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# STRENGTHENING SUSTAINABLE WATER MANAGEMENT FOR ENHANCED ENVIRONMENTAL QUALITY

FINAL REPORT

January 2006

This publication was produced for review by the United States Agency for International Development. It was prepared by ARD, Inc.

The Strengthening Sustainable Water Management for Enhanced Environmental Quality in Armenia Project (Sustainable Water Resources Management Project-SWRMP) was a bilateral Task Order financed under the Integrated Water and Coastal Resources Management Indefinite Quantity Contract (IQC), USAID Contract No. LAG-I-00-99-00018-00. The project was designed to address USAID/Armenia's Special Objective 1.6 "More Sustainable Water Management for Enhanced Environmental Quality." The project built and extended the work of the World Bank-financed Integrated Water Resources Management Project. Government of the Republic of Armenia (GoA) priorities related to water resources management, protection, and use guided project planning and implementation. The project was based in Yerevan with field activities focused primarily in the Lake Sevan and Hrazdan River basins. The project was implemented in two phases to provide results related to four tasks as follows:

Phase I- Planning

Task 1: Needs Assessment and Work Plan

Phase II- Implementation

Task 2: Strengthening the policy and institutional framework for improved management of water resources.

Task 3: Rehabilitating key infrastructure and management systems for water quality and quantity monitoring

Task 4: Implementing pilot activities to increase local-level capacity to develop and implement market-based water management solutions.

USAID contracted with ARD to administer this IQC Task Order. ARD implemented the contract in association with its IQC partner, Mote Environmental Services Inc. and Jinj Co. Ltd. of Armenia. The contract was signed on November 15, 2000. The project scope of work was expanded and the project extended with final completion at the end of May 2005. The project was completed on May 31, 2005. This report provides an overview of the Task Order, its accomplishments, and results.

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COVER PHOTO:

Decades of misuse severely threaten Lake Sevan's water resource options. The road along the mountainside (visible just below the snowcap) marks the lake's 1930s-era water level. The USAID-sponsored Strengthening Sustainable Water Management for Enhanced Environmental Quality Project sought to address Armenia's need for improved water resource management.

– Photo courtesy of Jonathan Hodgkin, ARD, Inc.

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## **DISCLAIMER**

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.



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# ACRONYMS AND ABBREVIATIONS

ADP	Acoustic Doppler Current Profiler
ASH	ArmState Hydrometeorological Services
BOD	Biochemical Oxygen Demand
BOD5	A specific five day test for BOD
COD	Chemical Oxygen Demand
COTR	Contracting Officer’s Technical Representative
EIMC	Environmental Impact Monitoring Center
EMC	Environmental Monitoring Center
ETS	Effluent Treatment System
GIS	Geographic Information System
GoA	Government of the Republic of Armenia
GPS	Global Positioning System
HEMA	Hydrometeorological and Environmental Monitoring Agency
HEPA	High Efficiency Particulate Air (filter)
ICP-MS	Inductively Coupled Plasma Mass Spectrometer
IGU	International Geographic Union
IQC	Indefinite Quantity Contract
IWRMP	Integrated Water Resources Management Project
LSEAP	Lake Sevan Environmental Action Program
MIS	Management Information System
MoNP	Ministry of Nature Protection
MOU	Memorandum of Understanding
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization

NIS	Newly Independent States (of the Soviet Union)
PLERF	NGO of Political, Legal and Economic Research and Forecasting
PSO	Private Sector Organization
RTi	Riverside Technology Inc.
SOW	Scope of Work
SWRMP	Sustainable Water Resources Management Project
TDS	Total Dissolved Solids
USAID	United States Agency for International Development
WRAP	Water Rights Analysis Package
WRMA	Water Resources Management Agency



# EXECUTIVE SUMMARY

With an area of 480 square miles, Lake Sevan is the largest lake in Armenia. The lake's size, depth, and Alpine location made it the target of an environmentally disastrous project that spanned three decades. In the 1930s, the former Soviet Union began diverting most of the lake's waters to the Hrazdan River for irrigating the Ararat Valley and generating electricity. The project was abandoned by the end of the 1950s. Consequently, for the last 60 years the lake level has dropped by nearly 70 feet and its volume shrunk by more than 40 percent. Since the late 1990s, a World Bank National Environmental Action Plan has recommended a series of activities to help restore the water resources of the Lake Sevan-Hrazdan River hydrologic system.

The Program on Strengthening Sustainable Water Management for Enhanced Environmental Quality in Armenia was initially a three-year, bilateral effort financed by the United States Agency for International Development (USAID) and implemented by ARD. The project Scope of Work (SOW) was expanded and the project extended for an additional 18 months. The primary goal of this national program was to develop Armenia's capacity for promoting integrated sustainable management of a critical natural resource in support of enhanced environmental quality and economic growth. The project completed four primary tasks to achieve the program's goals:

1. Complete a Needs Assessment and Create a Work Plan.
2. Improve the National Framework for Integrated Water Resources Management.
3. Increase Capacity for Water Resources Monitoring to Support Integrated Water Resources Management.
4. Increase Local Participation in Integrated Water Resources Management.

The Work Program was based on the needs assessment and a consensus-building participatory workshop. At the workshop, stakeholders identified a set of 19 priority action areas, including the need for a national water policy, implementation strategies, and legal reform. Rationalization of the country's water resource monitoring efforts and improving monitoring capacity were given high priority. Stakeholders clearly articulated the importance of the Sevan-Hrazdan hydrologic system and the priority placed on both protection and management of waters within this system. During the Stakeholder Workshop, a set of interlinked technical areas, or subtasks, were identified and provided focus for project activities. The technical areas were consistent with the three primary tasks outlined in the scope of work. The project achieved significant results in each of these task areas, which included:

## **IMPROVE THE NATIONAL FRAMEWORK FOR INTEGRATED WATER RESOURCES MANAGEMENT**

- Passage of a modern Water Code consistent with internationally accepted water management principles. The Water Code was ratified on July 1, 2002 and became effective October 10, 2002.
- Development of the National Water Policy and completion of an outline for a National Water Program, as called for in the Water Code.

- Assistance in establishing the Water Resource Management Agency of the Ministry of Nature Protection as the principal agency charged with the management, protection, and use of Armenia's water resources. This included office refurbishment, materials and equipment procurement, and training and skills development for staff.
- Completion of a water resources fee strategy based on economic incentives for conservation, efficient allocation of the water resources, and incentives for pollution control, as required by the Water Code.
- Provision of a detailed water use permitting structure based on the principles of equity and transparency.

## **INCREASE CAPACITY FOR WATER RESOURCES MONITORING TO SUPPORT INTEGRATED WATER RESOURCES MANAGEMENT**

- Completion of a water quality monitoring strategy and plan that resulted from a collaborative effort of multiple stakeholders. The strategy and plan was based on a consensus of the most important physical, chemical, and biological water quality constituents within Armenia's waters.
- Refurbishment of the Environmental Impact Monitoring Center (EIMC) water quality laboratory and procurement, delivery, and training in use and maintenance of nearly \$1 million laboratory instruments and equipment, including an Inductively Coupled Plasma Mass Spectrometer (ICP-MS), making the laboratory the most advanced in the South Caucasus.
- Procurement, delivery, installation, and training in the use and maintenance of hydrologic stream gauging equipment, including two sites with telemetry, allowing near real-time monitoring of flows into and out of Lake Sevan at the Arpa Channel and Geghamavan, respectively.
- Provision of equipment and training to the Hydrometeorological and Environmental Monitoring Agency (HEMA) to strengthen its ability to collect, analyze, and archive water quality and quantity data to allow improved resource management.

## **INCREASE LOCAL PARTICIPATION IN INTEGRATED WATER RESOURCES MANAGEMENT**

- Promotion of participation through a series of broad stakeholder fora, working groups, workshops, etc., for developing the Water Code and its associated policy and legal instruments.
- Management of a grant program designed to pilot integrated water resources management activities within the principal hydrologic system in Armenia.
- Completion of five grant projects that improved awareness and understanding of water-related issues and demonstrated innovative ways to protect water quality.
- Completion of a wastewater pretreatment plant for the effluent of the Kashi Tannery to protect water quality in the Hrazdan River.

The project made significant contributions toward its overall goal to develop Armenian capacity to promote sustainable management of a critical natural resource that will support enhanced environmental quality and economic growth.

# 1.0 OVERVIEW

## 1.1 BACKGROUND

Water resources have played a critical role in the economic development of Armenia. Irrigated agriculture in the Ararat valley and elsewhere makes a significant contribution to the economy. Hydropower generated on the Hrazdan and Vorotan cascades provides about 25 percent of the country's electricity needs. Lake Sevan, Armenia's largest freshwater resource and one of the world's largest alpine lakes, has provided much of the water needed for irrigation and hydropower in the region over the past 50 years. As a result of overexploitation, principally during the Soviet period, the lake level has dropped by nearly 20 meters with a volume reduction of more than 40 percent. The lake has been declared an environmental disaster. The National Environmental Action Plan (NEAP) and the Lake Sevan Environmental Action Program (LSEAP), both completed in the late 1990s by working groups of international and local specialists, highlighted a range of water resource management issues. NEAP and LSEAP program recommendations focused on policy, legal and regulatory reform, priority investments, environmental awareness, and information sharing. The development of an integrated water resources master plan was among the specific recommendations of the NEAP and the LSEAP. This recommendation resulted in the World Bank-supported Integrated Water Resources Management Project (IWRMP), which was implemented between 1999 and early 2001. The broad goal of the project was to assist in the development of an integrated national water resources management plan that would support the government's economic reconstruction strategy through sustainable management, regulation, development, and use of water resources. The project initiated a series of changes in the water sector that USAID chose to encourage and support through the Strengthening Sustainable Water Management for Enhanced Environmental Quality in Armenia Task Order under the Integrated Water & Coastal Resource Management Indefinite Quantity Contract (IQC).

The project was designed to address USAID/Armenia's Special Objective 1.6 "More Sustainable Water Management for Enhanced Environmental Quality" by improving the national policy and institutional framework for water management, rehabilitating key water quality and quantity monitoring system, and increasing local-level capacity to develop and implement market-based solutions to water management problems. The overarching goal of the project was to develop Armenian capacity to promote sustainable management of a critical natural resource that would support enhanced environmental quality and economic growth. The objectives of the project were to strengthen the policy and institutional framework for improved management of vital, scarce water resources; rehabilitate key infrastructure and management systems for water quality, meteorological, and hydrological data collection with monitoring, acquisition, communication, analysis, storage, modeling, and/or forecasting applications; increase local-level capacity to develop and implement market-based solutions to water management problems; and strengthen local government capacity for water management decision making. These objectives were to be achieved through a two-phase program consisting of four tasks, namely:

- Phase I–Planning
  - Task 1: Completing a Needs Assessment and Creating a Work Plan.
- Phase II–Implementation
  - Task 2: Strengthening the policy and institutional framework for improved management of water resources.
  - Task 3: Rehabilitating key infrastructure and management systems for water quality and quantity monitoring.
  - Task 4: Implementing pilot activities to increase local-level capacity to develop and implement market-based water management solutions.

ARD signed the contract to administer the Strengthening Sustainable Water Management for Enhanced Environmental Quality in Armenia Task Order in November 2000. The project was commonly referred to as the Sustainable Water Resources Management Project (SWRMP).

## 1.2 PROJECT CONTEXT

The World Bank financed IWRMP, which laid the foundation for sustainable water resources management, and was completed in April 2001. It made a number of recommendations, which included:

- Establishing a new and independent Water Resources Management Board (WRMB) with responsibility for preparation of water resources policies, strategies, and river basin plans;
- Establishing River Basin Authorities (under the authority of the WRMB) with responsibility for management of water resources within each basin;
- Creating one organization with the responsibility for water resources monitoring;
- Establishing a National Water Council at the national level and Water User Committees at the basin level to guide policy and ensure stakeholder participation; and
- Keeping responsibility for environmental protection and control with the Ministry of Nature Protection.

These recommendations, discussion about whether they should be accepted, how they should be implemented, and who should be responsible became a part of the political debate, with government action generally supporting all recommendations. As this project was completing Task 1: Needs Assessment and Work Plan in early 2001, the government issued Decree No. 92, which laid out its vision for institutional reforms. The Decree outlined the creation of a water resources management board, a water systems management agency, a tariff regulatory commission, and water basin management authorities. This was closely followed by Decree No. 151, which established the State Committee on Water Systems. This brought all government agencies managing water use under one umbrella. It was obvious that further changes regarding establishment of a water resources management board and water resources monitoring would be forthcoming, but specific actions and schedules were not clear as the project was completing its work planning process. Thus, the project began implementation within this climate of institutional uncertainty. In the face of this uncertainty, ARD recognized the need for implementation flexibility to provide targeted support to new agencies, in order to smooth the institutional transition and ensure that checks and balances were protected.

### 1.3 IMPLEMENTATION APPROACH AND STRATEGY

ARD's approach recognized changing the institutional framework for water resources management while focusing on achieving real gains in policy, technical, and institutional aspects of Armenia's national and international water management. The project developed a dynamic and responsive approach that built on gains already made in introducing integrated water resources management concepts and programs, the changing institutional framework for water management, and the very real limitations faced by agencies in the sector. The hallmarks of the project approach were:

- Flexible implementation strategies to enable response to changing institutional arrangements and emerging needs;
- Active stakeholder participation to ensure that project activities are in concert with local perceived need;
- Geographical focus in the basins and sub-basins of the Lake Sevan-Hrazdan River hydrologic system to provide opportunities for tangible benefits at the local level;
- Demand-driven activities to encourage national and local commitment to sustainable change;
- Coordination and collaboration to establish synergies with related programs and projects; and
- External and internal project linkages to demonstrate implementation of a truly integrated project.

The project recognized that the water resources management needs of Armenia do not fit neatly into a set of isolated tasks. Issues and problems are multi-dimensional and therefore require multi-disciplinary responses. In order to achieve sustainable results, the project developed a strategy that focused on the need for linkages between and among project activities. SWRMP designed a management and implementation plan that fostered intersectoral and interagency linkages through working groups and the contributions that an interdisciplinary project team could make by working together during the course of the project. The project strategy was consistent with the overall goals and Scope of Work. The project implementation plan actively linked tasks and activities through cross-sectoral and inter-ministerial involvement in activities at the national and basin levels, and internal information exchange and collaboration among project technical staff and project counterparts. The project worked at a national level on issues of national importance and focused on field implementation in the basins and sub-basins of Lake Sevan and the Hrazdan River. SWRMP recognized that long-term results and benefits only accrue if national and local agencies have the institutional capacity to develop coordinated strategies and implement realistic programs in support of sustainable water resources management.

### 1.4 PROJECT RESULTS FRAMEWORK

ARD's approach and strategy was responsive to USAID/Armenia's results framework for the Special Objective 1.6, as shown in Table 1.

**TABLE 1. SPECIAL OBJECTIVE 1.6 RESULTS FRAMEWORK**

Result	Indicator
Special Objective (Sp O) 1.6. More Sustainable Water Management for Enhanced Environmental Quality	Selected Armenian water management institutions functioning effectively
	Number of specific water quality and/or quantity indicators improved at specific locations
Intermediate Result (IR) 1. National Policy and Institutional Framework for water resources management improved	Number of key identified laws/regulations revised
	Number of selected opportunities for water resource fees or tariffs developed
	Key water resources management institutions apply integrated water resources management techniques
IR 2. Selected Water Quality and Quantity Monitoring Systems Rehabilitated	Number of data indicators on quantity and quality of surface/water collected, sorted, and used in resource management
	Number of sampling locations upgraded to for water quality monitoring
	Number of water quantity hydroposts upgraded and modernized
IR 3. Stakeholder participation in integrated water resources management increased	Non-governmental organization capacity increased
	Fora established and supported for broad-based intersectoral stakeholder participation in water resources management decision making

ARD initiated implementation of the project within this framework. The project remained true to this results framework throughout the course of the project, designing and completing activities in response to changing government structures and priorities.

