000
10	GE.IM.21	Improvement of potable water supply for the town Gurjaani	***Objective***: Rehablitation of water intake facilities and water supply network and elimination of the problem of drinking water shortage ***Planned Activities***: - Repair and restoration of water pump - Restoration of supply network - Reconstruction of intake facility - Bank reinforcement works	Gurjaani town	Local construction enterprises, e.g. "Mirian Kuprashvili Company" and others	500 000- 1 mill.

			- Cleaning and disinfecting water pipes and storage reservoirs - Reconstruction of operation roads			
11	GE.IM.24	Construction of the Duruji river Pebble-Processing Plant	***Objective***: Cleaning of the Duruji riverbed, protection of the population from mudflows, creation of new jobs for local population ***Planned Activities***: - Collection of scientific materials on the Duruji pebbles and sand - Publishing and distribution of a book - Design and construction of a plant (plants) in the Duruji gorge directly.	Kvareli district	"Tskalekologia", Institute of Engineering Ecology of the Academy of Sciences of Georgia, Technical University of Georgia, "Kavkasiis Meridiani, association.	10 mill.
12	GE.IM.26	Replacement of drinking water supply systems and construction of new intake facilities	***Objective***: Supplying population with clean fresh water. ***Planned Activities***: - Using artesian wells for drinking water - Construction of 30 intake facilities - Replace of 600km long water supply system	Kvareli district	Kvareli Water Supply Department ("Tskalkanali") Kvareli Consortium of Rural Engineering.	15 mill.
13	GE.IM.27	Construction of silt - detention facilities on the Duruji River and the Riverbed Cleaning	***Objective***: Protection of Kvareli population from mudflows ***Planned Activities***: - Publishing of a bi-langual (Georgian-English)book on the Duruji river including all data on the river - Selection of silt -detention structures and building them on the most dangerous sites. - Conducting river dredging works	Kvareli district	"Tskalecologia", Institute of Engineering of the Academy of Sciences of Georgia Kvareli "SoplMsheni" Department "Kavkasiis Meridiani", association	1 mill.
14	GE.IM.28	Efficient use and monitoring of the Artesian and sub-artesian Basin of the Alazani River	***Objective***: Providing ecologically clean fresh water supply to the population. ***Planned Activities***: - Inventory and investigation of the state of all existing wells and ground water reserves. - Their restoration and putting into operation - Drilling of new wells after proper examination. - Shutting down and cementing of wells not meeting technical standards	Kvareli district	Kvareli Hydrological Party, "kavkasiis Meridiani", association	100 000
15	GE.IM.29	Construction of sanitary landfill and waste treatment plant	***Objective***: Improving hygienic and environmental conditions ***Planned Activities***: - Construction of sanitary landfill - Construction of waste processing plant out of town Kvareli using German or other technology	Town Kvareli	Municipality, Kvareli "SoplMshenKomplexi"	1 mill.
16	GE.IM.32	Taking flood control measures on the Alazani river	***Objective***: Protection against floods ***Planned Activities***: - Building bank reinforcements on the Alazani river not only near bridges but also at all flood prone areas - Cleaning riverbeds	Lagodekhi district	Lagodekhi district irrigation management	32 000
17	GE.IM.33	Rehabilitation of Telavi drinking water supply system	***Objective***: Improving potable water supply for the city of Telavi ***Planned Activities***: - Building new water intake facilities - Building new major pipeline - Replacing pipes in distribution network on a gradual basis: construction works should firstly cover Matsantsala and southeastern parts of the city - Reconstruction of 1km major pipe from existing intake facility	Telavi town	Public Health Care Association of Georgia & Telavi Water Unit	370 500
18	GE.IM.35	Improving drinking water supply for Gurjaani town	***Objective***: Improving water supply system in town Gurjaani ***Planned Activities***:	Gurjaani town	Local construction companies; Telavi Water Unit	150 000-200 000

			- Building 20km major pipeline, which will be based on gravitational flow - Building water treatment plants (filtrating, disinfecting) on the Cheremi lake - Joining the new major pipe to currenty existing internal distribution network			
19	GE.IM.36	Building dikes on the river Jumaskure	***Objective***: To avoid and mitigate loosing of 175 ha land, shrinking of riverbeds and possibility to abrogate Georgian-Azerbaijan border. ***Planned Activities***: - Building of 500m long dikes on both sides of the river	Dedoplistskaro district	Dedoplistskaro district land reclamation office Journalists interest group; Newspaper "Shiraki"	8 000
20	GE.IM.38	Protection of the river Alazani ecological balance	***Objective***: Regeneration of degraded forests in the protection line of riparian forests (300m) of the river Alazani ***Planned Activities***: - Regeneration of major species of forest trees - Purchasing seeds - Building the nursery garden - Cleaning territories from weeds and bushes - Reclaiming soil, planting trees and protecting them	Dedoplistskaro district	CBO "Dedoplistskaroeli" District office of Forestry	8 000
21	GE.IM.39	Reconstruction of TSINANDALI HPP (2.4 MW designed capacity; 12 mill. KW/h annual power generation)	***Objective***: Improving power generation for the region ***Planned Activities***: - Hydro project design works - Construction activities - Preparation works for HPP operation	Telavi district,v. Tsinandali	Ltd. BASIANI-93	3.5 mill.
22	GE.IM.40	Renovation of KABALI HPP	***Objective***: Improving hydro power supply ***Planned Activities***: - Repairs/replacing of turbines - Increasing plant capacity up to 3MW - Repairs of other damaged part of the HPP - Preparation of the HPP for operation	Lagodekhi district, v. Kabali	Ltd. BASIANI-93	3.2 mill
23	GE.IM.41	Renovation of INTSOBA HPP	***Objective***: Improving hydropower generation ***Planned Activities***: - Repairsof turbines - Repairs of other damaged parts - Preparation for operation	Kvareli district, v. Sabue	Ltd. BASIANI-93	1.2 mill.
24	GE. IM.42	Renovation of CHALA HPP	***Objective***: Improving hydropower generation ***Planned Activities***: - Installation of turbine's new speed governor - Construction of water outlet - Replacement of turbine's pipeline - Preparation for operation	Kvareli district	Ltd. BASIANI-93	100 000
25	AZ.IM.1	Installation of low-capacity electric equipment on the smaller rivers of River Alazani	***Objective***: to utilize the potential of mountain rivers of the basin. This will be the simple equipment, which is easy to operate. The small generators can be installed on canals as well as on the rivers. The expenditure for the equipment and for operation will be low, the exploitation period – long enough, and the costs – shortly reimbursable. ***Planned Activities***: - Purchasing of the technical equipment necessary for installation. - Purchasing of small generators - Purchasing of other necessary equipment	Azeri side of the basin	Ecological-educational public organization "Bioflor"	17 000

