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CLEAN ENERGY AND WATER PROGRAM

FINAL REPORT

October 2015

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October 2015

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List of Acronyms

AUA	American University of Armenia
ATC	Agribusiness Teaching Center
BMO	Basin Management Organization
CEW	Clean Energy and Water
COE	Center of Excellence
CoP	Chief of Party
COR	Contracting Office Representative
COAF	Children of Armenia Fund
DSS	Decision Support System
EIA	Environmental Impact Assessment
EF	Ecological flow
ESS	Environmental Scoping Statement
EMMP	Environmental Monitoring and Mitigation Plan
FPWC	Foundation for the Preservation of Wildlife and Cultural Assets
GOA	Government of Armenia
GIS	Geographic Information Systems
ICARE	International Center for Agribusiness Research and Education
MEG	Modeling Evaluation Group
ME&A	Mendez England and Associates
MENR	Ministry of Energy and Natural Resources
MNP	Ministry of Nature Protection
MTA	Ministry of Territorial Administration
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
NSS	National Statistical Service
PMP	Performance Management Plan
RBMP	River Basin Management Plan
SCWS	State Committee on Water Systems
SEI	State Environmental Inspectorate
SHPP	Small hydro power plant
SMBP	Southern Basin Management Plant
UNDP-GEF	United Nations Development Program-Global Environment Fund
USAID	United States Agency for International Development
WASH	Water Access, Sanitation, and Hygiene
WCoE	Water Center of Excellence
WEAP	Water Evaluation and Planning Systems
WRMA	Water Resource Management Agency
WUA	Water User Association
Y	Year

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1. EXECUTIVE SUMMARY

The Clean Energy and Water Program (CEW Program) was authorized by the terms of Task Order Number: AID-EPP-I-00-05-00010/AID-111-TO-11-00001 and **Project Number: REQ-111-11-000015**. The Task Order for this project was issued by USAID/Armenia for a Period of Performance from 30 September 2011 through 29 September 2015. The project was implemented in the Republic of Armenia by Mendez England & Associates (ME&A)

The overarching goal of USAID for the program was to support the following objectives:

1. Introduce an integrated approach to sustainable energy and water management;
2. Help local communities and enterprises in selected water basins to improve the accessibility, reliability, quality, efficiency, and affordability of energy and water services;
3. Improve and strengthen application of hydropower and water regulations.

The work requirements established by USAID/Armenia for the Clean Energy and Water Program included four tasks:

Task 1: Develop Capacity for Integrated Energy & Water Resource Planning;

Task 2: Improve Local Clean Energy, WASH (*water access, sanitation, hygiene*) and Water Management and Development Practices

Task 3: Improve Hydropower and Water Regulation;

Task 4: Donor Coordination

The Economic Growth Office of USAID/Armenia initiated the Clean Energy and Water Program to support the country's energy and water security and improve resilience in adapting to climate change. This was to be achieved by providing technical assistance to support activities focusing on integrated energy and water planning and associated regulatory support, while working at the community-level to improve energy and water management practices through capacity building and the implementation of small-scale pilot projects. Together, these activities were planned to have a positive outcome on energy and water resource availability, climate change resilience, and diversification/conservation of energy and water sources.

Despite the significant dual challenges imposed by resource limitations and the challenges of the Armenia operating environment, the Clean Energy and Water Program met or exceeded majority of the critical indicator targets set out in the Task Order. The achievements of the CEW Program summarized below, are detailed in the main body of the report:

1. As part of the Integrated Energy and Water Resource Planning component, the CEW Program delivered the following major work products:
 - River Basin Management Plans for Vorotan, Voghji and Meghri Rivers as free-standing components of the integrated Southern Basin Management Plan (SBMP);