## 1.5 PROJECT IMPLEMENTATION

As previously noted, the project was designed to be implemented in two phases. Phase I consisted of one task: to complete a needs assessment and work plan. Following contract signing and project mobilization, this process began with an assessment that included reviewing relevant documentation, interviews with key stakeholders, a questionnaire survey of stakeholders, and a stakeholder workshop designed to provide a sound basis for developing the work plan. Informed by stakeholder interviews, questionnaires, and the stakeholder workshop, the project staff designed and implemented activities in seven inter-linked technical areas under the three additional activities outlined in the SOW. These technical areas included:

### **Task: Improve the National Framework for Integrated Water Resources Management**

- Capacity Building and Coordination
- National Policy and Legal Reform
- Policy Implementation

### **Task: Increase Capacity for Water Resources Monitoring to Support Integrated Water Resources Management**

- Water Quality and Quantity Monitoring
- Technical Support for Resource Planning

## **Task: Increase Local Participation in Integrated Water Resources Management**

- Broad-Based Public Participation
- Small Grants for Pilot Projects

National framework activities focused assistance to the government for the development and passage of a new Water Code, support for implementation of key provisions of the new Code, and support of the creation and capacity building of the Water Resource Management Agency (WRMA) within the Ministry of Nature Protection (MoNP). When the government raised the Water Code revision priority, the project staff prepared itself to respond. Then in August 2001, the Chairman of the Water Code Revisions Working Group formally asked for assistance. SWRMP responded by providing technical assistance, and organizing and managing seminars, working groups, and meetings that led to acceptance and passage of a Water Code that was based on modern water resource management principles. Capacity building for the Water Resource Management Agency began when the Agency was formally established in early 2002. Once established, the project supported implementation Water Code provisions for which the agency was responsible, and refurbished the new offices, and provided equipment and training.

Water resource monitoring activities focused on supporting the establishment of a sustainable water quality and quantity monitoring program by working with the Armenian Hydrometeorological Institute (Armhydromet) and the MoNP's Environmental Monitoring Center (EMC) to improve capacity to provide reliable information required for decision making. The project procured nearly \$1 million worth of water quality and quantity monitoring equipment, provided technical support and training, and assisted in creation of database systems to provide an interface between data collection and utilization by decision makers and the public. This work took place as the Armhydromet and EMC were joined to create the Hydrometeorological and Environmental Monitoring Agency (HEMA) in November 2002. They separated again to create ArmState Hydromet Services (ASH) and Environmental Impact Monitoring Center (EIMC) in 2004.

Local participation activities focused on awareness activities, supporting participation in the legal and policy development process, and field oriented grants to support improved environmental practices within the Sevan-Hrazdan basin.

Project implementation details are provided in Chapter 2.

## **1.6 KEY ACHIEVEMENTS**

Key achievements of the Strengthening Sustainable Water Management for Enhanced Environmental Quality Task Order include:

- Passage of a modern Water Code consistent with internationally accepted water management principles. The Water Code was ratified on July 1, 2002 and became effective October 10, 2002.
- Development of the National Water Policy and completion of an outline for a National Water Program, as called for in the Water Code.
- Assistance in establishing the Water Resource Management Agency of the Ministry of Nature Protection as the principal agency charged with management, protection, and use Armenia's water resources. This included office refurbishment, materials and equipment procurement, and training and skills development for staff.

- Completion of a water resources fee strategy based on economic incentives for conservation and efficient allocation of the water resources, as well as incentives for pollution control as required by the Water Code.
- Provision of a detailed water use permitting structure based on the principles of equity and transparency. Completion of a water quality monitoring strategy and plan that resulted from a collaborative effort of multiple stakeholders. The strategy and plan was based on a consensus of the most important physical, chemical, and biological water quality constituents within Armenia's waters.
- Refurbishment of the EIMC water quality laboratory and procurement, delivery, and training in use and maintenance of nearly \$1million worth of laboratory instruments and equipment, including an Inductively-Coupled Plasma Mass Spectrometer (ICP-MS), making the laboratory the most advanced in the south Caucasus.
- Procurement, delivery, installation, and training in the use and maintenance of hydrologic stream gauging equipment, including two sites with telemetry, allowing near real-time monitoring of flows into and out of Lake Sevan at the Arpa Channel and Geghamavan, respectively.
- Provision of equipment and training to HEMA to strengthen its ability to collect, analyze, and archive water quality and quantity data to allow for improved resource management.
- Promoted participation through a series of broad stakeholder fora, working groups, workshops, etc., for developing the Water Code and its associated policy and legal instruments.
- Management of a grant program designed to pilot integrated water resources management activities within the principal hydrologic system in Armenia.
- Completion of five grant projects that improved awareness and understanding of water-related issues and demonstrated innovative ways to protect water quality.
- Completion of a wastewater pretreatment plant for the effluent of the Kashi Tannery to protect water quality in the Hrazdan River.

These achievements are significant and pave the way for strengthening sustainable water management for enhanced environmental quality in Armenia.

# 2.0 PROJECT ACTIVITIES

## 2.1 TASK 1: NEEDS ASSESSMENT AND WORK PLANNING

Task 1: Needs Assessment and Work Plan development was conducted from January 1–March 16, 2001. During the initial weeks of project activity, the project team completed a literature review, conducted a series of interviews, and prepared and administered a detailed questionnaire regarding current water resources sector status, issues needing attention, and proposed activities to address the identified issues. This work culminated in a participatory workshop designed to allow stakeholders to provide direction and substance to project tasks and activities.

The stakeholders present sponsored a stakeholder workshop held on February 16–17, 2001. This workshop included government officials from the Office of the President, nine ministries, five private firms and joint stock companies focused on the water sector, five non-governmental organizations (NGOs), and several academic/research organizations. This broad stakeholder group clearly recognized the achievements of the World Bank-sponsored IWRMP, confirming that it provided the basis for moving forward in the water resources sector. Workshop participants also confirmed that USAID’s Project concept, which focused on three major tasks<sup>1</sup>, was valid and provided the basic structure for planning and implementing project activities. Through this consensus-building process, stakeholders identified action areas that included the need to strengthen the existing legal and regulatory structure, improve water resources monitoring, and promote stakeholder participation. Based on the recommendations provided by the stakeholders, SWRMP developed a Work Plan<sup>2</sup> and submitted it to USAID for approval on March 15, 2001. USAID approved the Work Plan, with minor comments, on April 10, 2001.

The Work Plan was consistent with USAID’s strategic framework and with the overarching themes and priorities identified by stakeholders. The Work Plan outlined subtasks and activities under three tasks<sup>3</sup> which were concretely linked to the task order Scope of Work:

- Policy Legal and Institutional Reform;
- Water Resources Monitoring Enhancements; and
- Local Stakeholder Participation in Water Management Decision Making through grants to fund pilot projects.

Workshop participants identified 39 potential project activities with 20 described as priority activities<sup>4</sup>. The Project Team worked to create a project work Plan based on these priority activities. The resulting

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<sup>1</sup> In addition to the Needs Assessment and Work Plan task.

<sup>2</sup> Needs Assessment and Project Work Plan for the Strengthening Sustainable Water Management for Enhanced Environmental Quality Task Order, ARD Inc., March 16, 2001.

<sup>3</sup> A first task, Needs Assessment and Work Plan Development, was complete with submission of the Work Plan.

<sup>4</sup> Workshop Proceedings: Stakeholder Workshop for the Strengthening Sustainable Water Management for Enhanced Environmental Quality Project, February 15 – 16, 2001, Tekyan Center, Yerevan Armenia, ARD Inc, and JINJ .

framework, shown in Table 2, consists of seven interrelated subtasks grouped under the three major headings as outlined in the original task order Scope of Work.

**TABLE 2. PROJECT WORK PLAN STRUCTURE**

Task	Subtask
Task 2: Improve the National Framework for Integrated Water Resources Management	Subtask 2.1 Capacity Building and Coordination
	Subtask 2.2 National Policy and Legal Reform
	Subtask 2.3 Policy Implementation
Task 3: Increase the Capacity for Water Resources Monitoring to Support Integrated Water Resources Management	Subtask 3.1 Water Quality and Water Quantity Monitoring
	Subtask 3.4 Technical Support for Resources Planning
Task 4: Increase Local Participation in Integrated Water Resources Management	Subtask 4.1 Broad-Based Public Participation
	Subtask 4.2 Small Grants for Pilot Projects

With this Work Plan in place, SWRMP began task implementation as described below. Almost immediately, work plan priorities changed when the government raised the priority for developing a new Water Code. The project team, with USAID approval, responded to this unique opportunity to inform the development of a modern water code based on integrated water resource management principles. The basic structure of the project and its activities did not change, but the subtask structure changed slightly, as described under each task. At project completion, the resulting activities had more immediate impact on water resource management than was originally anticipated.

## **2.2 TASK 2: IMPROVING THE NATIONAL POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK FOR INTEGRATED WATER RESOURCES MANAGEMENT**

The second task initially included three subtasks and associated activities. The subtasks were capacity building and coordination, national policy and legal reform, and policy implementation. The focus for these activities was support for the development of a new Water Code, which somewhat unexpectedly became a priority for the government. During the second half of 2001, following initiation of planned project activities, the government stepped-up its program to reform the Armenian Water sector to a pace not anticipated during the initial development of the Work Plan. The government made a formal request to USAID for support in this effort, and SWRMP was asked to refocus its early activities to accommodate this opportunity to support the sector and achieve results. SWRMP immediately increased its support for activities under Subtask 2.2. This work, in addition to resulting in a new Water Code for the Republic of Armenia, allowed the project to support improved intersectoral coordination and focused capacity building for WRMA of MoNP. Subsequent work under this task focused on supporting the development of policies and regulations required to implement the new Water Code under a new task, Subtask 2.3: Legal and Regulatory Development (the policy implementation task became Task 2.4).

## 2.2.1 Subtask 2.1: Capacity Building and Coordination

### Activity 1: Coordination for water sector reform

SWRMP was committed to a participatory approach that stressed intersectoral coordination and public participation from the outset. This was manifest in the project's commitment to intersectoral working groups and task forces as a mechanism for information exchange and collaboration. The approach also minimized conflict as decision making included a wide range of government and non-government stakeholders. Following the government's request for assistance in developing a new Water Code, SWRMP established a series of intersectoral working groups that included a broad range of government professionals and NGO representatives to work to develop Water Code drafts. International professionals participated with these groups, providing guidance and critiques of the work of the group during workshops. This approach was used initially for the development of the Water Code with a group of more than 30 individuals who met six times over an eight-month period. Guidance was provided by an internationally experienced natural resources/water law expert who used the Socratic Method to engage stakeholders in discussion of issues and eventual agreement on the draft Water Code<sup>5</sup>. Similarly, the National Water Policy and National Water Program Outline working group met formally in workshop settings five times, with participation of eight Armenian professionals and NGO representatives. Guidance was provided by an international water resources management specialist. Support for subsequent development of Water Use Permitting and Water Resource Fee Strategy Development followed a similar approach. This approach, in addition to providing the opportunity for knowledge and skills development, also created a sense of ownership among working group participants. They understood the rationale for all elements of the resulting work, and were able and willing to describe and defend decisions taken, recommendations made, and final outputs by the working groups.

### Activity 2: Water Resource Management Related Training

In addition to the learning opportunities that came from the working group approach, SWRMP conducted more formal training designed to build capacity of the institutions charged with managing the country's water resources. Focused trainings included:

- Environmental Impact Assessment training;
- Water Resources Analysis Package, a software designed for river basin management;
- Water cadastre management and data use for water resource modeling; and
- Establishing a National Water Reserve.

International study tours were also conducted to give senior policy makers the opportunity to see modern water resource management techniques in place and to explore how these experiences might be incorporated into Armenia's new water management system. Three international study tours were completed. These included trips to:

- Chicago, Illinois, to study institutional and regulatory issues in the water sector;
- Austin, Texas, to study basin management, water allocation, and water rights approached in action; and

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<sup>5</sup> See Appendices for details of this and other activities that involved participation and capacity building through working groups.

- Hungary, to see water resource management, basin planning, and water use as applied in a similar socio-political context.

These trainings and study tours focused largely on the legal and policy development elements of SWRMP's program. The water resources monitoring task (Task 3) which focused agencies and NGOs responsible for hydrological and water quality monitoring also incorporated the participatory working group approach for developing a water resource monitoring strategy and plan. It also included focused training on:

- Water quality laboratory methods and procedures;
- Field sampling and analysis;
- A series of trainings focused on specific water quality monitoring equipment<sup>6</sup>; and
- A series of trainings focused on hydrologic monitoring equipment.<sup>7</sup>

Additional details of water resources monitoring activities can be found under Task 3: Increasing the Capacity for Water Resources Monitoring for Integrated Water Resources Management.

### **Activity 3: Operational Start Up for the Water Resources Management and Protection Agency**

In August 2002, the WRMA moved into new office space on the fifth floor of Government House. SWRMP provided resources for the refurbishment of 360 square meters of office space, including renovation of office space and bathrooms, replacing windows, installing door locks, re-flooring the offices and hallways, installing modern electrical wiring and computer cabling for the office network, and all finish work, including moldings and painting. SWRMP also provided:

- Desks and chairs;
- Conference table and chairs;
- File cabinets and book cases;
- Telephone, fax, and internet service;
- Computers (17) for professionals and support staff;
- A network server for the website;
- LaserJet printers (8);
- Photocopy machine; and
- Supporting peripherals and expendables.

This overall support strengthened the Agency's institutional capacity to fulfill its obligations for national legal and policy reform. The renovation activities were initiated almost immediately following formal establishment of WRMA and completed in early 2004.

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<sup>6</sup> These included the lab-based Inductively Coupled Plasma Mass Spectrometer (ICP-MS) and field based Troll 9000

<sup>7</sup> Digital gauging stations and satellite communications systems.

#### **Activity 4: Improvement of Water Resource Monitoring Equipment and Facilities**

Capacity improvement also included providing support for improvement of water quality laboratory capacity for EIMC and upgrading the capacity of HEMA through the training mentioned above and supporting office improvements and procurements. EIMC support included a complete laboratory renovation, provision of modern water quality testing field, and updated laboratory equipment. HEMA support included provision of modern equipment for gauging stations including data loggers and telemetry equipment, satellite downloading equipment, computers, and servers, and office furniture. Details of this work are discussed more fully under Task 3.

#### **2.2.2 Subtask 2.2: National Policy and Legal Reform**

As mentioned above, the government began an accelerated process of revising its legal framework to modernize the country's approach to water resources management, protection and use shortly after completion of the Work Plan. This process was initiated through a series of decrees, namely:

- Decree No. 92 of February 2001 laid out the government's vision for institutional reforms. The Decree outlined the creation of a water resources management board, a water systems management agency, a tariff regulatory commission, and water basin management authorities.
- Decree No. 151 of February 2001 established the State Committee on Water Systems.
- Decree 446 of June 2001 created an intersectoral working group to revise the National Water Code.
- Decree No. 82 of January 2002 established the Water Resources Management and Protection Agency (to be known as WRMA) that combined the functions of water resources management and protection under one institutional entity.

In August 2001, the Deputy Chairman of the Water Code Revisions Working Group requested USAID's assistance in revising the water sector's legal framework. USAID supported this request through SWRMP. The project provided international and local consultants to prepare the analytical groundwork for the new Water Code and to develop drafts for government, National Assembly, and Presidential review. From January through May 2002, the project supported the Water Code Revisions Working Group through the process described under Task 2.1, Activity 1 and provided legal expertise in water and environmental law to support the drafting process.