			-Defining the parameters representing the technical and economical indicators of the equipment. - Preparation and installation of the pilot unit.			
26	AZ.IM.2	Reconstruction of the water pipe-line located under the main highway of Balakan district.	***Objective***: improving water supply in Balakan district ***Planned Activities***: - Construction of an new line with the length of 750m (diameter=300mm) along old pipe, not under the highway but above it.	Balaken district	Authority of municipal waters of city Balaken	72 000
27	AZ.IM.3	Repairs of drinking water reservoir in Kakh district	***Objective***: Meeting drinking water demands of population ***Planned Activities***: - Reconstruction of water drainage line with the length of 1km. - Restoration of old parts. - Additional fund-rising for financing of the suggested activities.	Kakh district	Kakh district authority of water supply and communal services	14 000
28	AZ.IM.5	Building of circle-fences around three water reservoirs in the distributing basin of drinking water supply for city Balaken	***Objective:*** to secure Balaken inhabitants with clean drinking water ***Planned Activities:*** - Construction of three circle fences around the reservoirs having the volume of 1200m^3, 600m^3, and 600 m^3 respectively.	Balaken town	District authority of municipal waters of Balaken	17 000
29	AZ.IM.7	Protection of urban districts, forests, and agricultural land from flooding by mountain rivers Katekh and Talachay	***Objective:*** to protect 72 households, roads, 250ha private agricultural lands and 52 ha municipal land and forests from flooding ***Planned Activities:*** - Cleaning the left bank of river from stones and sand across the critical 3km. - Building hills (levees) of 3m diameter and 2m height from this same material. - Building concrete reinforcements every 100 meters, consisting of 8 concrete blocks of 1x2 m size - Reconstruction of sand hills existing before.	Zagatala district	Zagatala district department of State Agency of Nature Protection; Town municipality of Ashagitaht	12 000
30	AZ.IM.8	Protection of houses, forests, agricultural and other land of the river bank from the floods caused by River Talachay	***Objective:*** to protect 20 households, roads, 50 ha private agricultural and municipal lands from flooding and inundations. ***Planned Activities:*** - Cleaning the riverbed across this critical 1.5km from the sediments, consisting of stones, sand, and bottom mud. - Building ground hills as reinforcements against flooding. using dredged materials - Putting pillars that will support iron grid every 100m section across the bank.	Zagatala district	Town municipality and district department of State Agency of Nature Protection	9 000
31	AZ.IM.10	Providing three asphalt plants with raw materials	***Objective:*** Avoiding flooding, utilizing dredged materials and recruiting local labor ***Planned Activities:*** - Delivering raw materials (sand, gravel, etc) dredged from riverbeds to asphalt plants - Improving roads to plants - Finding donor organization for finding favourable credit	Zagatala district	District Zagatala authorities. The managers of asphalt plants	17 000
32	AZ.IM.11	Step-by-step renovation of water-pipes of city Balaken	***Objective:*** Improving potable water supply to Balaken inhabitants ***Planned Activities:*** - Renovation of 25km section - Renovation of 20km section - Renovation of 20 km section	Balaken town	Balaken district authority of water-pipes and sewage collectors	1 400 000
33	AZ.IM.12	Improving water supply of city Balaken	***Objective:*** Improving potable water supply for the city of Balaken ***Planned Activities:***	Balaken town	Balaken authority “Sukanal”	12 000

			- Repairing of drinking water pipes and storage reservoirs, including: (1) Installation of filters in water intake facilities of river Siltik. (2) Cleaning of the riverbed. (3) Repairing of the main water pipes (d=400mm). (4) Cleaning and repairing of storage reservoirs. The project will include fund-rising work and preparation of necessary documentation.			
34	AZ.IM.13	Construction of water pipe from Hajibulak spring to city Zagatala	***Objective:*** Improving drinking water supply for the Zagatala town ***Planned Activities:*** - Building Intake facilities on the Hajibulak spring - Constructing 7km long water-pipe to city Zagakatala.	Zagatala town	Zagatala authorities of water pipes and sewage collectors.	42 000
35	AZ.IM.14	Improving water supply of Zagatala district rural population	***Objective:*** improvement of water supply for 8 villages of Zakagala district ***Planned Activities:*** - Building of 3 water reservoirs to collect water. - Directing forest springs to these reservoirs. - Drilling three artesian wells. - Cleaning and repairing water canals (150km).	Zagatala district	Zagatala district water association "Garachai"	67 000
36	AZ.IM.15	Reinforcement of the banks of the river Kumrukh	***Objectives:*** Protecting local population against mudflows ***Planned Activities:*** - Conducting bank-reinforcing works (build concrete reinforcements) across 120m of river Kumrukh bed.	Kakh district	Kakh authority "Melioservice"	87 000
37	AZ.IM.16	Reconstruction of water-pipe system destroyed in September 2001 in the city Kakhi	***Objective:*** Improving drinking water supply system for Kakh town ***Planned Activities:*** - Reconstruction of destroyed parts (~400m), of water pipe-line	Kakh town	Kakh authority of water-pipes and sewage collectors	23 000
38	AZ.IM.17	Use of the Ganykh (Alazani) River water for irrigation purposes	***Objective:*** increasing the amount of crops of the nearby lands of the Ganykh (Alazani) river through the use of its water for irrigating purposes. The use of the water of the Ganykh river would allow the full irrigation of about 3 000 hectares of lands located in the nearby area of the river. Annually, on these lands it would be possible to raise the amount of crops equivalent to about 1 million US $. ***Planned Activities:*** - Identification of the site on the Ganykh river and construction of a dike - Raising the volume of the water to the level which would allow for (make possible to) the irrigation of nearby areas - Construction of canals for bringing the water to the land plots. Or, alternatively, a system of water use with the help of powerful pumps could be developed.	Kakh district	Head of the executive authorities of Kakh District of Azerbaijan and/or local agencies	1 mill.
39	AZ.IM.18	Bank Strengthening Constructions	***Objective:*** strengthening of riverbanks, prevention of the changing the course of the river. ***Planned Activities:*** - Construction of the bank strengthening concrete dikes, irrigation canals and installations - Planting the forest strips, - Dredging the beds of the small rivers – inflows of the Ganykh (Katekh, Bulakan, Mazym and others) -Financing and design works	Azerbaijan side of the basin	These can be local structures and/or the organizations having won the tender	1 mill.
TECHICAL EVALUATION &ASSISTANCE (TE&A)						
40	GE.TE&A.9	Study of the state of the rivers in Kakheti region	***Objective:*** Study of river quality for selected components and radioactive content ***Planned Activities:*** - Purchasing analytical equipment; - Collecting the samples;	Georgian side of the basin	International Center for Investigation and Restoration of the Environment	200 000

			- Sample analysis; - Drawing conclusions and recommendations			
41	GE&AZTE&A.20	Capacity building in support of river basin management	***Objective:*** to promote sound water management practices in the Alazani river basin ***Planned Activities:*** - Establishment of river basin organizations in each side of the basin - Equipping two offices with necessary office appliances and communications - Establishing bi-national co-ordination unit - Developing water database - Arranging staff training -Arranging workshops - Arranging study tours for basin organization members - Conducting public outreach program	Alazani river basin	ORIGO-Consulting, Ltd.	170 000
42	GE.TE&A.22	Determining the Ways for the Elimination of Goiter and Other Illnesses Caused by Fresh (Drinking) Water	***Objective:*** Reduction of the illnesses caused by drinking water to the minimal level. ***Planned Activities:*** - Creation of up-to-date laboratory for the study of drinking water and thorough analysis of the water of all water supply systems, - Development of strategic plan and basic recommendations	Kvareli district	Association "Kavkasiis Meridiani"	70 000
43	GE.TE&A.23	Monitoring of forest resources use and afforestation	***Objective:*** Saving valuable wood species from destruction, biodiversity conservation ***Planned Activities:*** - Strengthening forestry services - Conducting forest inventory - Identification of vulnerable habitats and species - Conducting reforestation works - Fencing newly planted trees	Kvareli district	Kvareli district forestry department; "Kavkasiis meridiani"	240 000
44	GE.TE&A.25	Investigation of the state of rivers in Kvareli district	***Objective:*** Protection and rational use of water resources ***Planned Activities:*** - Investigation of the rivers Bolia, Kherkhmula, Intsoba, Chelti, Duruji, Bursa, Chantali, Fantasmuri, Shorokhevi, Avaniskhevi and Areshikhevi by means of field studies - Conducting the analysis of their ecological status, hydro-resources, their uses,etc. - Publishing the book on the state of the rivers - Development of strategic plan for their protection	Kvareli District	"Tskaecologia" – Institute of Environmental Engineering; "' Association "Kavkasiis Meridiani"; Tbilisi State University; Techical University	100 000
45	GE.TE&A.34	Investigation of ecological problems of the Alazani river bank areas in Lagodekhi district	***Objective:*** Investigation of the reasons of flooding of the Alazani river bank areas (in the Chiauri forest grove) and drawing recommendations on optimal solution of the issue ***Planned Activities***: - Establishing team of experts - Conducting studies - Developing recommendations	Lagodekhi district	Public Development Association of Georgia	15 000
46	GE.TE&A.43	Hydrological survey of the Alazani river and revelation of flood prone areas	***Objective:*** study and revelation of flood prone areas in the Aalzani basin ***Planned Activities:*** - Conducting hydrological survey of the Alazani river and some of its major tributaries - Conducting hydrological calculations and determining flood levels for longitudal profile of Aalzani river in correspondence to water discharge rates - Drawing up discharge curves of different probability	Georgian side of the basin	Ltd. BASIANI-93	10 000
47	AZ.TE&A.6	Improving the quality of	***Objective:*** to clean ground and surface waters chemically, biologically, and mechanically to	Azeri side of the basin	Ecological-educational	14 000