- The Decision Support System (DSS) – a sophisticated, GIS-based, open-source expert system to provide unique analytical information on water resources management and to aid in improving management, regulatory and policy decisions
 - A landmark Study of the Groundwater Resources of Ararat Valley
2. In the task area of Improved Local Clean Energy, WASH (water supply, sanitation, and hygiene), and Water Management and Development Practices, the overall impact of the CEW Program on the rural communities is summarized below:
 - 27,000 Armenians residing in nine villages gained improved access to safe drinking water supply;
 - 25,000 Armenians directly benefited from the application of energy efficiency technologies
 - As a result of CEW Program pilot activities for introducing energy saving technologies , Armenia now saves 1,449,612 kWh of energy and 1,193,459 m³ of water annually
 - Further, as a result of vigorous outreach and dissemination efforts, replication of the pilot energy and water projects is already well underway by both public and private sector actors. Thus, the long-term impacts of the CEW Program will be very significant.
 3. CEW Program activities in the task area of Improved Hydropower and Water Regulation focused on improvement of the legal and regulatory framework of the water sector. In Year 3. The CEW Program worked on the following priority areas in close coordination with the Water Resources Management Agency (WRMA):
 - The CEW Program expert group of international and Armenian consultants developed the Ecological Flow Calculation Methodology for Armenia. The “*Development of the Method for Estimation of Ecological Flow of the Rivers in Armenia*” report was submitted to USAID in September 2015.
A comprehensive policy review and recommendation report, “*Towards Improved Integrated Water Resources Management in Armenia: Identification of key legal and regulatory issues with recommendations for improvement*”, was submitted to USAID and the GoA in September 2015. The CEW Program legal task team conducted a comprehensive comparative analysis of the legal framework regulating issuance of water use permits in Armenia. This review and analysis included international documents, the Republic of Armenia Water Code, the Laws on National Water Policy, National Water Program and 13 other resolutions and Government decisions on the BMOs and water permitting processes.
 4. The CEW Program Donor Coordination task focused on both coordinating effectively with other donor activities and promoting and increasing the public visibility of the clean energy and water activities of CEW Program. This task supported the main project components and contributed to improved public awareness on clean energy and water issues. The communications efforts of the CEW Program have been highly successful in furthering the goals of the Program and increasing the visibility of its impact with various target audiences. The efforts were mainly built around the river basin management planning process; dissemination of the results of the highly successful energy and water demonstration projects; and promoting coordination and collaboration with other donors and donor-led organizations.

In summary nut shell, despite all the achievements and successes in this area, there is clearly a great deal more work to be accomplished; a number of challenges that should be addressed; and policy and fiscal issues that will need to be resolved before all citizens of Armenia receive the full benefits

of integrated water resource management. USAID and the Government of Armenia through the CEW Program implemented by ME&A have achieved measurable and significant progress in advancing integrated water resource management in Armenia and in building a strong foundation for additional future progress.

2. INTRODUCTION

In October 2011, the United States Agency for International Development (USAID) awarded Mendez England and Associates (ME&A) a Task Order to implement the Clean Energy and Water Program (CEW Program). The CEW Program aimed to support the improvement and integration of the water and energy sectors in Armenia.

This Final Report provides the summary of accomplishments achieved over the period of the Task Order (1st of October 2011 to the 29th of September 2015). The report includes the results framework for the CEW Program, its achievements and impacts, and identifies and addresses the challenges and lessons learned during the implementation of the program.

The CEW Program objectives contribute to the attainment of the USAID's Mission Development Objective 1: IR 1.1: Improved enabling environment for trade and investment

Specifically to Sub IR 1.1.3: More strategic management of energy and water resources:

The specific objectives of the program are:

- 1. Introduce an integrated approach to sustainable energy and water management*
- 2. Help local communities and enterprises in selected water basins to improve the accessibility, reliability, quality, efficiency, and affordability of energy and water services.*
- 3. Improve and strengthen application of hydropower and water regulations.*

CEW Program structure: Consistent with the Task Order, the CEW Program effort was operationally divided into the following task areas:

Task 1: Develop Capacity for Integrated Energy and Water Resource Planning
(River Basin Management Planning, RBMP)