#### **Activity 1: Development of the National Water Code of the Republic of Armenia**

The Water Code Revisions Technical Working Group (a subgroup of the formal Government Working Group to Draft the Water Code), with the support of project staff and consultants, worked closely together for five months to develop a modern Water Code consistent with internationally accepted water resource management principles. The government review draft was presented to the Deputy Chairman of the Government Working Group to Draft the Water Code on April 12, 2002. The draft was submitted for government Review on April 16. Although the basic legal and institutional framework was retained, a few important changes were made during this review. First, the implementation timeframe for completing program planning, basin planning, and permitting was shortened from five years to one. Second, the National Assembly eliminated a requirement that the government provide a dedicated budget for program implementation equal to or greater than collected water use permit fees (which became the current practice, any fees now collected must be remitted to the State Budget).

The government review draft was submitted to Parliament on April 29. The National Assembly held three readings on May 14, May 27, and June 4. The Code passed each reading without opposition. The

President ratified the Water Code on July 1. The Code was published on July 10, 2002, and became effective as the Water Code of the Republic of Armenia on October 10, 2002. SWRMP, in keeping with environmental principles, completed a strategic environmental assessment of the water code that provided an analysis of the code, taking into account all ecological limitations. This analysis identified and assessed possible impacts of the Water Code on human health, environment, economic, and social conditions; determined impact magnitude; developed measures for prevention, elimination, or mitigation of harmful impacts and their consequences; and outlined prohibited activities that have irreversible impact on the environment. Public involvement and consideration of public opinion was a critical element of this process. The project also supported public hearings on the proposed Water Code to allow for additional stakeholder input and to support the Åarhus Convention principles to which Armenia is a signatory.

The Armenian Water Code of 2002 departed significantly from the previous Water Code and from Soviet models of water law. Based in part on innovative ideas generated from within Armenia, and to some extent from innovative laws from other countries, the new Water Code adopted a number of modernized concepts of water sector management. These included:

- The doctrine of public trust which stated that water resources are the property of the public, and that the public entrusted the government with responsible management of the resources.
- The establishment of a National Water Reserve, defined as the quality and quantity of water required to satisfy present and future basic human needs, protect aquatic ecosystems, and secure sustainable development. Usable water resources are defined as those that may be allocated for consumptive use without reducing the National Water Reserve.
- The principle of integrated basin management, which promoted water allocation decisions that are based on supply rather than demand and forces information-based water use permitting, enabled the use of economic instruments for water resources management and cost recovery; and enabled private management of state-owned water systems.
- The incorporation of public notice and comment on major implementation provisions and right of access to information consistent with the Åarhus Convention.

The Water Code implemented its governing principles through: the National Water Policy, the National Water Program, Water Basin Management Plans, Water Use Permits, Water System Use Permits, and Third Party Management Provisions. The Code put into place an institutional framework that included the following principle implementing entities:

- The National Water Council and its Dispute Resolution Commission;
- The state authorized body for water resources management and protection;
- The Regulatory Commission;
- The state-authorized body for state-owned water systems management and its technical commission for hydro-technical structures;
- The state body for tariff and quality of service regulation;
- A board to regulate water user associations and federation;
- Basin management authorities; and
- A transboundary water commission.

While opportunities for reform in Armenia’s water sector increased as a result of adoption of the new Water Code, the heavy responsibilities associated with effective implementation loomed large over responsible parties.

The project exceeded benchmark requirements for this subtask. The project had anticipated support for development of a new Armenian Water Code over the course of the three-year project period. It had not anticipated that such a legal instrument could be drafted, submitted for governmental review, introduced to the Parliament, adopted by Parliament (without even one vote against its adoption), and ratified by the President, all during the first half of 2002.

## **Activity 2: Developing a National Water Policy**

Although developing a National Water Policy after passage of the new Water Code seems counterintuitive, the imperative to develop the water law precluded updating current sector policy. However, significant discussion of water sector policy did take place as the Water Code was being developed and basic principles that formed the basis for the National Water Policy are articulated in the Water Code (Chapter 1, Article 5: Basic Principles of Management, Use, and Protection of Water Sources and Water Systems). A more formal National Water Policy was developed over the year following passage of the Water Code. It was developed using the participatory working group approach outlined under Task 2.1. A select group of eight professional and NGO representatives (the National Water Policy and National Water Program Working Group) developed and refined the policy during a series of three facilitated workshops. Drafts were developed and circulated for review and comment, and a final draft of the National Water Policy was ready for formal government consideration in October 0f 2004<sup>8</sup>. The purpose of the policy, as stated in the Water Code of the Republic of Armenia, is:

*“[T]o assure that water resources of adequate quantity and quality are available now and in the future to meet welfare, Republic’s socio-economic development[, and] ecological and economic needs”*

It includes national water policy principles, based on those outlined in the Water Code, and outlines its objectives to be to:

- Ensure conducti of preliminary water resources assessment, including implementation of water resources availability assessment, defining National Water Reserve characteristics, and generating water resources demand;
- Ensure basis for identification of water resources use priority directions; and
- Ensure basis for development of water basin management principles, including Water Basin Management Planning and fundamental preparation of the National Water Program.

The policy also outlines how the required National Water Program will be developed, considerations of water resource demand, water resource use and protection priorities, and strategic water resource management at the basin level.

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<sup>8</sup> Republic of Armenia Law on Fundamental Provisions of the National Water Policy, October 2004.

## 2.2.3 Subtask 2.3: Legal and Regulatory Development

Passage of the Water Code in 2002 was just the first step in implementing the law. While the law provided the principles and framework for implementation, a wide range of supporting policies, regulations, and procedures still needed to be developed to implement the law in its fullest form. Major provisions included developing a National Water Policy; a National Water Program; Water Basin Management Plans for 14 defined basins; regulatory instruments that included a water use permitting process, containing national water quality standards and regulations relating to watershed, wetland, and critical ecosystem protection; provisions for water use management; a water use fee structure; a water cadastre for logging use; modeling impacts; and public notice, comment, and access to information. In consultation with the Armenian Government and USAID, SWRMP prioritized and agreed to assist in developing some of these supporting documents. Support provided by SWRMP for legal and regulatory development is as described in the following paragraphs.

### Activity 1: National Water Program Support

The Water Code also required the creation of a National Water Program (Chapter 3, Article 16). The requirements for the program were extensive and beyond the scope of SWRMP. The National Water Program

*“[I]s a scientific and dynamic description of Armenia’s water resources, the demands placed upon those resources, and a comprehensive, time-phased management system, with assigned responsibilities for balancing demands with the resource, including an implementation system consisting of institutional arrangements, a schedule, a budget, and a credible financing mechanism for sustaining the management system.”*

SWRMP provided assistance in developing an outline for the National Water Program that helped make the process of creating the program manageable. The topical outline suggested an approach for completing the National Water Program<sup>9</sup> that included all elements required by the Water Code. It is a logical framework that included an annotated outline and committee responsibilities for completion of each section. The annotated outline included:

- Background, problems, opportunities;
- Assessment of supply–classification and inventory including total supply, national reserve, and critical ecosystems;
- Assessment of demand by sector;
- Regulatory measures and means, including water quality standards and the agreed-upon water resource fee structure;
- Alternative management measures, costs and benefits of alternatives, and formulation of an optimal program for balancing demand and supply, for maintaining quality, and managing hazards; and
- Implementation, including institutional responsibilities, budget and financing, and annual updating.

The outline provided the necessary guidance to the National Water Policy and National Water Program Working Group and its committees needed to complete the program as required by law.

### Activity 2: Water Use Permitting Guidance

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<sup>9</sup> Topical Outline and Suggested Approach for Completing the National Water Program, David Burack and Lilit Harutunyan, September 2004.

The WRMA's ability to implement a clear, open, and transparent decision making process for issuing water use permits was essential to successful implementation under the new Water Code. Water use permits regulate the extraction and discharge of water and any person wishing to engage in any water use. Therefore, assisting the agency with development of guidelines governing the water use permitting application and decision making process was of paramount importance. The guidelines were intended to provide a framework for the permitting decision making process. In developing the guidelines, SWRMP supported the organization of the Water Use Permitting Task Force. SWRMP sponsored a series of out-of-town retreats for the Task Force to develop the guidelines. Draft guidance was submitted to USAID for approval in November 2003<sup>10</sup>. The guidelines considered issues related to risk adverse conditions, permit duration, liability, transferability, inheritability, property access to monitor and control of water use permit conditions, and conditional water use. The Water Use Permitting Guidelines outlined in detail a nine-step permitting procedure:

Step 1: Water Use Permit Application Submitted

Step 2: Initial Assessment of the Application

Step 3: Public Notice and Comment

Step 4: External Expert Review of a Draft Water Use Permit

Step 5: Agency Creates Preliminary Draft Water Use Permit

Step 6: Applicant Review of Preliminary Draft Water Use Permit and Attached Conditions

Step 7: Final Decision Making

Step 8: Final Public Notification, Adjudication, and Appeals

Step 9: Water Use Permit Implementation

The guidelines also included drafts of all required forms and a flow chart outlining how the permitting process would be moved in an open and transparent way.

### **Activity 3: Water Resources Fee Strategy Development**

The application of economic instruments for resources management and protection is an important component of Water Code. Because of its importance, SWRMP supported the development of a Water Resources Fee Strategy for incorporation into the National Water Program. International expertise in water resource economics was provided during the summer and fall of 2003 to assist counterparts in developing a greater understanding of the range of options for resource fee methodologies. Local consultants (through Political, Legal, and Economic Research and Forecasting [PLERF], the local NGO; see Task 4.2 for details) conducted background research on international experience with water resources fees and the Armenian experience with such fees. These consultants also conducted public surveys, pilot tested methodologies, and completed case study analysis. A Water Resource Fee Strategy Task Force was convened in May 2003. Through the process described under Task 2.1 and work completed by international consultants and SWRMP staff<sup>11</sup>, the Task Force developed the Water Resources Fee Strategy<sup>12</sup> for incorporation into the National Water Program. The strategy was based in three overriding

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<sup>10</sup> Water Use Permitting Guidelines for the Water Resources Management Agency, Ministry of Nature Protection, Government of Armenia.

<sup>11</sup> Water Resource Fee Strategy: International Experience and Implications for Armenia, Benoit Laplante and Lilit Harutunyan, May 2004.

<sup>12</sup> National Water Program Water Resources Fees Strategy, October 2004.

principles: the strategy must comply with the principles and requirements contained in the Water Code; the fee structure that emerges must be simple and clear; and despite its simplicity, the fee structure must aim to create incentives for conservation and efficient allocation of the water resources, as well as incentives for pollution control. Findings included:

- The fee system did not create any incentives to consume less water than the permitted quantity and few disincentives for consuming more than permitted;
- The system of abstraction fees did not take into account the relative abundance (or scarcity, depending upon the season or supply and demand) of water at the basin level and took only partial account of the economic value of water (by sphere of use, quality of water used, and level of pollution);
- Low pollution fees and the weak capacity to monitor pollution discharges resulted in polluters having very little incentives to reduce their pollution output;
- Pollution fees were not tailored to the conditions (water quality) and use of receiving water bodies;
- The list of materials facing pollution fees exceeded the actual monitoring capacity of the regulatory authorities; and
- No provision existed to automatically adjust (e.g., once per year) the level of the abstraction fees or pollution fees for inflation.

The major recommendations were:

- Except for quantities of water below a minimum threshold, abstraction fees should be based on the actual quantity of water abstracted, not on the quantity as it appears in the use permit;
- Abstraction fees should reflect the relative abundance of the water resource for each water basin (supply and demand), as well as the economic value of water per category of users;
- Water resource fees should gradually be raised over time to increase incentives for pollution abatement and control;
- Pollution fees should reflect the actual water characteristics of the receiving body;
- The list of pollutants subject to pollution fees should more accurately reflect the actual capacity of the regulatory agency to monitor effectively pollution discharges, which implied a very significant reduction in the number of pollutants subjected to pollution fees;
- All fees (abstraction, discharge, and pollution fees) should be automatically and regularly adjusted to account for inflation, thus preserving their real values and capacity to create incentives for water conservation and pollution control;
- New water resource fees and structures should be clear and easy to understand to all water users, should ensure that it is affordable to the less fortunate segments of society, and should be phased in over time to allow water users to make necessary adjustments to conserve water and reduce water pollution;
- Given the potentially harmful impact that fertilizers and pesticides use may have on water quality, consideration should be given to use of environmental taxes or product surcharges to induce a reduction in the use such products and substitution towards less-polluting agricultural inputs; and

- Revenues from water resource fees should be marked for an environmental fund and be used to support the implementation of the Water Program, as well as providing financial support to the implementation of activities and investments aimed at protecting water resources.

These recommendations as served as a basis for developing the National Water Program Water Resources Fees Strategy. The strategy also included a recommended fee structure, as well as pricing and recommendations for a phased implementation of the water resource fee strategy.

#### **Activity 4: Media Fora for Aarhus Convention Implementation.**

In addition to other public participation activities outlined under Task 4, SWRMP supported the public notice, comment, and public access to information requirements of the Water Code. This supported the government's commitment to the Aarhus Convention on Access to Information, Public Participation in Decision Making, and Access to Justice in Environmental Matters. SWRMP developed a website for the WRMA to be available on its server, though the website was delayed pending installation of the Agency's network server and Internet access. The website was designed to include public access to draft and final regulations, permit notices, and elements of the National Water Programs that are available to the public. The project also published five issues of a newsletter in conjunction with the WRMA to establish an early precedent for abiding by the terms and conditions of the Aarhus Convention.

#### **Activity 5: National Water Quality Standards**

Most work related to water quality was conducted as part of Task 3. Although no formal work was completed that responded directly to Water Code requirements to establish water quality standards, it is worth noting that the project team conducted a series of meetings and workshops that defined parameters of importance of water quality for Armenia, and provided the field testing and laboratory analysis equipment necessary for water quality testing. The work of establishing parameters of importance brought together scientists, engineers, and technically trained Government officials. These meetings involved significant disagreement and debate, which suggested that establishing national standards in the future will not be easy.

#### **Activity 6: National Water Cadastre**

The Water Code mandated the collection and storage of a broad range of data related to water resources, and requires that these data be stored in a Management Information System (MIS) designated as the State Water Cadastre. The Cadastre must consist of hydrological, meteorological, water quality, and ground water data; and data on water extraction, water use, and water systems. The Cadastre should also serve as the legal repository for all water use permits and registration of water control structures. SWRMP directly supported the principal water resources management agencies WRMA and HEMA, in debates about how the Cadastre would be structured, where it would reside, and who would manage its use. During the summer of 2003, SWRMP developed the information technology requirements for data sharing between HEMA and WRMA. Specifications for technical equipment and training were finalized, and plans made to install networked database management systems at both HEMA and WRMA. In late 2003, SWRMP completed the analysis of current data sources and data quality, recommendations for historical analog to digital data conversion, and evaluated the data content of the exiting Cadastre in light of the new legal requirements<sup>13</sup>. Findings of the study suggested that:

- The State Water Cadastre of Armenia will consist of a network of databases, housed in separate physical locations. At minimum, two sets of data are required in order to function: data on water

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<sup>13</sup> Armenia State Water Cadastre: Current Status and Recommendations for Development, Corkran, December 2003.

entering the system (hydrological data) and data on water withdrawn from the system (water use and the associated permits). The data will be housed at HEMA and WRMA, respectively.

- A policy statement/regulation, promulgated at the ministerial level, regarding lines of authority and responsibilities for the State Water Cadastre is critically needed to clarify ownership and data maintenance responsibilities.
- Outside technical support will be required for database and network management at both HEMA and WRMA for at least one to two years of operation of the Cadastre. Advanced training in database management, network administration, Geographic Information System (GIS), and water availability modeling is needed for a small number of individuals at HEMA and WRMA.