		drinking and industrial waters according to existing water quality standards	make their quality adequate to the demands posed for drinking water. ***Planned Activities:*** - Choosing of technology for cleaning of drinking, industrial and irrigation waters - Preparation of technological plan of cleaning - Preparation of technical-normative documents		public organization "Bioflor"; Feminine public organization "Qaygi	
48	AZ.TE&A.9	Strengthening of the river Alazani basin net of protected zones	***Objective:*** To conduct environmental control of existing natural reserves of the Alazani basin, and protect existing flora and fauna ***Planned Activities:*** - Providing necessary protection to existing protection areas - Assisting in regeneration of existing species of flora and fauna - Establishing unified information database - Building a capacity of affiliated services	Azerbaijan side of the basin	Ecological-educational public organization "Bioflor"; Women's organization "Qaygi	7 000
49	AZ.TE&A.20	Developing agro-ecological model for the Alazani basin	***Objective:*** Establishing agro-ecological model of the Alazani basin to support decision-making and make forecasts of crop productivity ***Planned Activities:*** - Establishing agro-ecological database for the basin - Developing the model of agricultural productivity - Conducting inventory of existing flora and fauna - Conducting monitoring over animal migrations - Forecasting ecosystem behaviour in response to different environmental pressures - Conducting ecosystem monitoring in various places of the basin	Azerbaijan side of the basin	Sheki Agrarian-Environmental Center; Ecological education center "Bioflor"; Women's public organization "Qaygi"	1 150 000
50	AZ.TE&A.22	Developing efficient wastewater treatment technology	***Objective:*** Cleaning waters to ensure human health and environmental protection ***Planned Activities:*** - Identifying technical parameters for water - Study of appropriate wastewater treatment technology - Conducting design works - Installation of equipment - Preparation for operation	Azerbaijan side of the basin	Ecological Educational Society "Bioflor' Women's public organization "Qaygi" Private company "Lale"	250 000
MONITORING & ASSESSMENT (M&A)						
51	GE.M&A.6	Purchasing of portable equipment necessary for hydro-metric measurements	***Objective:*** Improving river quantity monitoring ***Planned Activities:*** - Purchasing and installation of hydro-metric equipment, equivalent to the Soviet GR-36 type on the four monitoring sites of the Alazani river	Georgian side of the basin (Birkiani, Shakriani, Chiauri, Zemo Kedi)	Hydrometeorological station of Kakheti district	25 000-30 000
PABLIC AWARENESS & EDUCATION (PA&E)						
52	GE.PA&E.1	Protection of Lagodekhi ecosystems and health care of population	***Objective:*** Prevention of environmental disasters, fight against malaria, public health protection ***Planned Activities:*** -Providing population with relevant information through television, radio and newspapers -Inviting experts from relevant services and assessing existing situation - Arranging public hearing	Lagodekhi district	Association "Information Company Hereti'	15 000
53	GE.PA&E.37	Establishment of Azerbaijan-Georgian radio company	***Objective:*** Increasing public awareness among basin population ***Planned Activities:*** - Establishing of radio station company - Purchasing licence for broadcasting - Procuring appropriate technical equipment: PC, remote control, voice filters (processors), montage computers, communications	Dedoplistskaro district	Dedoplistskaro newspaper "Shiraki" District interest group of journalists; Azerbaijan "Natural Protection Society" Zagatala branch	30 000

			- Arranging radio programs on the region's environmental problems			
54	AZ.PA&E.4	Study of ecological state of the river Alazani and organization of educational activities	***Objective***: rising of public awareness about ecological issues. ***Planned Activities:*** - Preparation of technical methods and guidelines for environmental protection - Preparation of training courses - Publishing and distribution of different environmental brochures - Creating children's voluntary "environmental inspectorates" - Establishing permanently operating information centers - Arranging seminars, lectures, classes on different environmental issues	Azeri side of the basin	Ecological-educational public organization "Bioflor"; Women's public organization "Qaygi"	15 000

Table 8. Evaluation of Project Proposals

No	Code	Proposal	Engineering and Technical				Environmental		Social			Cost	Impact on electric energy crisis	Organization of Proposal	Score
			Population	Water quantity	Water Quality	Reduction of Water Pollution	Impact on Eco-systems	Water resource saving	Social Conflicts	Health Impact	Social Condition Improvement				
			8	10	10	10	8	9	7	10	5	5	8	7	
1	GE. PA&E.1	Protection of Lagodekhi ecosystem and health care of the population	3	1	1	1	1	1	1	2	1	1	0	1	115
2	GE. IM.3	Restoration of Irrigation System “Zilicha-I” to its Design Capacity (5221 hectares of irrigating area)	1	2	0	0	0	1	2	1	2	0	0	2	85
3	GE IM.4	Bank Reinforcement of the river Alazani	1	1	0	0	2	1	1	1	1	0	0	2	79
4	GE. M&A.6	Purchasing of Portable Equipment Necessary for Hydro-metric Activities	0	1	0	0	0	1	1	0	1	1	0	0	36
5	GE. IM.7	The use of mountainous rivers for hydropower generation	3	0	0	0	0	0	1	1	2	-1	2	1	69
6	GE. TE&A.9	Study of the state of the rivers in Kakheti region	3	0	1	1	1	0	0	1	1	0	0	2	81
7	GE. IM.11	Rehabilitation of "Kasristskali" Water-line	1	2	2	1	0	0	2	2	2	1	0	2	121
8	GE. IM.12	Rehabilitation of "Shavimta" Water-line	1	2	2	1	0	0	2	2	2	1	0	2	121
9	GE. IM.13	Restoration of the Irrigation System “Zilicha-II” to its Design Capacity and Irrigation of Agricultural lands of 4 427 hectares.	1	2	0	0	0	1	2	1	2	0	0	2	85
10	GE. IM.14	Extraction of Drinking (Fresh) Water from Existing Artesian Wells	3	2	1	0	0	0	1	1	2	0	2	1	104
11	GE. IM.15	Improvement of environmental and health conditions	0	0	2	2	2	0	1	2	2	1	0	0	98
12	GE. IM.17	Restoration of Chiaura Forest Ecosystem	3	2	1	1	2	2	1	2	2	1	0	2	154