Although the State Water Cadastre was not complete at the conclusion of SWRMP, these findings and recommendations provided the government with the information and guidance required to establish the State Water Cadastre as required by the Water Code.

### **Activity 7: Watershed, Wetland and Critical Ecosystem Conservation**

SWRMP provided the services of a natural resources management expert to review current watershed and wetlands regulations, and then develop a set of recommendations to inform near-term water management and permitting decisions as they relate to conservation. These recommendations were intended to provide the basis for the development of comprehensive regulations for wetland and critical watershed conservation. The completed review highlighted the fact that current laws and regulations include overlapping mandates, are inconsistent in some instances, and difficult to interpret in others. Recommendations were structured around defining and establishing watershed protection zones with specific regulation and enforcement mechanisms for each type of zone. Examples of effective regulations were provided and a process defined for moving toward promulgating and implementing regulations related to watershed, wetland, and critical ecosystem conservation<sup>14</sup>.

### **2.2.4 Subtask 2.4: Policy Implementation**

Policy implementation activities were designed to support improved intersectoral cooperation and participatory decision-making at the basin level. Three activities were envisioned: Public participation in integrated water resources management, water resources planning and decision making, and economic instruments.

To achieve results the project planned to work with responsible government agencies at the national and marz (province) level. The plan was to build capacity for decision making by examining local water basin issues in a comprehensive fashion. Activity focus was to be on community-based planning for a sub-basin located in the Sevan-Hrazdan system. The project was expected to work broadly in the Lake Sevan-Hrazdan River hydrologic system. The focus of project support was to be on analysis of demands from all water users, alternative water uses, and environmental requirements such as required minimum flow, and sanitary flow in water bodies, among others. Working groups were to be convened to develop methodological approaches for the application of economic instruments in the context of water resources management. The concept underlying the policy implementation on the sub-basin level was that it provided the opportunity to examine the real implications of specific actions, regulations, and procedures as the National Water Policy and a new Water Code were being discussed. However, the government's

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<sup>14</sup> Assessment of Regulatory Development Pertaining to Conservation of Ecosystems Critical to Integrated Water Management, Johnstad, March 2004.

focus on developing a new Water Code outpaced events at the regional and local levels. The passage of the new Code required that policy implementation activities be brought in line with the Code, rather than provide practical experience that could serve to inform the policy and legal development process.

A number of activities were initiated as part of this subtask. The first of these was the Sevan-Hrazdan Hydrologic System Workshop<sup>15</sup>. This workshop brought together government agencies and users of the Sevan-Hrazdan system, including members of the Office of the President, officials from five ministries, staff of the State Committee for Water Systems, regional and local officials from all marzer in the Sevan-Hrazdan basin, 14 NGOs, and personnel from multiple academic research institutes. The workshop provided a clear understanding of priority problems in Sevan-Hrazdan system from the stakeholder perspective. The workshop led to the selection of four sub-basins where implementation activities were to take place: the Arachi, the Gavaraget, the Marmarik, and the Masrik. More detailed information on these sub-basins was collected in preparation for a more focused sub-basin planning process. Passage of the new Water Code and the need to prepare implementing laws and regulations relating to river basin management prior to implementing sub-basin activities have had impact on this subtask. Note that four of the five grant-funded pilot projects described under Subtask 4.2 were implemented in the selected sub-basins.

## **2.3 TASK 3: REHABILITATING KEY INFRASTRUCTURE AND MANAGEMENT SYSTEMS FOR WATER QUALITY AND QUANTITY MONITORING**

This Task initially included two subtasks and associated activities: water quality and quantity monitoring, and technical support for water resources planning. During work planning for the second year of SWRMP, the first subtask (water quality and water quantity monitoring) was divided into three subtasks (planning water quality and water quantity monitoring, water quality monitoring enhancement, and water quantity monitoring enhancement), due to the different institutional and technical aspects of these monitoring activities. Activities under four subtasks are described in the following paragraphs.

### **2.3.1 Subtask 3.1: Planning Water Quality and Water Quantity Monitoring**

#### **Activity 1: Clarify Imitational Arrangements**

Task 3 was designed to help strengthen water resources monitoring so that accurate information would be available to allow improved water resources management. Effective infrastructure rehabilitation, as outlined in the Work Plan, required multiple elements, including a commitment to cooperation and coordination among several government agencies, assignment of new or redistributed institutional roles and responsibilities, and consolidation of a fragmented and ill-equipped laboratory structure. When SWRMP began, water quantity monitoring (flow measurements at gauging stations) through Armenia was the responsibility of Hydrology and Water Resources Center of Armenian Hydrometeorological Institute (Armhydromet), and was a line-item funded in the state budget. This gave it significant autonomy from its parent ministry, the Ministry of Nature Protection (MoNP). Water quality was nominally being monitored by a number of agencies, including EMC and the Environmental Inspectorate (both of MoNP), the Ministry of Health and its State Hygiene and Epidemiological Services, and several institutes at the National Academy of Sciences, among others. Each of these had different capabilities and responsibilities. As described above, institutional arrangements relating to water resources monitoring

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<sup>15</sup> Sevan-Hrazdan Hydrologic Workshop for the Sustainable Water Resources Management Project, Tsaghkadzor Writer's House, September 25-26, 2001, ARD Inc.

were in flux at the beginning of the project. Institutional changes took place over the next two years. Water quality monitoring responsibilities within MoNP were merged and placed under Armhydromet in March 2002, when HEMA was created as part of MoNP. HEMA was then reorganized into several independent sections, including ArmState Hydromet (ASH) and EIMC. As this process unfolded, an agreement was reached with Armenian agencies and stakeholders that SWRMP would support improvement of water quality monitoring at the central laboratory of what began as EMC and became EIMC. The project also supported improvement of hydrologic monitoring of what was the Hydrology and Water Resources Center of Armhydromet and became ASH. These changes did not have any impact on what support was provided to improve water resources monitoring, but did introduce some uncertainty and some administrative complications related to responsibility for data and data sharing within and among MoNP agencies and data accessible to the public.

### **Activity 2: The Lake Sevan-River Hrazdan Water Resources Monitoring Strategy and Plan**

The Lake Sevan-River Hrazdan Water Resources Monitoring Strategy and its associated plan were developed during 2001 and through the first quarter of 2002<sup>16</sup>. This was completed with the full participation of Armenian water resource monitoring professionals from MoNP, Armhydromet, EMC, the Armenian National Academy of Sciences, the Institute of Water Problems, the Ministry of Health, USAID, and project staff who formed the Monitoring and Information Management Committee.

The strategy was developed through a series of meetings, working sessions, and workshops using the participatory working group approach described under Task 2.1. The resulting strategy was based on consensus understanding that the SWRMP monitoring program must be focused and results driven with the flexibility to be expanded geographically and/or in technical content. The monitoring strategy addressed both water quality and water quantity monitoring requirements for the most important watersheds in Armenia, namely the Hrazdan River and the Lake Sevan watershed (the Sevan-Hrazdan hydrologic system).

The water quality component of the strategy defined a water quality monitoring program that would monitor surface water quality at 65 locations. Of these, 51 locations would serve routine water quality monitoring requirements and 14 locations would focus on monitoring known-point sources of pollution within the basin system. The strategy also identified 29 water quality parameters to be analyzed and reported on. These are outlined in Table 3, along with whether lab or field analysis was required. The subsequent procurement of water quality monitoring materials and equipment provided the government with the capacity to test for all these parameters.

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<sup>16</sup> Lake Sevan-River Hrazdan Surface Water Resources Monitoring Strategy, ARD Inc., April 2002.

**TABLE 3. ROUTINE MONTHLY MONITORING PARAMETERS**

Parameter	Analysis Location		Parameter	Analysis Location	
	Field	Lab		Field	Lab
Water Temperature	X		Sodium – Na <sup>+</sup>		X
pH	X		Potassium – K <sup>+</sup>		X
Dissolved Oxygen	X		Total Iron – Fe		X
Total Dissolved Solids	X		Calcium – Ca <sup>2+</sup>		X
Chloride – Cl <sup>-</sup>	X		Magnesium – Mg <sup>2+</sup>		X
Ammonium – NH <sub>4</sub> <sup>+</sup>	X		Boron – B		X
Nitrate – NO <sub>3</sub> <sup>-</sup>	X		Mercury – Hg		X
Nitrite – NO <sub>2</sub> <sup>-</sup>	X		Arsenic – As		X
Sulfate – SO <sub>4</sub> <sup>2-</sup>	X		Lead – Pb		X
BOD <sub>5</sub>		X	Cadmium – Cd		X
COD		X	Chromium – Cr		X
Bicarbonate – HCO <sub>3</sub> <sup>-</sup>		X	Nickel – Ni		X
Suspended Solids/Turbidity	X	X	Copper – Cu		X
Oil & Grease		X	Aluminum – Al		X
Phosphorus (as PO <sub>4</sub> <sup>3-</sup> )		X			

The water quantity monitoring plan outlined five critical hydroposts (gauging stations)<sup>17</sup> that need to be upgraded to provide reliable hydrological data for the Sevan-Hrazdan hydrologic system. The surface water monitoring post at Hrazdan-Geghamavan, the outlet of Lake Sevan, links the lake to the Hrazdan River. Therefore this post was critical for monitoring water flow from Lake Sevan and for water resource allocation. The monitoring plan recognized the importance of this post and recommended its upgrade, as well as the upgrade of the Artsvanist post at the outlet of the Arpa-Sevan water transfer tunnel. The recommendation was that these two stations be equipped with digital data recorders and satellite data transmission systems. SWRMP was also requested to assist in upgrading water quantity measuring stations along the border with Turkey. As a result of this request, three border hydroposts were included in the water quantity monitoring facility upgrades.<sup>18</sup> These border posts are critical to monitoring water-sharing agreements between Armenia and Turkey. During 2002, following agreement on the strategy, the project began the process of identifying and procuring this equipment. Some \$890,000 of water quality and water quantity equipment has been installed and users have been trained on the use and care of this equipment. The following subtasks describe these activities.

### 2.3.2 Subtask 3.2: Water Quality Monitoring Enhancement

SWRMP refurbished the EIMC laboratory and provided water quality monitoring equipment and training. The project also provided field sampling equipment and training for parameters to be sampled and analyzed in the field or stored for transport to the central laboratory.

#### Activity 1: Central Laboratory Refurbishment

The EIMC laboratory occupied space at 29 Komitas St., Yerevan. In order to meet the requirements of a modern water quality laboratory, 45 square meters of lab space needed a complete refurbishment. SWRMP undertook this refurbishment as an element in improving water quality monitoring. The

<sup>17</sup> At Artsvanist, Geghamavan, Aghavnador, Yerevan, and Masis.

<sup>18</sup> At Surmalu on the Araks, and at Yervandashat and Haykadzor on the Akhuryan

analytical lab space required filtered air; metal-free counters and cabinets, chairs, and shelving; and sufficient fume hood space for the required acid cleaning baths and distillation apparatus. Free-standing High Efficiency Particulate Air (HEPA) filter units capable of re-circulating room air at least once per hour were also included. In addition, room air dust was controlled by replacing old drafty windows with modern air-tight windows. The ceiling and walls were re-plastered and painted with enamel to eliminate dust. The floors were re-finished to provide a dust-free, level surface resistant to potential drips and spills of acids. A smaller storage facility was also refurbished. This work took place in early 2003 as laboratory equipment and materials were being procured and delivered. After materials and equipment were delivered and installed, a formal ceremony to open the new lab was held in September 2003.

## **Activity 2: Water Quality Monitoring Equipment Procurement and Training**

The water quality monitoring procurement and training activity was designed to enable monitoring in the field where possible, and in the laboratory when not possible. A detailed list of materials, equipment, spares, and consumables was developed, following agreement on the monitoring strategy. The elements of the procurement allowed for testing for all parameters identified in the Water Resources Monitoring Strategy. The types of analytical equipment that were provided to the Government of Armenia and their purpose included:

- Inductively Coupled Plasma Mass Spectrometer (ICP-MS). This unit, the only one of its kind in the region, has the capability of measuring for 30 metal ions at low detection limits. It will measure for aluminum, arsenic, boron, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, orthophosphate, potassium, and sodium. The presence of these chemicals can indicate pollution discharged from mining, manufacturing, and leather tanning.
- Benchtop Spectrophotometer. This unit measures for ammonium, nitrate, nitrite, sulfate, and chemical oxygen demand, which can indicate contamination from livestock operations, municipalities, and industrial discharges.
- Chemical Oxygen Demand Reactors. These units use a chemical digestion method to determine oxygen demand. High oxygen demand is an indicator of organic pollution from such sources as sewage, food processing, and agricultural wastes.
- DO Conductivity Meter. This unit measures dissolved oxygen, pH, and conductivity which correlates with Total Dissolved Solids (TDS). TDS is an indicator of pollution.
- Titration Equipment. These dispense reagents for colorimetric endpoints to test for bicarbonate, dissolved oxygen, and other titration analyses.
- Oil and Grease Evaluation System. This measures for hydrocarbons and lipids that can be discharged from gas stations, restaurants and mechanical shops, street runoff, and many types of manufacturing.

Safety equipment, including eye wash stations, rubber gloves and lab coats were considered essential elements of the procurement. Reagents, standards, buffers, general lab glassware, and expendables (labels, sterile wipes, filter paper, etc.) were included. Computers and associated peripherals for data analysis and storage were also provided.

Training in the use of this modern laboratory equipment was provided to laboratory staff in September 2003. This training included operation of each item of analytical equipment/instrumentation (and the theories behind the analytical analyses and the instruments) including calibration requirements, analytical procedures, maintenance, documentation of calibration and maintenance, and hands-on in-laboratory training of new analytical techniques. This consisted of repetitive use (practice) on various pieces of equipment/instrumentation, namely: benchtop visible light spectrophotometer, lab DO/pH/conductivity

meter, COD Reactor (kit), BOD5 Incubator (kit), oil and grease analyzer, automated titration equipment, etc. Training also incorporated sessions on lab safety and quality control (QC) programs and procedures. Because the ICP-MS is a sensitive and specialized piece of equipment, the manufacturer's representative (From Perkin-Elmer in Moscow) visited Yerevan to provide training in its care and use on three occasions. During the initial installation and training the unit was damaged and needed repair. Following repair of the unit, two additional training sessions for laboratory staff were held.

### **Activity 3: Water Quality Field Sampling and Training**

The Water Resources Monitoring Strategy was designed so that many parameters could be measured at streamside. Parameters such as temperature pH, turbidity, and others must be measured in the field (or are most effectively measured there). The sampling plan<sup>19</sup>, prepared in late 2003, provided specific task-oriented guidance to the individuals and organizations with responsibility for implementing surface water quality monitoring in the Lake Sevan and River Hrazdan Basins. It built upon the strategic concepts described in the Lake Sevan-River Hrazdan Surface Water Resources Monitoring Strategy. Conceptually, field sampling was designed to be managed from three Regional Centers under HEMA management. EIMC laboratory staff would receive samples delivered by Regional Centers, care for and analyze them, record resulting data and transfer the data to the proper authorities, clean and otherwise prepare sample containers for reuse, and prepare sampling kits for use by the Regional Centers. Each field sampling site was visited and Global Positioning System (GPS)-located as part of developing the sampling plan.

Regional Centers were provided with swing samplers, Troll 9000 multimeters, and Hach Field Colorimeters (as well as backup Hach Colorimeters), which are small and transportable. Several of the parameters planned for routine monitoring have significant holding time requirements, including BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand). The sampling plan and associated procurement allowed for this by providing sample containers, ice chests for use in the field, and refrigerators for each Regional Center.