13	GE. TE&A. 20	Capacity building in support of river basin management	3	1	1	2	1	1	2	1	2	0	1	2	137
14	GE. IM.21	Improvement of water supply for the city of Gurjaani	2	2	2	2	1	2	2	1	2	0	2	1	159
15	GE. TE&A. .22	Determining the Ways for the Elimination of Goiter and Other Illnesses Caused by Fresh (Drinking) Water	3	0	2	1	1	0	1	2	1	1	0	1	106
16	GE. TE&A. 23	Monitoring of forest resources use and afforestation	3	1	1	1	2	1	1	1	1	0	0	1	108
17	GE. IM.24	Construction of the Duruji river Pebble-Processing Plant	1	1	1	0	1	0	1	1	1	-1	0	1	60
18	GE. TE&A. 25	Investigation of the state of rivers in Kvareli district	3	1	1	1	1	1	1	1	1	1	1	1	120
19	GE. IM.26	Replacement of Drinking Water Supply Systems and Construction of Head Facilities	2	1	1	1	2	1	1	2	-1	0	1	0	101
20	GE. IM. 27	Construction of silt-detention facilities on the Duruji River and the Riverbed Cleaning	2	1	1	0	2	1	1	1	2	0	0	1	95
21	GE. IM.28	Efficient Use and Monitoring of the Artesian and sub-artesian Basin of the Alazani River	3	2	1	0	-1	1	1	1	1	1	0	1	89
22	GE. IM.29	Construction of sanitary landfill and waste treatment plant	2	0	2	2	2	0	1	2	2	0	0	1	116
23	GE. IM.32	Taking flood control measures on the Alazani river	3	2	1	2	2	1	0	2	1	1	0	1	136
24	GE. IM.33	Rehabilitation of Telavi drinking water supply system	3	2	2	2	1	2	2	2	1	0	1	2	166
25	GE. TE&A. 34	Investigation of ecological problems of the Alazani river bank areas in Lagodekhi district	2	0	1	0	2	0	1	2	2	1	0	2	103
26	GE. IM.35	Improving drinking water supply for Gurjaani town	2	2	2	1	0	1	2	1	2	0	1	2	131
27	GE. IM.36	Building dikes on the river Jumaskure	2	0	0	1	2	0	1	1	1	1	0	2	83
28	GE. TE&A. 37	Establishment of Azerbaijan-Georgian radio company	3	0	0	0	2	1	2	1	1	1	0	2	61
29	GE. IM.38	Protection of the river Alazani ecological balance	3	1	1	1	2	2	1	1	0	2	0	2	129

30	GE. IM.39	Reconstruction of TSINANDALI HPP	3	1	0	0	-1	1	2	1	2	-1	2	2	99
31	GE. IM.40	Renovation of KABALI HPP	3	1	0	0	-1	1	2	1	2	-1	2	2	99
32	GE. IM.41	Renovation of INTSOBA HPP	3	1	0	0	-1	1	2	1	2	-1	2	2	99
33	GE. IM.42	Renovation of CHALA HPP	2	1	0	0	-1	1	2	1	2	1	2	2	101
34	GE. TE&A. 43	Hydrological survey of the Alazani river and revelation of flood prone areas	3	0	0	0	2	1	2	1	1	1	0	2	89
35	AZ. IM.1	Installation of low-capacity electric equipment on the smaller rivers of River Alazani	1	0	0	0	1	0	1	1	2	1	2	2	73
36	AZ. IM.2	Reconstruction of the water pipe-line located under the main highway of Balakan district.	3	2	1	1	1	2	2	1	2	1	0	1	131
37	AZ. IM.3.	Repairs of drinking water reservoir in Kakh district	3	2	0	0	0	1	2	1	2	1	0	1	94
38	AZ. PA&E.4	Study of ecological state of the river Alazani and organization of educational activities	3	0	0	1	1	1	1	1	1	1	1	1	95
39	AZ. IM.5	Building of circle-fences around three water reservoirs in the distributing basin of drinking water supply for city Balaken	2	0	1	1	0	0	1	1	1	1	0	1	65
40	AZ. TE&A.6	Improving the quality of drinking and industrial waters according to existing water quality standards	3	0	1	2	1	0	1	2	1	1	0	1	99
41	AZ. IM.7	Protection of urban districts, forests, and agricultural land from flooding by mountain rivers Katekh and Talachay	1	1	0	0	2	2	2	1	2	1	0	2	100
42	AZ. IM.8	Protection of houses, forests, agricultural and other land of the river bank from the floods caused by River Talachay	1	1	0	0	2	1	2	1	2	2	0	2	91
43	AZ.TE&A.9	Strengthening of the river Alazani basin net of protected zones	1	0	0	0	2	0	1	1	1	2	0	2	50
44	AZ. IM.10	Providing three asphalt plants with raw materials	3	1	-1	-1	1	1	1	0	2	1	0	1	55

45	AZ. IM.11	Step-by-step renovation of water-pipes of city Balaken	3	2	2	2	-1	2	2	2	2	-1	0	1	145
46	AZ. IM.12	Improving water supply of city Balaken	3	1	2	2	0	1	1	2	2	1	0	2	134
47	AZ. IM.13	Construction of water pipe from Hajibulak spring to city Zagatala	2	2	1	0	-1	0	1	1	2	1	0	1	72
48	AZ. IM.14	Improving water supply of Zagatala district rural population	2	2	1	0	-1	0	1	1	2	1	0	1	72
49	AZ.IM.15	Reinforcement of the banks of the river Kumrukh	3	1	0	0	2	1	1	2	2	1	0	1	103
50	AZ. IM.16	Reconstruction of water-pipe system destroyed in September 2001 in the city Kakhi	3	2	2	1	0	2	1	2	2	1	0	1	136
51	AZ. IM.17	Use of the Ganykh (Alazani) River water for irrigation purposes	3	2	0	0	-1	1	1	1	2	0	1	1	129
52	AZ. IM.18	Bank strengthening constructions	3	1	0	0	1	1	1	1	2	-1	0	0	78
53	AZ. TE&A. 20	Developing agro-ecological model for the Alazani basin	3	1	2	2	2	1	2	2	2	-1	2	2	152
54	AZ. TE&A. 22	Developing efficient wastewater treatment technology	3	1	2	2	2	1	2	2	2	0	0	2	157

Table 9. List of Prioritized Project Proposals

No	Code	Title	Score
1	GE. IM.33	Rehabilitation of Telavi drinking water supply system	**166**
2	GE.IM.21	Improvement of water supply for the city of Gurjaani	**159**
3	AZ.TE&A. 22	Developing efficient wastewater treatment technology	**157**
4	GE.IM.17	Restoration of Chiaura Forest Ecosystem	**154**
5	AZ.TE&A.20	Developing agro-ecological model for the Alazani basin	**152**
6	AZ.IM.11	Step-by-step renovation of water-pipes of city Balaken	**145**
7	GE&AZ.TE&A.20	Capacity building in support of river basin management	**137**
8	AZ.IM.16	Reconstruction of water-pipe system destroyed in September 2001 in the city Kakhi	**136**
9	GE.IM.32	Taking flood control measures on the Alazani river	**136**
10	AZ.IM.12	Improving water supply of city Balaken	**134**
11	AZ.IM.2	Reconstruction of the water pipe-line located under the main highway of Balakan district.	**131**
12	GE.IM.35	Improving drinking water supply for Gurjaani town	**131**

13	AZ.IM.17	Use of the Ganykh (Alazani) River water for irrigation purposes	**129**
14	GE.IM.38	Protection of the river Alazani ecological balance	**129**
15	GE.IM.11	Rehabilitation of "Kasristskali" Water-line	**121**
16	GE.IM.12	Rehabilitation of "Shavimta" Water -line	**121**
17	GE.TE&A.25	Investigation of the state of rivers in Kvareli district	**120**
18	GE.IM.29	Construction of sanitary landfill and waste treatment plant	**116**
19	GE.PA&E.1	Protection of Lagodekhi Ecosystem and Health Care of the Population	**115**
20	GE.TE&A.23	Monitoring of forest resources use and afforestation	**108**
21	GE.TE&A.22	Determining the Ways for the Elimination of Goiter and Other Illnesses Caused by Fresh (Drinking) Water	**106**
22	GE.IM.14	Extraction of Drinking (Fresh) Water from Existing Artesian Wells	**104**
23	AZ.IM.15	Reinforcement of the banks of the river Kumrukh	**103**
24	GE.TE&A.34	Investigation of ecological problems of the Alazani river bank areas in Lagodekhi district	**103**
25	GE.IM.26	Replacement of Drinking Water Supply Systems and Construction of Head Facilities	**101**
26	GE. IM.42	Renovation of CHALA HPP	**101**
27	AZ.IM.7	Protection of urban districts, forests, and agricultural land from flooding by mountain rivers Katekh and Talachay	**100**
28	AZ.TE&A.6	Improving the quality of drinking and industrial waters according to existing water quality standards	**99**
29	GE.IM.39	Reconstruction of TSINANDALI HPP	**99**
30	GE.IM.40	Renovation of KABALI HPP	**99**
31	GE.IM.41	Renovation of INTSOBA HPP	**99**
32	GE.IM.15	Improvement of environmental and health conditions	**98**
33	GE.IM.27	Construction of silt-detention facilities on the Duruji River and the Riverbed Cleaning	**95**
34	AZ.PA&E.4	Study of ecological state of the river Alazani and o rganization of educational activities	**95**
35	AZ.IM.3	Repairs of drinking water reservoir in Kakh district	**94**
36	AZ.IM.8	Protection of houses, forests, agricultural and other land of the river bank from the floods caused by River Talachay	**91**
37	GE.TE&A.43	Hydrological survey of the Alazani river and revelation of flood prone areas	**89**
38	GE.IM.28	Efficient Use and Monitoring of the Artesian and sub-artesian Basin of the Alazani River	**89**
39	GE.IM.3	Restoration of Irrigation System “Zilicha-I” to its Design Capacity (5221 hectares of irrigating area)	**85**
40	GE.IM.13	Restoration of the Irrigation System “Zilicha-II” to its Design Capacity and Irrigation of Agricultural lands of 4 427 hectares.	**85**
41	GE.IM.36	Building dikes on the river Jumaskure	**83**
42	GE.T E&A.9	Study of the state of the rivers in Kakheti region	**81**
43	GEIM.4	Bank Reinforcement of the river Alazani	**79**
44	AZ.IM.18	Bank strengthening constructions	**78**
45	AZ.IM.1	Installation of low-capacity electric equipment on the smaller rivers of River Alazani	**73**
46	AZ.IM.13	Construction of water pipe from Hajibulak spring to city Zagatala	**72**
47	AZ.IM.14	Improving water supply of Zagatala district rural population	**72**
48	GE.IM.7	The use of mountainous rivers for hydropower generation	**69**
49	AZ.IM.5	Building of circle-fences around three water reservoirs in the distributing basin of drinking water supply for city Balaken	**65**
50	GE.TE&A.37	Establishment of Azerbaijan-Georgian radio company	**61**

51	GE.IM.24	Construction of the Duruji river Pebble-Processing Plant	**60**
52	AZ.IM.10	Providing three asphalt plants with raw materials	**55**
53	AZ.TE&A.9	Strengthening of the river Alazani basin net of protected zones	**50**
54	GE.M&A.6	Purchasing of Portable Equipment Necessary for Hydro-metric Activities	**36**

Appendix 3
Combination of Prioritized Measures and Projects

Table 1. Summary Table of Prioritized Measures and Projects

Prioritized Functions	Pripiritized Measures Under Each Function	Time Schedule for Measures	Codes of Prioritized Project Proposals under each function	Project Cost	Project Location	Possible Source of Financing
Drinking Water Supply	Reconstruction/construction of distribution networks (Y)[1]	2003-2013	GE.IM.33 GE.IM.21 AZ.IM.11 GE&AZ.TE&A.20[2] AZ.IM.16 AZ.IM.12 AZ.IM.2 GE.IM.35 GE.IM.11 GE.IM.12 GE.TE&A.22 GE.IM14 GE.IM.26 AZ.IM.3 AZ.IM.13 AZ.IM.14 AZ.IM.5	370 500 500 000 1 400 000 170 000 23 000 12 000 72 000 200 000 38 000 46 000 70 000 67 000 15 000 000 14 000 42 000 67 000 17 000 Total: 18 108 500	Telavi town Gurjaani town Balaken town Alazani basin Kakh town Balaken town Balaken town Gurjaani town Dedoplistskaro district Dedoplistskaro district Kvareil district Lagodekhi Kvareli district Kakh district Zagatala town Zagatala district Balaken town	Local budget WB JICA EBRD SIF KFW Asian Bank Islamic Development Bank UNDP USAID TACIS Swiss Agency for Development and Cooperation
	Reconstruction/construction of intake facilities and trunk pipes (Y)	2003-2010				
	Capacity building for river basin management (Y)	Continuous				
	Rehabilitation/construction of chlorinating and laboratory facilities; Fencing of intake facilities (Y)	2003-2006				
	Rehabilitation/construction of filtrating facilities (Y)	2003-2004				
	Public awareness campaign (No)[3]	Continuous				
	Building new intake facilities (Y)	2003-2007				
	Scientific and technical studies (Y)	Continuous				
	Installation of water metering systems (No)	2009-2013				
	Equipping water units with office equipment and communications (No)	2004-2005				
	Training of specialists (Y)	2003-2013				
	Establishment of Technical Training Centre[4] (No)	2003-2004				
	Equipping Sanitary Inspection Laboratories with office, analytical equipment and communications (Y)	2003-2004				
	Rehabilitation/construction of water pumps (Y)	2006-2007				

[1] Measures under which specific long-term projects were identified
[2] Common to all functions
[3] Measures under which long-term projects were not identified
[4] ***Center*** will include training the specialists from other units as well, e.g. , irrigation offices

Public Health and Ecosystem Support	Construction of Wastewater Treatment Plants[4] (Y)	2004-2013	AZ.TE&E22	250 000	Azeri side of the basin	Local budget WB JICA EBRD SIF KFW Asian Bank Islamic Development Bank UNDP USAID TACIS Swiss Agency for Development and Cooperation
	Riverbed cleaning (Y)	Continuous	GE.IM.17	75 000	Lagodekhi district	
	Planting trees/reforestation (Y)	2003-2004	AZ.TE&A.20	1 500 000	Azeri side of he basin	
	Rehabilitation/construction of sewage systems (No)	2003-2013	GE&AZ.TE&A.20	170 000	Both sides of the basin	
	Rehabilitation/building of sanitary landfills and waste treatment plants (Y)	2005-2010	GE.IM.32	32 000	Lagodekhi	
	Equipping communal offices with office, laboratory equipment and communications (No)	2003-2004	GE.IM.38	8 000	Dedoplistskaro district	
	Reconstruction/construction of dikes and levees (Y)	2003-2006	GE.TE&A.25	100 000	Kvareli district	
	Equipping MoE regional offices with office and analytical equipment and communications (No)	2003-2004	GE.IM.29	1 000 000	Kvareli district	
	Cleaning drinking water and enriching them with various elements (Y)	Continuous	GE.PA&E.1	15 000	Lagodekhi	
	Training of MoE staff in compliance assurance monitoring and control (No)	2003-2004	GE.TE&A.23	240 000	Kvareli district	
	Capacity building for integrated river basin management (Y)	Continuous	AZ.IM15	87 000	Kakh	
	Public awareness campaign (Y)	Continuous	GE.TE&A.34	15 000	Lagodekhi district	
	Conducting scientific researches and technical studies (Y)	Continuous	AZ.IM.7	12 000	Zagatala district	
	Increasing capacity of healthcare systems to fight against malaria (Y)	Continuous	AZ.TE&A.6	14 000	Azeri side of the basin	
			GE.IM.15	100 000	Telavi district	
			GE.IM.27	1 000 000	Kvareli district	
			AZ.PA&E.4	15 000	Azeri side of the basin	
			AZ.IM.8	9 000	Zagatala	
			GE.TE&A.43	10 000	Georgian side of the	
			GE.IM. 28	100 000	Kvareli district	
			GE.IM.36	8 000	Dedoplistskaro district	
			GE.TE&A.9	200 000	Georgian side of the basin	
			GE.IM.4	120 000	Dedoplistskaro district	
			AZ.IM.18	1 000 000	Azeri side of the basin	
			GE.PA&E.37	30 000	Dedoplistskaro district	
			GE.IM.24	10 000 000	Kvareli district	
			AZ.IM.10	17 000	Zagatala district	
			AZ.TE&A.9	7 000	Azeri side of the basin	
			GE.M&A.6	30 000	Georgian side of the basin	
				Total : 16 164 000		
Irrigation	Reconstruction/construction of desilting facilities (No)	2003-2006				Local budget WB JICA EBRD SIF
	Reconstruction/construction of irrigation networks (Y)	2003-2013	GE&AZ.TE&A.20	170 000	Both sides of the basin	
	Capacity building for integrated river basin management (Y)	Continuous	AZ.IM.17	1 000 000	Kakh district	
	Public awareness campaign (No)	Continuous	GE.IM.3	165 000	Dedoplistskaro district	
	Establishing and strengthening water user associations (No)	2003-2006	GE.IM.13	538 000	Dedoplistskaro district	
				Total : 1 873 000		