Knowledge transfer regarding sampling took place during development of the sampling plan, as all parties were involved in discussion of where and how to take samples, analyze them, and/or preserve them properly. A formal training for all staff involved in the field sampling program took place in late 2003. This training included sessions on sampling equipment and its use (theories behind the field analytical instruments), prevention of sample contamination, sample preservation, operation and calibration of field analytical equipment, field logs and documentation, and repetitive streamside hands-on experience using the provided field equipment. Specialized training in the care and use of the Troll multimeters was also provided by an experienced user of this equipment.

### **2.3.3 Subtask 3.3: Water Quantity Monitoring Enhancement**

As mentioned above, the Lake Sevan-River Hrazdan Surface Water Resources Monitoring Strategy identified 8 critical hydroposts of 20 that needed to be upgraded to provide reliable hydrological data. These were all manual posts with chart-based water level indicators and bridges or cableways for measuring water velocity (which was integrated over the cross-section at the site to derive flow). The monitoring strategy identified two of these as being critically important, requiring special attention. These were at Geghamavan, at the outlet of Lake Sevan (which links the lake to the Hrazdan River), and at Artsvanist, at the outlet of the Arpa-Sevan water transfer tunnel (which transfers water from the Arpa River watershed to Lake Sevan). These were to be upgraded with automatic equipment and telemetry systems allowing real-time monitoring. The three other sites would continue to operate as manual posts

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<sup>19</sup> Lake Sevan-River Hrazdan Surface Water Quality Monitoring Sampling Plan, December 2003.

with water level indicators and periodic velocity measurements. As mentioned above, three additional gauging stations along the Akhuryan and Araks River border with Turkey were included in the program by special request. Equipment needs for implementation of the strategy was evaluated using outside international expertise. The consultant evaluated existing resources available for implementing this strategy, and then developed recommendations for additional equipment and supplies for procurement. Descriptions of activities to improve water quantity measurement are included in the following paragraphs.

### **Activity 1: Data-logger and Telemetry Procurement, Installation, and Training at Critical Stations**

The Government of Armenia (GoA) has particular concerns about the water level of Lake Sevan. Water flows from Lake Sevan through a man-made channel at Geghamavan, which was built during Soviet times, into the Hrazdan River, where it powers turbines for power generation and is used for irrigation in the lowlands. Water flows from the lake are controlled in this channel. Monitoring flows in at this location is critical for managing lake level and monitoring water allocations downstream. At the other end of the lake, water flows into the lake at Artsvanist through the Arpa tunnel that links the Arpa River to the Lake Sevan watershed. These two stations are critically important for managing water resources within the Sevan-Hrazdan hydrologic system. Due to the importance of these two monitoring sites, government agencies and SWRMP proposed establishing state of the art digital gauging stations at these two sites. These would not only have the capacity to collect and store data, but also to provide real-time data to monitoring agencies and decision makers and via satellite telemetry. SWRMP outlined requirements that included integrated systems, standardized equipment, and redundancy for a field sensor to headquarters-based digital data storage and analysis system. Training for installation, use, and maintenance of all system components was provided. Equipment and materials procured through an integrating vendor (Riverside Technology, Inc. [RTi] of Fort Collins, Colorado, who provided equipment and training for all water quantity monitoring sites) for these two stations included:

- Staff gages;
- Analog chart recorders, including pulley wheels, counter weights, floats, recorder pens, charts metric, and associated hardware and spares;
- Digital gauging stations, including data-loggers and sensors, storage modules, enclosures, power supplies, data-logger support software, and associated hardware and spares;
- Meteosat-based communications, including Meteosat SatLink satellite transmitter, antennas, and associated cabling and mounting hardware; and an
- Acoustic Doppler Current Profiler (ADP) with software, cables and installation hardware for the Geghamavan site.

Staff from RTi made four trips to Armenia to support this procurement. In April 2003, a post-award survey trip was made to visit sites, interview prospective trainees, and verify details of the procurement. The vendor then assembled the required materials and equipment for all eight sites and shipped them to Yerevan. Following arrival and clearance, two technicians visited to provide training in Yerevan for Armhydromet staff on the concepts and design of automated data collection and telemetry for hydrological surface water monitoring, training and installation of Data Collection Platforms at the Geghamavan and Artsvanist gauging posts, and a training and equipment acceptance session in Yerevan to prepare for the independent installation of the remaining project equipment. This was followed by post-installation survey to verify operation and installation of all project equipment, and to provide additional training. A final visit was made to resolve final telemetry issues at Geghamavan and Artsvanist.

Once installed and all technical issues resolved, the Geghamavan and Artsvanist sites were operating as designed, with data uploaded via satellite to Eumetsat servers in Germany for query and downloaded by ASH as needed. Data loggers were operating to provide back-up data capture in the event of interrupted satellite communications. The result was that the GoA now has the capacity to monitor scheduled water released from Lake Sevan, detect unauthorized releases, and measure inflow to Lake Sevan through the Arpa tunnel in real time.

### **Activity 2: Facilities Upgrades at Traditional Gauging Stations**

Near-term improvements were made at three existing flow monitoring stations at Yerevan and Masis on the Hrazdan River, and upstream at Aghavnadzor on the Marmarik River. All stations were provided with new staff gauges and automatic graph recorder to replace non-functioning Soviet-era equipment. At the Yerevan site, the footbridge used for velocity measurements was repaired for safety reasons. At the other sites, river transit cables and associated civil works were repaired and/or replaced to allow for periodic flow measurements. Training in the use and maintenance of the new chart recorders was provided to HEMA staff.

### **Activity 3: Data-logger Installation at Border Gauging Stations**

The government first identified four gauging stations on the border with Turkey as critically important. Although diplomatic relations with Turkey are non-existent, the two countries continue to abide by previously agreed-upon protocols which governed allocation of the water of border rivers. Until SWRMP installed modern equipment, The GoA had to accept flow data that Turkey provided and associated volume allocation based on this data. In order to check the data, the government wanted to upgrade posts at Margara, Yervandashat, Surmalu, and Haykadzor. In 2001, the Prime Minister directed Armhydromet to prepare and submit plans for upgrading these four gauging stations. SWRMP was asked to assist by providing equipment and associated training for upgrading three of these four (Yervandashat, Surmalu, and Haykadzor). Following visits to each site and extensive analysis of needs and staff capacity, SWRMP procured and provided both analog and digital data-logging equipment for these sites, but not telemetry (at least partly because visibility of the Meteosat satellite from these locations). Equipment provided included replacement staff gauges, analog chart recorders (and spares), and solar-powered programmable digital gauging stations. These stations are designed so that data can be viewed on site and stored data can be downloaded for processing and analysis in Yerevan.

Although SWRMP planned to assist in installing this equipment, delays in completing civil works repair (the government contribution to the program) and security constraints along the Armenia-Turkey border prevented this. However, the same analog and digital recording equipment was also procured for the stations within the Sevan-Hrazdan basin, as standardization simplifies operation and maintenance and facilitates spares procurement. In this case, it also facilitated training in both installation and use of the equipment. Staff were given instruction as part of the training, both in classroom and in the field, as were staff responsible for the Geghamavan and Artsvanist stations.

## **2.3.4 Subtask 3.4: Technical Support for Water Resources Planning**

Subtask 3.4 was designed to improve systems for using water resources monitoring data. Activities focused on support for data development and establishment of the State Water Cadastre, introducing use of the data for managing use and permitting through water resource modeling, and basic computer and database training. The project concept was that links needed to be made between data collection and data use. Decision makers need to have data available to them in a form and format that allows them to make rational decisions and demonstrate to others that these decisions are supported by sound science and

complete analysis. Activity 4 under Subtask 2.1 and Activities 5 and 6 under Subtask 2.3 focus on providing relevant government agencies with the tools required to support water resource planning.

### **Activity 1: Support for Development of the State Water Cadastre**

In July 2003, the project conducted an assessment of the information tools being provided to WRMA and HEMA under USAID's national and regional water projects. The focus was on ensuring that the central database that had been created would accommodate data that will be collected as a result of water monitoring equipment procurements under SWRMP. In addition, the assessment examined the potential interface between the HEMA central database and the needs of data users for information to be used for decision making. This assessment enabled SWRMP to finalize information technology procurements for WRMPA and HEMA for synergistic systems that allow for data storage, transfer, and sharing in an effective manner (see Task 2.1, Activity 4). This assessment provided for technical specifications for additional IT procurements to ensure these synergies.

SWRMP also conducted an assessment of the current water cadastre, outlined requirements for automating the cadastre, and compared the differences in the current cadastre with the requirements of the Water Code<sup>20</sup>. The resulting report reviewed the data available for inclusion in the State Water Cadastre and made recommendations on digitizing those data, reviewed computer network systems planned for managing the Water Cadastre, identified policy issues to be addressed to enable development and proper operation of the Cadastre, and made specific recommendations for priorities in the development of the Cadastre. The report also outlined what data needed to be included (hydrologic, groundwater, water quality, permitting, and other data needed to meet the requirements of the Water Code) and sources for that data. It specified what historical data were available and how critical historical data could be digitized. This work also highlighted issues that the government needed to resolve regarding the Cadastre, including the ultimate location of the servers, who would be responsible for data quality, database access issues. A key recommendation was that the MoNP needs to establish a clear set of policies and procedures for managing the State Water Cadastre and for providing data to the Cadastre. In addition, the policies and procedures should be formalized in a Memorandum of Understanding (MoU) to be signed by all departments and agencies involved in supporting the Cadastre. These agreements were not yet in place at the end of SWRMP.

### **Activity 2: Introduction of Water Resource Modeling**

During the study trip to Austin, Texas, four participants were exposed to the water availability model used by the State of Texas to support surface water rights permitting, the Water Rights Analysis Package (WRAP). Permit applicants use this model to demonstrate that water is available before a permit can be granted. The model is simple to use and is in the public domain. During the study tour, participants worked directly with the model's developer, Dr. Ralph Wurbs, to gain an understanding of the model. Following a discussion and analysis of the WRAP model and an alternative (MIKE BASIN model) SWRMP decided to introduce the WRAP model on a pilot basis. Dr. Wurbs visited Armenia and conducted a five-day workshop with about 25 participants to train them in application of the generalized WRAP model and to establish capabilities for modeling the Lake Sevan-Hrazdan River system and other river systems in Armenia. Dr. Wurbs noted the current lack of sufficiently reliable data for the basin as a constraint. As a result, SWRMP worked to identify and distill sufficient data to provide a first-cut model for the basin. This work was conducted by a consultant familiar with WRAP model, SWRMP staff, and staff from HEMA and WRMA. The consultant found that despite the effort to assemble data, it was not available in an easily usable format. Although the model's geometry to represent channel connectivity

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<sup>20</sup> Armenia State Water Cadastre: Current Status and Recommendations for Development, Michael Corkran, December 2003.

and withdrawal points could be developed, too many gaps existed in the available data set to develop a useful model for managing the water resources of the system. Recommendations deriving from this work included:

- Developing a model in a piecewise manner, starting in upper sub-basins where naturalized flows can most accurately be developed. The upper Marmarik would be the first sub-basin to be modeled.
- Working downstream, modeling additional sub-basins and lower reaches of the Hrazdan River as the required data is uncovered or collected. The Hrazdan River between Hrazdan city and Lusakert should be the second priority for modeling. This work would be completed before the end of the year, if the information listed in the section titled Data Assessment for the Sevan-Hrazdan Basin would be made available to the Project before mid-December 2003. Only the data for those points upstream of Lusakert is required from the section titled Data Assessment for the Sevan-Hrazdan Basin.
- Once each piece of the complete basin model is established, continuing efforts should be made to improve the quality and quantity of data available so that the model simulates real-world conditions with increasing accuracy. Such commitment to improvement will increase the value of the model as a water management tool.

Although accurate modeling was the objective of the GoA, this exercise demonstrated that much remains to be done before useful models will be ready for water resource modeling in Armenia.

### **Activity 3: Training**

In addition to the training outlined in the paragraphs above, SWRMP supported a set of basic information technology and computer skills courses for staff of HEMA and WRMA to prepare these Agencies for their role in managing water resources. Between 2 and 10 trainees took part in the following courses:

- Application of Information Tools (beginning through intermediate database functions)
- Computer Network Management (network, database, and website management)
- GIS Tools for Water Resources Management (ArcView GIS, GPS, and Water Availability Modeling)
- Data Management for Decision Makers

These courses were designed to give the staff the basic computer and information technology background required for working with electronic data.

## **2.4 TASK 4: INCREASE STAKEHOLDER PARTICIPATION IN INTEGRATED WATER RESOURCES MANAGEMENT**

This Task included two subtasks and associated activities: public participation and small grants for pilot projects.

### **2.4.1 Subtask 4.1: Broad-Based Public Participation**

The public participation subtask sought to establish a tradition of public participation and cooperation among water resources management stakeholders to help ensure sustainable management of this vital natural resource. Three major activities were included in the work plan: training in workshop techniques for participation, public awareness, and participation in water resources management.

### **Activity 1: Training in workshop techniques for participation**

The project completed a facilitator training program in September 2002. During this training, facilitators learned workshop techniques for participation, focusing on methods to encourage participation and achieve specific workshop results. These participants then put these lessons to use as facilitators for the Sevan-Hrazdan Hydrologic System Workshop. Many of these trained facilitators participated in other project activities and encouraged stakeholder participation. The project made possible numerous meetings to involve stakeholders in the government's deliberative process in the water sector. Additionally, the public was involved in Water Code development by attending two public hearings and an environmental impact assessment, sponsored by the project.

### **Activity 2: Public awareness**

The project committed to publishing a periodic newsletter. A first newsletter of 20 pages was published in both English and Armenian. A second 10-page newsletter was published in January 2003. The third and fourth newsletters were published in June and September of 2003. The last newsletter was published in December 2003, just before the original end date of the project. The project-supported WRMA website did and will contribute to broader public awareness and transparency related to water resources management, use, and protection.

### **Activity 3: Participation in water resources management**

In addition to the Initial Stakeholder Workshop and the Sevan-Hrazdan Hydrologic System Workshop, the project supported broad-based intersectoral dialogue on important water sector issues. This was done through establishing stakeholder fora to develop policies, strategies, and laws, and regulations related to implementation of water resources management throughout 2003.

#### *High Level Meeting Fora to Discuss Sustainable Water Resources Management Issues*

The first national level forum was convened at a meeting of the National Water Council on December 6, 2002. At the Earth Day Forum on April 22, 2003, the US Ambassador, USAID Mission Director and staff, and the Minister of Nature Protection participated in the discussions of sustainable development and water resources management. SWRMP also supported the participation of local stakeholders in high level international forum discussions. The project financed the participation of six Armenian participants in the International Geographic Union (IGU) Commission Conference for Water Sustainability, held in Armenia. The project also financed a local NGO representative to attend a Global Water Partnership meeting in Tajikistan.

#### *Fora to Develop Policies, Laws, and Regulations*

In the context of its day-to-day work with WRMA, SWRMP assisted with the organization of three intersectoral fora convened to develop specific products related to Water Code implementation. A Water Use Permitting Task Force was convened in February that led to the development of Water Use Permitting guidance that will be incorporated into the National Water Program. The Water Resources Fee Strategy Task Force was convened to deliberate and recommend a resource fee strategy to be incorporated into the National Water Program. ARD assisted WRMA with the organization of the National Water Policy and Program Task Force, charged with coordinating the development of the National Water Policy and Program. These fora are discussed in greater detail in previous sections of this report.

Local participation in water resources management activities was supported through local citizen and NGO involvement on advisory committees, in working groups, at workshops and training programs, and in pilot projects. The project was successful at involving NGOs in all aspects of project activity, but

achieved less success in encouraging regional and local participation. This was in large part because of the delays in implementing Subtask 3 of the Water Code: Policy Implementation, which was designed to work in a more focused way in several sub-basins of the Sevan-Hrazdan hydrologic system. However, in support of Subtask 4.1, the project trained 75 local and national NGO representatives in grant proposal writing.

#### **2.4.2 Subtask 4.2: Small Grants for Pilot Projects**

The goal of the Small Grants for Pilot Projects Subtask was to provide funds for small grants to support priority projects that furthered the overall goal of promoting sustainable water resource management. The grants were to provide opportunities to implement practical solutions to water resources problems. They provided a chance for agencies and individuals to work collaboratively and gain experience in implementing integrated management approaches. The specific objectives of Subtask 4.2 were to: support local participation in water resources management through provision of resources to implement activities as defined by local priorities, begin the process of establishing local NGOs and Private Sector Organizations (PSOs) as partners with government agencies in the sustainable water resources management, and help build public confidence that results are achievable at the local level. Planned activities included: development of grant program management plan, establishment of grant program administrative process, initiation of competitive grant application process, implementation of the grant program, and provision of technical support when necessary.

SWRMP developed its Grants Management Program Plan and a Grantee Handbook to guide its grant program. In keeping with the program design, the project distributed a call for expressions of interest for the grant program to over 11,000 NGOs. Eighty-two expressions of interest were received and 16 project concepts were identified for further consideration. In July 2002, ARD's Grants Round I Selection Committee selected four grants for award. In October 2002, the project solicited targeted proposals for grants to support research for methodologies for water resources fees. One grant was subsequently made. Management of these five grant projects was highly resource intensive and required significantly more staff time than it should have required. Initially, none of the NGOs that were awarded grants had the capacity to manage them. A tremendous burden fell to the project financial management staff to train NGO staff and review financial reporting to ensure that financial documents were prepared in accordance with USAID regulations. Project technical staff were also required to review technical progress reports, monitor progress in the field, discuss problems with grantees, and help resolve implementation issues. A brief description of each grant is provided below, followed Table 4: A Summary of SWRMP Grants.

##### **Grant Title: Alternative Livestock Watering Facility and Biogas Production Unit**

##### **Grant Recipient: ECO-99**

Runoff from over 90 localities of the Gegharkunik District drained into Lake Sevan. 240,000 people (and an undetermined number of cattle, pigs, and horses), lived within the drainage system of the Lake. Due to the lack of sewage treatment for human wastes and lack of practices to prevent runoff from entering livestock facilities, pollution loadings to the Lake were substantial. The overall objective of the project was to decrease water pollution of Lake Sevan through two activities: construction of an alternative watering facility for livestock operations located near the Lake and recycling manure to reduce nonpoint source loads. Biogas generation would not only prevent pollution, but it would benefit the locality by producing cooking fuel for at least 6 families and provide fertilizer for a 10-hectare plot. The project was to carry out the following primary tasks:

- Installation of an alternative watering facility for 60 cattle that were watering at Lake Sevan;

- Installation of a biogas generation facility to accommodate the wastes of cattle associated with the alternative watering facility; and,
- Public awareness-raising through the agricultural extension service about the biogas generation technology and its economic and environmental benefits.

The geographic region for this project was the village of Karchaghbyur, which is located near the shores of Lake Sevan. ECO-99 formed a partnership with the NGOs “Shkxta” and “Top Management” and the Agriculture Promotion District Center of Gegharkunik to implement the grant. 15 extension agents were to participate in the training courses so they could use the new knowledge and skills in their daily consultations with farmers. The village headman of the district was also be involved in the project, and permission from the Country Department of the District Government was obtained.

### **RESULTS:**

Although much was expected on this grant, it was plagued by difficulties almost from the start. The original site for the project refused to participate once the grant documents were signed. An alternative site in Tsovak Village was proposed and agreed to, but the facility would only serve 30 cows, rather than the planned-upon 60. Licensing for the company providing the design for the biogas facility (Gosotherm Co. Ltd.) and safety issues related to the gas production were raised and needed to be addressed. Finally, cold weather closed in and field work came to a stop in December 2003. Field work began again in 2004, but again logistical problems slowed progress. Difficulty in procuring the necessary materials and labor disputes and plagued the project. Although some progress was made during the construction season of 2004, final commissioning of the facility could not be completed until the spring of 2005. At project completion, 8 of the 10 scheduled tasks were complete. The grantee did not provide an analysis of processed and non-processed manure, water, and soil (Task 8) or obtain TV coverage illustrating the biogas system’s environmental benefits (Task 9), due to lack of funds. The funds that had been saved were expended because the project was delayed so significantly. Other issues that required project attention were overpayment of grantee staff, documentation for the required cost share, and concerns about the material and equipment procurement for the project. However, at project completion, watering facilities were built and a biogas system had been constructed.

### **Grant Title: Public Awareness and Lake Sevan Clean-Up**

#### **NGO Implementing Grant Recipient: Armenian Red Cross Society Red Cross**

Finding solutions to problems threatening Lake Sevan’s survival was, and still is, among Armenia’s highest priorities. Armenia’s youth have much to contribute towards the lake’s protection and preservation. Before the project began, youth volunteers of Armenian Red Cross Society worked in cooperation with German Red Cross Youth to implement the “Clean Sevan” project. The purpose of the project was to clean the shores of Sevan and to raise awareness of the lake and its environmental problems among the general population. In 2000, the program involved of 40 youth volunteers from Yerevan and Gagharkunik marz. With the assistance of German Red Cross the program was expanded into “Clean Sevan 2001,” an international ecological camp, which attracted 80 youth volunteers, not only from all marzer, but from Germany, Philippines, and the USA as well. As a result 30 kilometers of lakeshore were cleaned at Shorja, Drakhtik, Aghberk, and Chkalova villages. The camp organized courses and lectures on ecology and group sessions on painting, information, music, and sports programs. The purpose of these activities was to raise awareness of the importance of Lake Sevan to local community life. Information on the program was aired widely through various TV stations. At the end of the program, there was an Armenian TV “Hot line” program to present and highlight the project and its beneficial outcomes.

The grant was to build upon the success that Armenian Red Cross had achieved. The objectives of this particular program were to:

- Increase national level public awareness of problems and solutions to water resources problems in Lake Sevan;
- Conduct an environmental education program in 26 schools in the Gegharkunik marz to teach local school children ways to protect and preserve the Lake; and
- Organize a 15-day environmental camp during the summer 2003 to clean up 60 kilometers of beaches and install waste bins and anti-littering signs.

In carrying out the grant, the Armenian Red Cross led a cross-cutting consortium of international and local organizations and volunteers which encouraged the local community to continue in the spirit of protection and conservation of the Lake, based on lessons-learned. Consortium members were to be responsible for implementing various aspects of the grant program.

### **RESULTS:**

The grantee completed five technical tasks and provided a final report in December 2003. Highlights of the grant were that:

- Information about the environmental issues related to Lake Sevan and the “Clean Sevan” program were developed and distributed. 500 pamphlets were created and disseminated. The Grantee organized a town hall meeting that was covered by the press, and participated on a radio talk show to highlight environmental issues and discuss the “Clean Sevan” program. Television talk shows were also arranged, videotaped, and broadcast. A video clip on “Clean Sevan” program issues was broadcast on television three times a day during the last week of July to provide information on the Armenian Red Cross program, and to announce the Clean-up camp.
- Nearly 150 sixth form schoolchildren from 26 schools near Lake Sevan participated in a school program that highlighted environmental problems globally, and for Lake Sevan in particular. The students discussed environment protection issues and brainstormed ideas for their communities. Hands-on activities included performing skits and making informational booklets and posters. Thirty of these children participated in one of the TV talk shows.
- A 10-day Lake Sevan Ecological Camp was organized and managed for Red Cross Youth volunteers, followed by a 5-day children’s camp. The volunteer camp was attended by 90 participants representing all regions of the country. The children’s camp was attended by 30 students from 18 schools in 6 towns near Lake Sevan. Both sessions included two hours of lakeshore clean-up, a one-hour workshop on environmental issues and an evening “ecological hour” each day.

This grant required significant oversight and capacity support. The Armenian Red Cross Society had no experience with USAID grants management or with the relatively strict reporting requirements that required accounting for all funds.

### **Grant Title: Women's Participation in Water Resource Management**

### **Grant Recipient: All Armenian Union of Women**

The Republic of Armenia’s enacted law on Water Users Associations and Federations enabled participatory irrigation management. The newly adopted Water Code encouraged devolution of water management authority to the local level. In the 10 years before the project began, a significant proportion of the male population had immigrated to foreign countries to work. As a result, as many as 60 percent of

on-farm irrigation managers were women. Despite this, the substantial contribution of women to the management of water resources used in agricultural production was not broadly recognized. Although practices for water conservation, equitable distribution, and pollution prevention in irrigation water management were not widespread, an increased role of women in the water management decision making process could broaden their application. Given the potential for an increasing role of women in irrigation water management, it was necessary to improve their understanding of effective management practices and then-own potential contribution to the decision-making process.

The goal of this grant project was to increase the role of women in water resources use management in irrigation. Its objectives were threefold: to train women in Participatory Irrigation Management techniques, water resource management principles, water users associations, irrigational norms, latest conservation practices, water economics, and water metering; to provide a demonstration model for female-organized clean-up of irrigation canals; and to promote information dissemination with regards to lessons learned, new skills developed, solutions identified, and strategies developed for women's participation in irrigation management.

The geographic focus of the project was Karbi village, located in the Arzni-Shamiram irrigation system, and Mkhchyan village, located in the Artashat irrigation system. Arzni-Shamiram and Artashat Main waterways are the largest irrigation systems of the Sevan-Hrazdan hydrological system, irrigating 26.7 and 30.4 thousand hectares land, respectively. Both are located in the downstream segment of the Hrazdan River. Karbi village is located in the Hrazdan irrigation diversion system. Mkhchyan village is located near the Mkhchyan pumping station, which diverts water from Hrazdan River through the Artashat Canal to irrigate Ararat Valley. Both villages are among the most important agricultural producing regions of Armenia.

### **RESULTS:**

The grantee completed eight technical tasks and provided a final report in December 2003. Highlights of the grant were that:

- A total of 34 women, 18 women from Karbi village and 16 women from Mkhchyan village, were trained in irrigated agriculture and related environmental issues, irrigation management institutional reform, irrigated agriculture economics, and domestic waste removal.
- Models for demonstration of female-organized clean-up activities along the irrigation canals and domestic waste removal were provided. Clean-up days were organized and implemented.
- Numerous activities were implemented to promote information dissemination, with regards to lessons learned, new skills developed, and solutions identified, and strategies developed for women's participation in irrigation management. This including distribution of information materials to water users during the social surveys, distribution of hand-outs to training workshops participants, publication of booklets and distribution to stakeholders, production of the film "The Path of the Water" and broadcast by TV, a project wrap-up workshop and presentation of project results to the workshop participants and stakeholders, and information dissemination by mass media.

The grant ended on a positive note with a wrap-up meeting with all of the women participants of the training that was held in the two pilot villages. A film, "The Path to Water" was aired. This film was very well done and captured the essence of what farmers in Armenia face in attempting to meet their water needs.

**Grant Title: Research to Support Development of Water Resource Fees**

**Grant Recipient: NGO of Political, Legal and Economic Research and Forecasting**

The new Water Code of the Republic of Armenia into force on October 10, 2002. The Code relies on two principle regulatory mechanisms: Water Use Permits to regulate wastewater discharge and water withdrawals, and Water System Use Permits (licenses) for tariff and quality of service regulation. The new Code puts a special emphasis on economic instruments to facilitate an optimal allocation of Armenia's water resources among competing users, and promote an effective management, use and protection of the water resources. These instruments include water extraction fees for both surface and groundwater, wastewater discharge fees, and water pollution fees. Establishment of a fee structure required careful consideration of issues such as equity and affordability, transparency and simplicity of the fee structure, protection of the value of the resource fee against inflation, and earmarking of revenues to support water management and protection activities. A water resources fee strategy was developed to provide guidance, methodologies, and so forth on how those resources fees should be set. The strategy addressed a number of issues of relevance to Armenia, such as:

- The pricing of surface water extraction relative to groundwater extraction;
- The pricing of water extraction by industrial producers vs. farmers vs. water suppliers;
- The pricing of wastewater discharges and pollution fees by industrial producers and wastewater dischargers;
- Regional variations in prices;
- The pricing of water use by the hydro-power sector;
- Nature of fee structure; and
- Earmarking of water resources fees.

The purpose of this grant was to provide for supporting research on the issues above to support the government's effort to develop a formal Water Resource Fee Strategy to incorporate into the National Water Program.

### **RESULTS:**

The grantee completed seven technical tasks and provided a final report in May 2004. Highlights of the grant were:

- Development and administration of a survey instrument designed to inform the development of a water resource fee strategy.
- Two very successful workshops focusing on Water Resource Fees were conducted. The first focused on review and analysis of survey data, a report on pollution fees, a report on water abstraction and use fees, and discussion of the issues outlined above. The second focused on discussion of further research to support a rational fee strategy and recommendations for said strategy. Twenty percent of workshop participants were Armenian NGO representatives.

The results of this grant provided information and analysis that led to the finalization of the Draft Water Resource Fee Strategy.

**Grant Title: Reducing Industrial Effluent Discharges to the Hrazdan River from the Kashi Tannery Factory**

**Grant Recipient: Environmental Survival**

The objective of this grant was to develop an environmentally sustainable wastewater discharge model for the tanning industry in Armenia. Environmental impacts of water pollution at tanneries are well-known and well-publicized. The control of such impacts are essential to protect human health and natural ecosystems from adverse consequences of exposure to chromium VI and other contaminants, which are the products of the tanning process. Lower-cost wastewater treatment facilities have been developed, and are currently in use in a number of developing countries, to control these impacts and allow for badly needed economic development.

The Kashi tannery was considered as a good model for business development because it was relatively modern and its capacity could be expanded significantly with a relatively small investment. However, it discharged directly into the Hrazdan River wastewater treatment system. Its owners wished to expand its operations and were willing to make investments. Business expansion support was contingent on introducing capacity to treat harmful effluents through an on-site secondary treatment system. The beneficial outcomes of this grant include the following:

- Application of Appropriate Technology: A model wastewater treatment technology for the tanning industry was developed at the Kashi Tannery.
- Monitoring of Results: Model effluent monitoring capacity was developed within the facility and among the environmental NGO community to monitor effluent and impacts before and after application of the technology.
- Model Water Use Permit for the Tanning Industry: Through work with SWRMP project staff and WRMA, the grantees worked to develop a model Water Use Permit for the Armenian tanning industry.

The SWRMP provided grant funding to support procurement of supplies, materials and equipment for development of the wastewater treatment facility; support for effluent monitoring; and support for development of the model Water Use Permit. DAI, the contractor for the USAID-supported Agribusiness Small and Medium-Sized Enterprise Market Development (ASME) Project, was to provide the international technical expertise for design of the treatment system and oversee its installation.

### **RESULTS:**

This project was by far the most complex and most difficult of the grants. ARD awarded this grant, at least partly because DAI requested project assistance in addressing environmental issues related to tannery operations. These issues included the possibility for high pH, COD, and suspended solids levels, as well as chromium and sulfide pollution<sup>21</sup>. USAID encouraged SWRMP to support this grant to provide an Effluent Treatment System (ETS) for the tannery which included rebuilding primary treatment capability and establishing secondary treatment to address the specific pollutants related to the tannery's operation. This project was initially envisioned as a grant because this was the only contractual way the project could support the request. The project collaborated with DAI to outline a responsive project to address potential Kashi tannery pollutants.

The Environmental Survival grant included: an initial assessment of ecological conditions for the effluent affected area of the Hrazdan River basin, a complete environmental review, preparation of technical specifications and bid documents (with the assistance of DAI's tannery consultant), procurement of ETS equipment (to be paid for by SWRMP directly), oversight of the completion of civil works to be

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<sup>21</sup> Note that the project provided the necessary equipment and training to the Environmental Impact Monitoring Center to test for all potential effluent contaminants from the tannery as part of Task 2.

completed by Kashi tannery and installation of equipment, and chemical and bacteriological water quality monitoring of Hrazdan River and Kashi effluents.