[4] Information for wastewater collection and treatment demand is given in table 2 below

	Installation of water metering systems (No)	2008-2013				
	Rehabilitation/building of irrigation reservoirs (Y)	2005-2010				
	Training of specialists (No)	Continuous				
	Scientific and technical studies (No)	Continuous				
	Establishment of water database center (Y)	2003-2005				
	Reconstruction/construction of pump stations (Y)	2009-2010				
Hydropower Generation	Capacity building for river basin management (Y)	Continuous	GE&AZ.TE&A.20 GE.IM.42 GE.IM.39 GE.IM.40 GE.IM.41 AZ.IM.1 GE.IM.7	170 000 100 000 3 500 000 3 200 000 1 200 000 17 000 <u>100 000 000</u> Total: 108 187 000	Alazani Basin Kvareli district Telavi district Lagodekhi district Kvareli district Azeri side of the basin Georgian side of the Basin	Local budget WB JICA EBRD SIF KFW Asian Bank Islamic Development Bank UNDP USAID TACIS Swiss Agency for Development and Cooperation
	Public awareness campaign (No)	Continuous				
	Improvement of power grid and establishment of regional power grid (No)	2003-2013				
	Conducting scientific researches and technical studies (Y)	Continuous				
	Training of specialists (No)	Continuous				
	Reconstruction/construction of small to medium HPPs (Y)	2005-2010				
	Establishing water database center (Y)	2003-2005				
	Development of micro HPPs (Y)	2005-2006				

Table 2. Development of Sewerage System in the Alazani Basin

#	Settlement Area	Number of population (1000man)[5]		Norm for Discharged Water (1/24 hours/person)	Wastewater Consumption (1000 m^3/24 hour)	Designed Capacity of Wastewater Treatment Plant (1000 m^3/24 hour)	Cost of Waste Water Treatment Plant (1000$)	Sewage System Network Development %	Sewage System Rehabilitation Tentative Costs[6] (1000$)
		2001	2013						
1	Akmeta	8.8	8.8	340 1/day/capia	2992	3000	657	---	150
2	Telavi	26.3	26.3		8942	9000	885	70	250
3	Kvareli	11.2	11.2		3808	4000	765	40	250
4	Lagodekhi	8.3	8.3		2822	3000	657	80	100
5	Signagi	3.4	3.4		1156	1000	497	20	100
6	Tsnori	2.8	2.8		952	1000	497	0	100
7	Gurjaani	12.3	12.3		4182	4000	765	50	200
8	Dedoplistskaro	8.4	8.4		2856	3000	657	40	150
9	Balaken	13.0	44.33		15.07	15.0	1185	40	450
10	Kakh	11.7	39.9		13.57	15.0	1185	10	700
11	Zagatala	27.0	92.07		31.3	30.0	1448	60	800
12	Sheki	63.8	217.56		73.97	75.0	2150	50	1500

[5] According to estimations of UNDP and WB: annual ***rate of population growth for*** Georgia during last ten years was maintained at approx. – 1%. According to Azerbaijan's official statistics, annual growth rate for the Azeri side of the basin is about Azerbaijan is 9.9%.

[6] ***Costs*** include costs for wastewater collectors

Appendix 4.
Pilot Projects

Table 1. Pilot Project Briefs

No	Code[1]	Proposal Title	Brief Description	Implementing Organization	Location	Cost (USD)
TECHNICAL MEASURES (TM)						
1	GE.4	Problems of village Giorgeti	The project is about the dam reinforcements on River Kabal. As the river is one of the most watery rivers in the basin and periodical inundations are flooding the territories, agricultural lands, households, etc. This project will include the following: - reconstructing the dams and reinforcements on the specific places	Association for Social Investigation and Development	Lagodekhi District, Village Giorgeti (41°50' Lat - 46°3' Long)	1,000
2	GE.5	Water quality investigation of tributary rivers of Alazani	For detailed investigation of River Alazani the samples will be taken from two hydro meteorological monitoring sites, such as Shakriani (near Telavi Town as upstream) and Chiauri (near Lagodekhi as the downstream and the border Azerbaijan-Georgia). The element contents of waters will be investigated by using the high-sensitive double-focusing mass-spectrometer with laser-ion source, and radioactivity - by the semi-conductor γ-spectrometer of the American firm CANBERRA. Following components will be identified: pH, common ions, biogenic substances, organic substances, permanganate oxygenation, dichromate oxygenation, BOD, COD, phenol, pesticides, as well as micro elements, as I, B, As, Cu, Mn, Fe and etc. The following activities are planned: - Collecting the necessary amount of samples - The measurements will be carried out in the laboratory	NGO -International Center of Investigation and Restoration of Environment	Shakriani Monitoring Site, 41°59'0 Lat 45°35'0 Long Chiauri Monitoring Site 41°40'0 Lat 46°5'0 Long	2,000
3	GE.7	Specification of the role of Zemo Alazani irrigation system in water resources management scheme	Main objective of the project is detailed assessment of actual importance of the Zemo Alazani irrigation system and its prospects and elaboration of development plan on the basis of integrated resource planning principles. It must be noted that insufficient information on water regime of R. Alazani after 90-ies will hamper comprehensive study of the subject.	National Agency on Climate Change	Zemo Alazani Irrigation Area Starting in the Village Matani (42°5' Lat - 45°10' Long) Ending in the Village Kardanakhi (41°41' Lat - 45°55' Long)	4,620
4	GE.9	Arranging water supply to Telavi Secondary School No 1	To eliminate poor sanitary-hygienic conditions in the school and the epidemics of different diseases among schoolchildren. Telavi sec. school No 1 is one of the oldest educational institutions in Georgia, which was founded in 1758 y. by the King Erekle II and is situated inside the royal fortress in the center of the city. 998 students and 77 teachers study and work there. During the last 10 years the water-supply system was damaged. It causes the epidemics of A-Hepatitis, measles and other inflectional diseases at least twice a year in school. Toilets and drinking fountains, canteen is left without any water. It is one of the most severe problems in school, which is connected, with the health of the children. Suggested activities are as follow. - Arranging 8 tone reservoir (10 days) - Water pipe-line (14 days) - Rehabilitation of the territory (3 days)	Telavi English Teachers' Association	Telavi Town	*770-800*

[1] Code: Ge - country code, No – project number

No	Code[1]	Proposal Title	Brief Description	Implementing Organization	Location	Cost (USD)
5	GE.13	Rehabilitation of local water supply for three streets of Telavi town	The aim is to recreate the operation of water supply for Nadikvari, Rcheulishvili and Tetriani streets, as well as the school #3. The local water supply system was created at the beginning of 2001 and consists of bore, reservoir and the pipeline. The water is pumped in the reservoir, from where it streams in the pipes to the households. In the beginning of 2002 the pump was damaged. It was fixed 4 times but it did not work more than a fortnight. In order to recreate the water supply system the new pump needs to be purchased, with power generator and purchase and installation of four water meters. -Purchasing the pump with height of 40 m and capacity of 1200-1400 l/hr. -The capacity of power generator has to be 3 kW. -The installation will be carried out conducted by the volunteering of the inhabitants of this area.	CBO "Nadikvari"	Telavi Town	840
6	GE.15	Re-vegetation works to recreate the agricultural lands	To receive 3 ha high productive pastures and interrupt the intensive erosion processes in Village Busheti in Telavi District. During the Soviet Union the centralized land use planning in Eastern Georgia demanded the development of vineyards and even though in the Village Busheti 3 ha of land was one of the high productive pastures, these pastures were destroyed and the vineyards were built. Therefore, the cultivation of these lands for the vineyards caused the erosion in the lands. Nowadays village population desires but cannot recreate the pastures. There are several activities to be done: - Cleaning the given 3 ha of deserted agricultural lands near Village Busheti from remains of concrete columns, rusty wires, stones Stones will be used for reinforcement and interrupting the intensive erosion processes.	Association "Tsinandali 2002"	Telavi District-Village Busheti ($41^{o}54'$ Lat - $45^{0}10'$ Long)	985
7	AZ.5	Use of hydro-energy resources of the Alazan river basin	The Alazan river basin has high hydro energy potential. In spite of this today population of the basin do not use them and there is energy problem in the region. The Implementation of the project will play important role in planning of energy use programs and promote improving of energy supply of the region. This may also lead to the elimination of mass cutting of forests, which are used as fuel wood in many locations.	IHP NGO (Baku)	Azeri Side of the Basin	2,650
8	AZ.7	Database development for expanding of protected areas in the Alazan basin	In two existing natural reserves of the region, the natural mountain landscape with the characteristic flora and fauna is protected. Today settlements are being constructed close to these reserves. To stop this process there is necessity for optimization of protected area and expanding its boundaries, which will be determined under this project.	ARZU, BIOFLOR NGO (SHEKI)	Azeri Side of the Basin	1,150
TRAINING & AWARENESS (T&A)						
9	GE.1	Demonstration of Irrigation System "Fregate" on Alazani Valley	Farmers and other interested persons will be invited to see the Irrigation System "Fregate", to be able to get acquainted its technical and economical parameters. This project will include the following: - Providing information for the interested persons; - Publishing the brochures; - Presentation and seminars	NGO "Fregate"	Signagi District, City Tsnori	1,000
10	GE.2	Trainings and informative seminars on the water resource management issues	There are serious issues in the Alazani river basin. In order to solve them it is necessary to involve as many active resident as possible, which will participate, learn and teach others how and with which ways to solve some problems existing in the basin. This project will include the following: - Conducting series of trainings and seminars; - Issuing the information bulletins and distributing pilot area. Project will be implemented in following Telavi district and Akhmeta town;	Initiative Group "XXI Century Journalists"	Telavi District and Akhmeta Town	1,000
11	GE.3	Working on the environmental and	There have been flooding soil bogging and salinization processes in Chiauri Forest, Lagodekhi district, which has become the sources of malaria and destruction of many animal species. In	Association for Social Investigation and Development	Lagodekhi District	600-700

No	Code[1]	Proposal Title	Brief Description	Implementing Organization	Location	Cost (USD)
		water resource problems in Lagodekhi District	this project the association will try to increase the awareness of population on the issues of ecology and water resources. This project will include the following: Publishing the information bulletins on the malaria symptoms and the ways of cure; Distributing these bulletins among the district residents			
12	GE.6	One year regular TV series on environmental issues	The aim of the project is to identify the problematic issues and draw the attention of competitive persons and public. For instance, Lagodekhi Khevi needs cleaning from the urban solid waste, therefore, the public will see and hear what can be the results of this problem. There will be attempts to increase the awareness in society not to litter the rivers nearby. This project will include the following: - TV participation in the various public and decision makers activities on the above mentioned issues and the ways of solution; Preparing the programs and broadcasting regularly on TV (8 programs, each 30 minutes)	Lagodekhi TV Company "ECOMI"	Lagodekhi	500
13	GE.8	Public Awareness raising and public involvement through independent mass-media	Achievement of specific goals on the basis of the study of ecological problems (namely the Alazani basin), their generalization for the purpose of finding ways for their solution. The far east of Dedoplistskaro is a bordering region with Azerbaijan territory. The Alazani river runs along the boarder of these two countries. The ecological problems of the river basin are common for the both sides. There exists only one regional newspaper in Dedoplistkaro "Shiraki" financed by the local administration "Gamgeoba". Hence, any issue on ecological problems highlighted by us, which is also true for the Alazani basin problems, most probably always will be biased and will not cover them fully. - 4 issues	Dedoplistskaro, newspaper "Shiraki"	Dedoplistskaro district	1,000
14	GE.10	Children's Paintings Competition with the slogan "Alazani is Big"	This proposal aims at the formation of proper awareness on the river problems within the children (students). In Telavi, Kvareli, Signagi, Lagodekhi, Gujaani, Dedoplistskaro with the department of education the task will be given to the students of all schools to create the paintings on the river problematic issues and afterwards the best paintings will be selected and be published in the specially issued brochure.	"Little Town" - NGO	Georgian side of basin	1,000
15	GE.11	Children's concert with the slogan "Alazani is Big"	This project aims increasing the interest between the youngsters (students) on the Alazani Basin problematic issues. In the cities of Georgian side of basin the selection of qualified artists will be made, who will select the most talented children (around 10) and will prepare the special concert program with them on the water issues. The program will be presented in all the cities of Georgian side of basin.	"Little Town" - NGO	Georgian side of basin	*600-700*
16	GE.12	Children's Sport Marathon with the slogan "Alazani is great"	The selected students group from all schools in the towns will conduct the sport marathons in all towns of Georgian side of basin.	"Little Town" - NGO	Georgian side of the basin	*700-800*
17	GE.14	Ecological Security of Alazani River	Collecting the information on Malaria problems near the Alazani River territories and informing the citizens about it. As the public do not have the information on the activities of environmental protection and the ways of decreasing negative impacts, the following activities are planned: 1. Arrangement of public hearing on environmental issues; 2. Establishment of working team who will deal with the problems and process and working plan Besides, there will be the following activities during the implementation of the project: 1. Publishing the brochures with the information on the nature protection according the Georgian laws and legislations; 2. Issuing the information papers for the public where the collected data and the conducted activities of organization will be identified; 3. Conducting the meetings with the decision-makers. TV programs on the above mentioned issues would be prepared and broadcasted in the local	International Society for the Fair Elections and Democracy	Lagodekhi District	1,000