It became clear quite quickly that Environmental Survival did not have the capacity to manage preparation of bid documents, procurement, and installation process, although they did have the technical knowledge required to monitor effluent water quality and complete required environmental reviews (which they did complete) As a result, the technical staff of the SWRMP, with ARD home office assistance, managed these tasks. The project was delayed significantly by a range of issues that included:

- The time required to develop final bidding documents from the initial designs provided;
- Significant underestimation of the project cost by local consultants engaged by the project and by DAI's tannery specialist;
- Inability of US or Newly Independent States (NIS)-based companies to provide responsive bids for the required material and equipment as required by USAID source and origin requirements;
- Delays inherent in the source/origin waiver process;
- Equipment fabrication and delivery lead times (and custom clearances) once the contract with EcoPlus, an Italian firm, was finalized;
- The decision of Kashi tannery to bid civil works contract rather than complete this work themselves as originally envisioned;
- Civil works construction delays due to unforeseen issues with existing infrastructure and winter weather; and
- The necessity for contract extensions required as a direct result of these delays (from November 2003 to May 2005)

The project was completed with installation of all equipment and training for Kashi technicians in March 2005 and final follow-up visit in May by EcoPlus staff to be sure that all equipment was operating properly.

**TABLE 4. A SUMMARY OF SWRMP GRANTS**

Organization	Implementing Partners	Grant Project	Award Amount	Grant Signature Date	Grant Completion Date
Armenian Red Cross Society	Gegharkunik marz Administration, International Red Cross Society, Ministry of Nature Protection	Nation-wide public awareness campaign of Lake Sevan Issues; Environmental Education program, Youth Camp and Beach Clean-Up at Lake Sevan	\$30,00	12/2/2002	Completed September 2003
Environmental Survival	Kashi Tannery Factory, USAID Small and Medium Enterprise Development Project (DAI)	Monitoring of Small Scale Wastewater Treatment System for Model Industrial Tannery. An additional \$112,000 Subcontract was required to install Kashi Tannery Effluent Treatment System	\$99,988	12/3/2003	Completed May 2005 <i>Due to a lengthy procurement process for the effluent treatment system, the final work was completed under subcontract through an international procurement.</i>
ECO-99	Greens Union, Shakta NGO, Khachatryan Dairy Farm	Alternative Water Facility and Biogas Regeneration for Model Livestock Operation Located Near Lake Sevan	\$32,000	12/3/2002	Completed April 2005 <i>Grant extended to allow for construction of the biogas and alternative livestock watering facility, due to inclement weather and a lengthy procurement process.</i>
All Armenian Union of Women	Karbi and Mkhchyan Village Water User Associations	Enhancing Women's Participation in Water Resources Management in for Irrigation Water Use	\$25,000	2/17/2003	Completed September 2003
PLERF	Water Resources Fee Task Force of the Government of the Republic of Armenia	Primary Data Collection for Economic Research to Support Development of the Water Resources Fee Strategy	\$34,963	8/17/2003	Completed April 2004

# 3.0 REACHING GOALS AND OBJECTIVES

The overarching goal of SWRMP, as stated in the original solicitation was “*to develop Armenian capacity to promote sustainable management of a critical natural resource to support enhanced environmental quality and economic growth.*” The specific objectives of the project were to:

- Strengthen the policy and institutional framework for improved management of vital, scarce water resources;
- Rehabilitate key infrastructure and management systems for water quality, meteorological, and hydrologic data collection with monitoring, acquisition, communication, analysis, storage, modeling, and/or forecasting applications; and
- Increase local-level capacity to develop and implement market-based solutions to water management problems and strengthen local government capacity for water management decision-making.

Furthermore, it was anticipated that project tasks would provide improved tools, techniques, and training to policy-makers and water managers that will strengthen their understanding and broaden the set of policy instruments available; increase the quantity and quality of data and improve access to information on water resources and uses; and develop on a selected, pilot basis key demonstrations of effective local participation and partnership building.

Task 1 of SWRMP, to complete a Needs Assessment and Work Plan for the project, confirmed the original project design in all aspects and provided the opportunity to detail activities as described above under the three specific project objectives. As indicated in previous sections, water resources management in Armenia was in a state of flux as the project began. This provided both challenges and opportunities. The challenges were that sector institutions were in transition and subject to some degree to political influences beyond project control. This delayed some activities as government decisions regarding the legal responsibilities and institutional structure for water resources management, monitoring, protection and use were worked out. It also provided opportunities to provide discuss these changes with decision-makers and provide observations about changes being considered. Strengthening sector management by providing training and equipment under these conditions can be difficult, as responsibilities for decision making at the government level and the specifics of the relationships among new and reformed agencies are being worked out. However, the opportunities to support and strengthen the capacity of government agencies to water resources protection and management were significant. The government was clearly focused on the sector, as evidenced by its focus on creating a new Water Code and in the changes to the sector that this process initiated. The SWRMP was instrumental in supporting Water Code development and in developing accompanying regulations and procedures. In addition, SWRMP provided significant support to the new and restructured agencies responsible for water sector management, agencies that lacked skills and resources to respond to their mandates. Discussions of these activities are discussed in Section 2 of this report. Specific project results and indicators, as outlined in the Performance Monitoring Plan are provided in Table 3.1. A discussion of each follows.

**TABLE 3.1. RESULTS AND INDICATORS**

Expected Result	Indicator Description
Sp O 1.6 More Sustainable Water Management for Enhanced Environmental Quality	Selected Armenian water management institutions functioning effectively
	Number of specific water quality and/or quantity indicators improved at specific location
IR 1 National Policy and Institutional Framework for water resources management improved	Number of key identified laws/regulations revised
	Number of recommended selected opportunities for water resource fees or tariffs developed
	Key water resources management institutions apply integrated water resources management techniques
IR 2. Selected Water Quality and Quantity Monitoring Systems Rehabilitated	Number of data indicators on quantity and quality of surface/water collected, sorted and used in resource management
	Number of sampling locations upgraded to for water quality monitoring
	Number of water quantity hydroposts upgraded and modernized
IR 3 Stakeholder participation in integrated water resources management increased	Non-governmental organization capacity building
	Fora established and supported for broad based intersectoral stakeholder participation in water resources management decision making

### 3.1 OBJECTIVE: MORE SUSTAINABLE WATER MANAGEMENT FOR ENHANCED ENVIRONMENTAL QUALITY

#### Indicator: Selected Armenian water management institutions functioning effectively

SWRMP established a four-point ranking system to measure institutional effectiveness: “1” indicated that the institution was established; “2” indicated that it was performing some functions; “3” indicated that it was performing most functions; and “4” indicated that it was performing all functions effectively. The target institutions were primarily WRMA and Armhydromet, both agencies of the MoNP. WRMA was not formally established until January 2002 (Government Decision #82 of 2002) with its charter and management structure approved in June. Also in 2002, Armhydromet was combined with the EMC to form the HEMA as part of restructuring the MoNP in March 2002 (Government Decree 199) with its charter and management structure following in September. HEMA was further restructured internally to form ArmState Hydromet Services (ASH) and EIMC, both with the power to charge for services. During the course of SWRMP, WRMA was judged at “0” initially (having not been established) and “3” at project conclusion as it had moved into new offices, had a clear mandate, and was developing and implementing rules and procedures as outlined in the Water Code. HEMA’s precursors, ASH and EMC, were established at the beginning of SWRMP and were judged at “1,” since the staff of these organizations had the skill, but could not perform their functions, because they had neither the budget nor equipment to function effectively. At the end of the project ASH and EIMC had been strengthened with modern water resources monitoring equipment and were able to monitor water resources within the Sevan-Hrazdan hydrologic system. Although the technical capacity existed, issues related to ongoing

operational costs had not been fully resolved at project close, so these agencies were judged to have reached “2” on the institutional effectiveness scale.

Although these organizations were the primary focus for the project, other organizations contributing to more sustainable water management were also strengthened through the training and discussions leading to the Water Code and its associated regulations. The State Committee on Water Systems and other organizations (including NGOs) were among those represented on various working groups and task forces, including the Government Working Group to Draft the Water Code and the National Water Policy and National Water Program Working Group. These organizations, and the individuals representing them, have significantly increased the skills and abilities required to meet the objective of more sustainable water management in Armenia.

**Indicator: Number of specific water quality and/or quantity indicators improved at specific location**

SWRMP supported both water quality and water quantity monitoring enhancements at specific locations, as noted in the indicator description. USAID had anticipated that focus on water quality and/or quantity indicators would result in the improvement in the availability of accurate and reliable data on which to base water resource management decision making. The project design had assumed that providing materials and equipment to already trained staff of the relevant organizations would be sufficient to improve data availability. However, this was not as successful as anticipated for several reasons, including the disruption caused by institutional changes in the sector, the time required to determine exactly what materials and equipment were needed and to procure them, and the lack of budget resources to allow ASH and EIMC to do anything more than the minimal data collection and analysis.

However, for water quantity monitoring, SWRMP provided and installed improvements that have resulted in the collection of hydrologic data in digital form at 5 hydroposts and the physical upgrading of analog chart recorders at 3 locations for the first time. Improved data was being collected at these sites by the end of the project. In addition, substantial progress was also made toward improving water quality data as well. The Lake Sevan-River Hrazdan Water Resources Monitoring Strategy outlined 51 locations to serve the routine water quality monitoring requirements and 14 locations to focus on monitoring known point sources of pollution. The strategy also identified 29 water quality parameters to be analyzed and reported on. Although regular sample collection and data analysis had not begun by the end of the project, SWRMP was able to help develop a realistic water quality data collection and analysis program, along with the specific materials and equipment (and associated training) required to implement it. Although this may not have fully met initial expectations, these achievements were recognized as substantial, given the capacity of the Armenian agencies responsible at the time the project began.

## **3.2 RESULTS**

### **3.2.1 Result: National Policy and Institutional Framework for water resources management improved**

To achieve this result, SWRMP focused activities on the national policy and institutional framework for improving water resources management. SWRMP Task 2 addressed legal, policy, and institutional issues. Three key indicators were used to monitor achievement of this result.

#### **Number of key identified laws/regulations revised**

The single greatest success of SWRMP is the development and passage of the new Water Code, already described under Subtask 2.2. The Water Code outlined a whole range of regulations and procedures that the government must adopt to implement the Code. There are some 60 or 70 listed under Article 121 of the Code. SWRMP was asked to assist in developing some of these regulations and procedures. In consultation with USAID, SWRMP supported a select set of these requirements, including:

- Supporting the National Water Policy and National Water Program Working Group to develop the National Water Policy and an outline for the National Water Program;
- Developing Water Use Permit Guidelines;
- Providing analysis relating to conservation of ecosystems critical to integrated water management;
- Analyzing the needs for the State Water Cadastre and providing hardware, software, and training to support it; and
- Establishing public notice and comment procedures.

The project also supported development of the Law on Lake Sevan and Ratification of Århus Convention on Access to Public Information

### **Number of selected opportunities for water resource fees or tariffs developed**

Article 77 of the Water Code specifically addressed the need to establish water use permit fees and environmental fees. This indicator specifically targets this critically important aspect that supports improved water resource management. The Water Code states specifically that environmental fees shall be based on development water resource fees and water tariff charges, and that these should be included in the National Water Program.

SWRMP, with the participation of the Economics and Fees Task Force of the National Water Policy and National Water Program Working Group and research provided by PLERF, provided knowledge, guidance, and workshop support leading to the analysis report “Water Resource Fee Strategy: International Experience and Implications for Armenia” and recommendations for a overall water resources fees strategy as outlined in National Water Program Water Resources Fees Strategy (October 2004).

### **Key water resources management institutions apply integrated water resources management techniques**

This indicator relates to the development of policies, strategies, program plans, and their respective implementation. The Armenian Water Code required that WRMA coordinate development of a National Water Policy, and National Water Program, and development of a strategy for organization of Water Basin Management Plans and formation of Water Basin Management Authorities. The agreed-upon unit of measurement for this result was a government-led development of National Water Policy, National Water Program, and Strategy for Water Basin Planning.

As mentioned above, SWRMP supported the development of the National Water Policy and an outline for the National Water Program by working closely with the National Water Policy and National Water Program Working Group. SWRMP consultants, both international and local, provided guidance. The project provided meeting venues and supported workshops as part of this effort. The project supported the strategy for Water Basin Planning through discussions with WRMA senior officials and by supporting international study tours to Texas and Hungary that provided senior officials the opportunity to learn from the basin management experiences of others.

### 3.2.2 Result: Selected Water Quality and Quantity Monitoring Systems Rehabilitated

The project Scope of Work outlined three anticipated tasks, namely: development an integrated monitoring plan that incorporates both the surface and groundwater systems; procurement of needed equipment for both surface and groundwater monitoring; and conduction of training both as part of plan development and associated with equipment procurement and installation. SWRMP completed all three of these tasks. However, the initial hypothesis that this would result in improved Armenian capacity to collect, manage, and store data on the quantity and quality of surface and ground water; and then calculate water balances, forecast changes, and ensuing impacts was flawed and the objective overly ambitious.

#### **Number of data indicators on quantity and quality of surface/water collected, sorted, and used in resource management.**

Units of measurement for this indicator included 2 parameters for water quantity and 27 parameters for water quality. Ultimately, planned water quantity measurements included water level and water velocity (from which flow is calculated), water temperature, and rainfall. As indicated under Subtask 3.1, 29 water quality parameters were ultimately chosen.

Water quantity data for five sites within the Sevan-Hrazdan hydrologic system was being collected by the end of the project. Although data from two sites (Geghamavan and Artsvanist) was available in digital form, and for incorporation into the National Water Cadastre and used for resource management, it is not clear that this was happening as institutional decisions about cadastre management remained to be made at project completion.

In spite of the fact that all water quality sampling sites had been visited and vetted by SWRMP consultant specialists and government technicians; all equipment required for streamside sampling, analysis, and sample storage for central laboratory analysis (with all associated training); and an agreed-upon monthly and quarterly program had been developed; it did not appear that water quality data was being routinely collected, stored, and used for resource management.

#### **Number of sampling locations upgraded for water quality monitoring.**

Three regional water quality monitoring centers (Artashat, Sevan, and Yerevan) were upgraded with either portable and bench top analytical equipment and refrigeration for sample storage when needed. In addition, the EIMC Central Analytical Laboratory was refurbished to clean-room quality. The laboratory was equipped with all the necessary equipment for analysis of the agreed-upon parameters (along with training in improved analytical techniques) and with computers and Internet connection, to allow the storage and transfer of the resulting water quality data. As mentioned above, all sampling locations were identified by GPS coordinates. This met the agreed-upon targets for this result.

#### **Number of water quantity hydroposts upgraded and modernized.**

Five hydroposts in the Sevan-Hrazdan hydrologic system were upgraded. These include the Arpa inflow to Lake Sevan at Artsvanist and the Geghamavan outflow site from Lake Sevan. These were equipped with electronic data loggers and telemetry to allow rapid transfer of data to ASH in Yerevan. Three additional sites—the inflow of Marmarik River in Hrazdan River, the Hrazdan-Yerevan site upstream of Yerevan Reservoir, and the Hrazdan-Masis hydropost, where the Hrazdan River flows into the Araks River—were upgraded, including the installation of modern chart recorders. Electronic data loggers and associated sensors and hardware were procured for three hydroposts along the border with Turkey—the Haykadzor hydropost measuring flow from the Akhurian Reservoir, Yervandashat hydropost measuring flow from Akhurian River above the confluence with the Araks River, and the Surmalu hydropost measuring Araks River flow below the confluence with the Akhurian River. Even though the three

hydroposts along the border with Turkey were not installed at the end of the project, the agreed-upon target of four hydroposts upgraded and modernized was exceeded.

### **3.2.3 Result: Stakeholder participation in integrated water resources management increased**

The intent of this result was to support effective local participation, management, and partnership building so that local priority water management problems could be addressed. SWRMP actively sought participation through the grants program and by engaging NGOs in working groups and task forces.

#### **Non-governmental organization capacity building**

Although the unit of measure was defined as the number of NGOs or local organizations in the target area developing increased capacity to elicit local capacity to implement water resources management solution or decision making, both USAID and SWRMP used the number of NGO grants as a proxy. As outlined under Subtask 4.2, SWRMP awarded five grants designed to the principles of integrated water resource management. Although this was one less than the target, none of the 82 grant applications received met project criteria for award. These recipients, in addition to being provided support for grant activities also received formal and informal one-on-one training in proposal writing, bookkeeping and financial reporting, and technical reporting.

#### **Fora established and supported for broad based intersectoral stakeholder participation in water resources management decision-making.**

The unit of measure was the number of fora established that enable intersectoral involvement in developing specific strategies, policies, and regulations for integrated water resources management, or which enable public participation in water resources management decision making. This was a broad measure which included formalized participation at many levels. The initial Stakeholder Workshop was attended by government officials from the Office of the President, nine ministries, five private firms and joint stock companies focused on the water sector, five NGOs, and several academic/research organizations. This set the stage for broad participation throughout the project. This was followed up with the Sevan-Hrazdan Hydrologic System Workshop, which focused on the target area of the project. Invited participants at this workshop included staff from the Office of the President, officials from 5 ministries, staff of the State Committee for Water Systems, regional and local officials from all marzer in the Sevan-Hrazdan basin, 14 NGOs, and members of multiple academic research institutes. Participants at this workshop helped focus SWRMP activities within the basin. SWRMP supported a range of fora and opportunities for formalized stakeholder participation throughout the project. These included:

- Water Code Revision Technical Working Group;
- National Water Policy and National Water Program Working Group;
- Water Use Permitting Task Force;
- Economics and Fees Task Force; and
- Water Resources Monitoring Working Group and associated task forces.

All these included stakeholder participation from multiple ministries and NGOs. SWRMP guided and supported multiple workshops and working sessions for these working groups and task forces. Other opportunities for broad stakeholder participation included:

- Earth Day activities in 2002 and 2003;
- The Strategic Environmental Impact Assessment of the Water Code;
- Multiple public hearings of the draft of the Water Code in support of the Århus Convention; and
- SWRMP's grant program.

Increased public awareness was also recognized as an important element leading to increased public involvement. To this end, SWRMP issued newsletters in both English and Armenian to highlight the projects, and GoA's and others' efforts to improve water resources management, protection and use. SWRMP also supported the creation of a website for the MoNP.

Together, these opportunities provided both formal and informal fora for improved awareness, understanding, and participation in the process of strengthening sustainable water management for enhanced environmental quality.



# 4.0 ADMINISTRATION AND FINANCIAL MANAGEMENT

SWRMP staff, with support from ARD's home office project management support team, worked closely with USAID to implement the Strengthening Sustainable Water Management for Enhanced Environmental Quality Project according to the applicable administrative and financial management requirements. The SWRMP team focused on ensuring that attention was given to meeting the information and communications needs of USAID, the National Water Council, the Government Working Group to Draft the Water Code, the National Water Policy and National Water Program Working Group, and the MoNP and its associated agencies, in order to ensure collaboration and collective decision making. With USAID, this was achieved through the weekly Chief of Party Meetings and constant communication with the Contracting Officer's Technical Representative (COTR) assigned to the project. Coordination and communication with GoA officials took place on a formal and informal basis with many officials participating in working groups that SWRMP supported. More formal meetings that facilitated coordination and helped guide the program were held periodically with government officials at the ministerial level and with members of the Office of the President, as well as with agency heads, particularly of those agencies that SWRMP was designed to work with and strengthen. NGOs were represented in working groups and participated in most activities of the project. Within this framework, SWRMP successfully met the administrative and financial management requirements of USAID and partner organizations.

Within this overall management structure, the project:

- Employed and managed as many as six technical staff and seven administrative staff at one time though weekly administrative staff meetings and comprehensive weekly schedules;
- Provided 900-person days of long-term US professional services, and 1,400-person days of short-term international expert technical assistance and local short-term technical assistance;
- Provided more than 8,600-person days of project staff and short-term technical assistance;
- Procured more than \$1 million of equipment and provided training in its maintenance and use to enhance the government's capacity to monitor the nation's water resources;
- Awarded and administered five grants that engaged NGOs in water resource management issues;
- Planned and managed numerous conferences and workshops;
- Sponsored three international study tours;
- Provided translation and interpretation services in support of project activities; and
- Delivered all required reports and deliverables.

The following table provides an expenditure summary by the main categories of expenses for the life of the Project.

**TABLE 4.1. PROJECT COST SUMMARY**

<b>Project Item</b>	<b>Cost</b>
LABOR	\$ 2,392,145
TRAVEL, ALLOWANCES & ODCs	\$ 1,190,356
SUBCONTRACTS/GRANTS	\$ 616,173
EQUIPMENT	\$ 1,169,119
<b>TOTALS</b>	<b>\$ 5,367,793</b>

# APPENDIX 1: LIST OF PROJECT DOCUMENTS AND REPORTS

January 2001: Procurement and Property Management Plan

February 15–16, 2001: Stakeholder Workshop (English, Armenian)

September 25–26, 2001: Sevan–Hrazdan Hydrologic System Workshop (English, Armenian)

October 2001: Comments on Cost-Benefit Analysis of the Vorotan Hydrological Structure

December 8–9, 2001: Water Code Revision Technical Working Group: Informal Retreat (English)

March 2002: Project Newsletter No. 1

February 7–9, 2002 Water Code Revision Working Group Retreat II (English)

March 2002: Lake Sevan River Hrazdan Water Resources Monitoring Strategy

May 2002: Water Resources Monitoring Equipment Procurement Plan

June 11–13, 2002: Training in Proposal Writing (English)

July 23–25, 2002: Training in Proposal Writing (English)

July 5–7, 2002: Training in Proposal Writing (English)

July 16–18, 2002: Water Code Working Group Retreat III (English, Armenian)

July 2002, Report: Technical Experts on Water Code Revision Analysis (English)

August 10–25, 2002 Report on the Study Tour

October 29–31, 2002: National Water Reserve for National Water Policy and National Water Program (English, Armenian)

November 8, 2002: Economic Incentives for National Water Policy and National Water Program (English, Armenian)

December 6, 2002 Meeting on the National Water Council (English)

February 2003: Project Newsletter No. 2

March 2003: Translation: Water Management Plan for the Lower Colorado River Basin (English, Armenian)

May 2003: Task 2 and 3.2 Procurement Plan

May 2003, Report: Water Use Permitting Task Force Retreat

May 2003: USAID Water Case study Series: Armenian Water Code Revision and Adoption—A Stakeholder Process for Legal Reform

June 2003: Project Newsletter No. 3

July 2003, Report: Water Resources Fee Task Force Retreat

July 2003: Analysis of Data Retrieval, Data Storage and Data Sharing Capability

September 2003: Project Newsletter No. 4

November, 2003: Lake Sevan River Hrazdan Water Quality Monitoring Sampling Plan

November, 2003: Water Use Permitting Guidelines for the Water Resources Management Agency, Ministry of Nature Protection, Government of Armenia

December 2003: Project Newsletter No. 5

December 2003: Armenia State Water Cadastre: Current Status and Recommendations for Development

March 2004: Assessment of Regulatory Development Pertaining to Conservation of Ecosystems Critical to Integrated Water Management

May 2004: Water Resource Fee Strategy: International Experience and Implications for Armenia

September 2004: Topical Outline and Suggested Approach for Completing the National Water Program

October 2004: National Water Program Water Resources Fees Strategy,

October 2004: Republic of Armenia Law on Fundamental Provisions of the National Water Policy

# APPENDIX 2: TRAINING EVENTS, WORKSHOPS, AND STUDY TOURS

## TRAINING EVENTS

Title	Audience	Dates	Number of Participants	Lead Trainer
<b>Policy, Legal and Institutional Framework</b>				
EIA Training	WRMA Staff	Jul-02	15	AED Clive George
WRAP Training Workshop	WRMA Staff	Aug 11-13, 2003		Dr. Ralph Wurbs
National Water Reserve Seminar	WRMA Staff	Oct 29-31, 2002	8	Richard Kiesling
National Water Cadastre and Water Resource Modeling	WRMA Staff	Apr. 14, 4004	7	Michael Corkran/ Richard Hoffpaur
<b>Water Resources Monitoring</b>				
Water Quality Laboratory Methods and Procedures	EIMC/ASH staff	Sept.1-7, 2003	9	Dr. Damian Shea
Field Sampling and Analysis Training	EIMC/ASH staff	Sept.10-13, 2003	11	Dr. Steve Legore
Water Quality Troll 9000/Lab QA/QC	ASH/EIMC staff	May 26-June 4, 2004	7(4)	Dr. Mikhael Zapevalov
Water Quality ICP-MS (Part 1)	EIMC staff	Oct-Dec 2003	6	Dr. Peter Timofeev
Water Quality ICP-MS (Part 2)	EIMC staff	March 29-April 2, 2004	5	Dr. Peter Timofeev
Hydrologic Monitoring Equipment	ASH/HEMA Staff	Oct. 28-Nov. 5, 2003	5	Victor Lee/Kelly Scott
Hydrologic Monitoring Equipment Follow-up	ASH Staff	April 29 – May 7, 2004	5	Victor Lee
Hydrologic Monitoring Equipment Second Follow-up	ASH Staff	October 2-5 2004	5	Victor Lee
<b>Stakeholder Participation</b>				
Advanced Participation Methods		September 11-13, 2001	20	Gary Forbes
Grant Proposal Writing Training I		June 11-13, 2002		Lusine Kharatyan
Grant Proposal Writing Training II	Grant Recipients	July 5-7, 2002		Lusine Kharatyan

Title	Audience	Dates	Number of Participants	Lead Trainer
Grant Proposal Writing Training III	Grant Recipients	July 23-25, 2002		Lusine Kharatyan
Irrigation Management Training	Grant Participants			Grantee-AAUW
Women's participation in Water Resource Management	Grant Participants			Grantee-AAUW
Training programs held at 26 schools in Gegharkunik Region'	Grant Participants			Grantee - ARCS
Participatory Planning Techniques, Phase II – Building Local Capacity for Grant Project Management, Monitoring and Evaluation	Grant recipients	October 13 – 18, 2002	11	

## WORKSHOPS AND SEMINARS

Title	Dates	# Participants	Lead	Location
<b>Start-up</b>				
Project Start-up Stakeholder Workshop	Feb 15-16, 2001	51	Gary Forbes	Tekeyan Center
Sevan-Hrazdan Priority Problem Identification Workshop	September 25-27, 2001	78	Gary Forbes	Writer's House, Tsaghkadzor
<b>Policy, Legal and Institutional Framework</b>				
<i><b>Water Code Development</b></i>				
Water Code Revisions Working Group Informal Retreat	December 8-9, 2001	38	John Harbison	Writers' House, Tsaghkadzor
Water Code Working Group Retreat II- Discussion: Water Code Implementation	February 7-9, 2002	34	Mark Johnstad	Adigas, Tsaghkadzor
Briefing on the Draft Water Code with the State Committee for Water Systems	April 12, 2002	28	Mark Johnstad	SCWS offices, Yerevan
Water Code Briefing with the National Water Code Working Group	Apr. 22, 2002	43	Mark Johnstad	Yerevan Hotel
Briefing on the Draft Water Code with the MoNP	April 24, 2002	16	Mark Johnstad	Yerevan Hotel
Water Code Working Group Retreat III- Discussion: Water Code Implementation	July 16-18, 2002	36	Mark Johnstad	Adigas, Tsaghkadzor
<i><b>National Water Policy &amp; National Water Program</b></i>				
National Water Policy organizational meeting	October 23 –24, 2003	8	Wayne Hall	Harsnaqar Hotel, Sevan
National Water Policy Drafting Retreat I	November 13-15	8	Wayne Hall	Adigas, Tsaghkadzor
National Water Policy Drafting Retreat II	December 11-13	8	Wayne Hall	Harsnaqar Hotel, Sevan
National Water Policy Drafting Retreat III	Feb 20-21	8	Wayne Hall	Adigas, Tsaghkadzor
National Water Policy Final Draft Presentation	March 26-27	8	Wayne Hall	Writer's House, Tsaghkadzor
<i><b>National Water Code and Water Use Permitting</b></i>				
Establishing an Informed Decision Making Process; Informal Discussion I	May 15-17, 2003	16	Mark Johnstad	Writer's House, Tsaghkadzor
Establishing an Informed Decision Making Process; Informal Discussion II	May 27-29, 2004	15	Mark Johnstad	Writer's House, Tsaghkadzor
<i><b>Resource Fee Strategy</b></i>				
Economic Instruments for Sustainable Water Resources Management	November 1-3, 2001	43	Benoit Laplante	Tekyan Center, Yerevan

Title	Dates	# Participants	Lead	Location
Technical Discussion on Economic Incentives	Nov. 8, 2002	8	Benoit Laplante	ARD Offices
Key Elements of Water Resource Fee Strategy	July 10-12, 2003	8	Benoit Laplante	Tsaghkadzor
Research on International and Armenian Experiences on Water Resource Fees	July 29-30, 2003	8	Benoit Laplante	Tsaghkadzor
Water Resource Fee Strategy Recommendations	September 23-24, 2003	8	Benoit Laplante	Tsaghkadzor
Draft Water Resource Fee Strategy presentation and discussion	April 27-28, 2004	12	Benoit Laplante	Tsaghkadzor
Stakeholder workshop: Initial social survey results	Feb. 10, 2004	15	PLERF	Nat'l Acad. of Science, Yerevan
Stakeholder workshop: Final results of the social survey	March 6-7, 2004		PLERF	Writer's House, Tsaghkadzor
<b>Water Resources Monitoring</b>				
Monitoring and Information Management Committee meeting	June 4, 2001	8	Steve LeGore	ARD Office
Monitoring and Information Management Committee meeting	June 13, 2001	8	Steve LeGore	ARD Office
Monitoring and Information Management Committee meeting	Sept 18, 2001	8	Steve LeGore	ARD Office
Monitoring Task Subcommittee Discussion Seminar on Monitoring Strategy Draft	Dec. 11, 2001	8	Steve LeGore	ARD Office
Monitoring Strategy finalization meetings w/M&IM Committee	March, 2002		Steve LeGore	ARD Office
<b>Stakeholder Participation</b>				
Integrated Water Resources Management	Nov 14-15, 2001	26		Tekyan Center
Public Hearing on the Draft Water Code of the Republic of Armenia	February 14, 2002	51		
Earth Day Forum	Apr. 22, 2002	51		AUA Business Center
Public Hearing on the Draft Water Code of the Republic of Armenia	April 25, 2002	50		Tekyan Center
Public Hearing on Report on Strategic Environmental Impact Assessment of Draft Water Code of the Republic of Armenia	June 7, 2002			Tekyan Center
Water Resources Rational Use and Conservation in a Changing Environment.	July 10-15, 2002			
National Water Council Meeting	December 6, 2002	49		Metropol Hotel, Yerevan

## STUDY TOURS

	Title	Dates	# Participants	Location
1	Institutional and Regulatory Issues for the Water Sector Study	August 10–25, 2002	10 senior policy makers	Chicago, Illinois, USA
2	Water Allocation and Water Right Study Tour	March 16–30, 2003	10 senior policy makers	Austin, Texas USA
3	Water Resource Management, Basin Planning and Water Use	March 14–20, 2004	2 senior policy makers	Hungary



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