No	Code[1]	Proposal Title	Brief Description	Implementing Organization	Location	Cost (USD)
			TV.			
18	GE&AZ. 16	Georgian and Azerbaijan Student Exchange (Zagatala, Lagodekhi)	10 Lagodekhi secondary school students with two teachers will travel to Zagatala for a week. They will live in the Azeri families. They will study in Zagatala school (the teachers are to provide the interpretation). The attention will be drawn on the Alazani Basin issues in additional lessons that will be conducted everyday during the visit. The families who will host the Georgian students will provide the food. Next week Azerbaijan students will make the same visit in Lagodekhi. Following activities are planned under the project: 1. Preparation of the teachers on the Alazani Basin issues; 2. Selection of the students in Lagodekhi and Zagatala; 3. Make arrangements with the families who are to host the students in both countries; Arranging the exchange travels	Little Town - Georgia Ecorez- Azerbaijan	Lagodekhi Town Zagatala Town	1,000
19	AZ.1	Public Awareness rising in the field of water resources sustainable use	In result of this pilot project we are planning to: ▪ Publish a booklet, consisting of information about state of water resources and recommendations for sustainable water use; ▪ Distribute them among the local population. Organize seminars for eco-activities for related districts.	Ecological Innovation Center NGO (Baku)	Azeri Side of the Basin	1,100
20	AZ.2	Awareness rising among irrigation water users	In four districts of the basin, meetings with farmers will be organized. By involving of experienced specialists, we are going to prepare related handbook for them and train them on its basis. Handbook will include information on world sustainable irrigation water use experience, necessity of adopting chargeable water use, optimal irrigation norms, etc	Fovgal NGO (Baku)	Azeri Side of the Basin	1,250
21	AZ.3	Save the unique forests of Sheki-Zagatala region!	Following activities are planned under this proposal: ▪ organizing meetings with locals; Arranging information campaigns through mass media; publishing bulletins in the field of forest protection.	Center of protection of birds NGO (Baku)	Sheki District and Zagatala District	1,270
22	AZ.4	Environmental training for local school children and volunteers within the Alazan river basin	The ECORES will organize training in districts of the basin for large audience of school children and volunteers. In each of these two-day trainings, they the audience will be informed about existing problems of the basin, legal and practical instruments of their solving.	ECORES NGO (Baku)	Azeri Side of the Basin	950
23	AZ.6	Informing local population on the new rules for sanitary protection (buffer) zones around water objects	Organizing of seminars in all districts of the basin; The subject of seminar will be rising of knowledge of population about existing experience, legislation and ways of creating sanitary zones around water objects. Implementing of project will promote the protection of drinking water sources of the rejoin.	MONITORING NGO (Baku)	Azeri Side of the Basin	800

Criteria and Methodology for Evaluation of Pilot Project Proposals

The methodology is based on evaluation criteria representing

1. Public awareness rising
2. Impact on water quality
3. Saving of water resources
4. Impact on ecosystems
5. Impact on population health
6. Social impact
7. Organization of proposal

The criteria representing each of these fields in details were discussed and assigned importance factors, ranging from 1 to 10 and expressing relative importance of each criterion in meeting the basic goals of integrated river basin management.

Table 2. Weighted importance factors Assigned to Evaluation Criteria for Pilot Project Proposals

Evaluation Criteria	Importance Factors
1	2
1. Public Awareness rising	10
2. Water qu ality	8
3. Saving of water resources	8
4. Population health	10
5. Impact on ecosystems	7
6. Social impact	7
3. Organization of proposal	6

Rating Factor

Rating factors were developed for each of the evaluation criteria. The “rating factor,” which normally ranges from 0 to 2 for specific project proposals is a measure of how well a specific project proposal satisfies each evaluation criterion. Rating factor 2 indicates that the proposal fully meets the underlying objective of the criterion, while rating factor 0 indicates that the proposed pilot project does not satisfy the criterion.

Table 3. Evaluation Criteria and Factors for Pilot Projects

Evaluation Criteria	Rating Factors
1	2
Public awareness rising	Factor 0 – No impact Factor 1 – Indirect impact: population involved indirectly in activities Factor 2 – Direct impact: population involved directly in activities
Water quality	Factor 0 – No impact Factor 1 – Indirect impact Factor 2 – Direct impact
Saving of water resources	Factor 0 – No saving Factor 1 – Indirect impact Factor 2 – Direct impact
Population health	Factor 0 – No impact Factor 1 – Indirect impact Factor 2 – Direct impact
Impact on ecosystems	Factor 0 – No impact Factor 1 – Indirect impact Factor 2 – Direct impact
Social impact	Factor 0 – No impact Factor 1 – Indirect impact Factor 2 – Direct impact
Organization of proposal	Factor 0 – No impact Factor 1 – Indirect impact Factor 2 – Direct impact

Table 4. Pilot Projects Evaluated

#	Proposal Title and country code	Project type	Cost, USD	Public Awareness Rising	Water Quality	Saving of Water Resource	Healthcare	Impact on Ecosystems	Social Impact	Organization of the Proposal	Score
				10	8	8	10	7	7	6	
1	Rehabilitation of local water supply for three streets of Telavi town	TM.GE.13	840	1	2	2	2	0	2	2	88
2	Arranging water supply to Telavi Secondary School No 1	TM.GE9	770–800	1	2	1	2	1	2	2	87
3	Students ex-change, Zagatala, Lagodekhi)	T&A.GE&AZ.16	1000	2	1	1	1	1	2	2	79
4	Informing local population on the new rules for sanitary protection (buffer) zones around water objects	T&A.AZ.6	800	2	2	0	2	1	1	1	76
5	Problems of village Giorgeti	TM.GE.4	1000	1	0	2	1	2	2	2	76
6	Working on the environmental and water resource problems in Lagodekhi District	T&A.GE.3	600-700	2	1	0	2	1	1	2	74
7	Trainings and informative seminars on the water resource management issues	T&A.GE.2	1000	2	1	1	1	1	1	2	72
8	Water quality investigation of tributary rivers of Alazani	TM.GE.5	2000	1	2	0	2	1	1	2	72
9	Children's Paintings Competition with the slogan "Alazani the Great"	T&A.GE10	1000	2	1	1	1	1	1	2	72
10	Save the unique forests of Sheki-Zagatala region!	T&A.AZ.3	1270	2	0	1	1	2	1	2	71
11	Public Awareness aising and public involvement through independent mass-media	T&A.GE.8	1000	2	1	1	1	1	1	1	66
12	Public Awareness rising in the field of water resources sustainable use	T&A.AZ.1	1100	2	1	1	1	1	1	1	66
13	Database development for expanding of protected areas in the Alazan basin	TM.AZ.7	1150	2	0	1	1	2	1	1	65
14	Awareness rising among irrigation water users	T&A.AZ.2	1250	2	0	1	1	1	1	2	64
15	Children's concert with the slogan "Alazani the Great"	T&A.GE.11	600-700	1	1	1	1	1	1	2	62
16	Children's Sport Marathon with the slogan "Alazani the Great"	T&A.GE.12	700-800	1	1	1	1	1	1	2	62
17	Environmental training for local school children and volunteers	T&A.AZ.4	950	1	1	1	1	1	1	2	62

	within the Alazan river basin										
18	Specification of the role of Zemo Alazani irrigation system in water resources management scheme	TM.GE.7	4620	2	0	2	0	1	1	2	62
19	Ecological Security of Alazani River	T&A.GE14	1000	2	1	0	1	1	1	1	58
20	One year regular TV series on environmental issues	T&A.GE.6	500	2	1	0	1	1	0	2	57
21	Demonstration of Irrigation System "Fregate" on Alazani Valley	T&AGE.1	1000	2	0	0	1	1	1	2	56
22	Re-vegetation works to recreate the agricultural lands	TM.GE.15	985	1	0	0	1	1	2	2	53
23	Use of hydro-energy resources of the Alazani river basin	TM.GE.15	2650	1	0	0	1	1	2	1	47

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