Task 2: Improve Local Clean Energy, WASH and Water Management and Development Practices
(Demonstration Projects)

Task 3: Improving Legal and Regulatory Framework

Task 4: Donor Coordination

CEW Program's operating strategy and approach included the following key elements/aspects:

- Provision of high quality in-country human resources to achieve the assigned tasks;
- Using innovative and flexible approaches to meet, and even exceed, delivery of the required outcomes;
- Maximizing impact per dollar spent by using the most cost effective solutions and maximizing the use of highly qualified local and regional experts to produce high quality outcomes;

- Using flexible project management strategy and structure to adapt to the changing environment and still achieve the planned results while enhancing both cost-effectiveness and long-term sustainable impacts in Armenia;

3. PROGRAM ACHIEVEMENTS

3.1 Task 1: Develop Capacity for Integrated Energy and Water Resources Planning

As part of the Integrated Energy and Water Resource Planning component, the CEW Program delivered the following major work products:

- River Basin Management Plans for Vorotan, Voghji and Meghrijet Rivers as free-standing components of the integrated Southern Basin Management Plan (SBMP);
- Decision Support System (DSS) – a sophisticated, GIS-based, expert system to provide unique analytical information on water resources management and to aid in improving management, regulatory and policy decisions
- Comprehensive assessment study of the Ararat Valley groundwater resources.

3.1.1 Southern Basin Management Plan including Vorotan, Voghji, Meghrijet River Basin Plans:

CEW Program considers the Southern Basin Management Plan (SBMP) as one of its major deliverables as part of the strategy to assist the Government of Armenia in attaining integrated management of country's water resources (Executive Summary of the Report is attached as an annex). In consultations with the USAID and Government of Armenia, the Southern Basin of Armenia was selected as a pilot for development of the basin management plan with the following approach:

- (a) Development of a draft RBMP for Vorotan, Voghji and Meghrijet rivers to include comprehensive information on the basin with measures to address the challenges identified in the area.
- (b) Development of a draft SBMP which includes the Vorotan, Voghji, and Meghrijet river basin management plans. SBMP also includes the consolidated analysis for the Southern basin as a whole, including climate change scenarios, public participation, disaster management measures, economic and financial aspects, and cost-benefit analyses of plan implementation.

The Southern Basin was selected as a pilot area due to extensive, energy, industrial and economic activity (*mining, existence numerous small hydro power plants (SHPP) and Vorotan Cascade, one of the largest hydro power plants in the country, untreated urban and industrial wastes*) carried out in the region. Such influences appeared to be having a significant adverse impact on the ecological status of the region.

The completion of a Basin Management Plan for the whole of the Southern Basin is a significant achievement and is the first basin planning effort of this scale and depth conducted in Armenia. The plan encompassed the three major rivers of the Southern Basin – Vorotan, Voghji and Meghrijet basins including significant tributary rivers such as Karchevan, Geghi, Artsvanik, Tsav and Vachagan Rivers. The plan introduced the state-of-the-art river basin planning techniques and methodology for the first

time in Armenia. For the first time, Environmental Scoping Statement (ESS) was developed and Environmental Impact Assessment (EIA) was conducted for the basin planning purposes which sets the criteria for similar tasks to be undertaken in the future.

The plan is based on current information technologies and methods which were applied to enable dramatic improvements in the management of water resources. These method and techniques included: remote sensing, use of high resolution satellite imagery and ground-truthing activities and field tests. At the beginning of the process, the team prepared a Conceptual Framework which outlined and guided the entire river basin management planning (RBMP) effort. Specifically, the basin planning included the following major elements:

- characterization of the basin, including natural, social and economic conditions of the river basins, detailed descriptions of the geography, topography, geology, climate, hydrological characteristics of surface and groundwater resources and current water use practices;
- analysis of human and natural pressures and impacts;
- delineation of surface water bodies in the basin, including identification of water bodies at risk, artificial water bodies and heavily modified water bodies;
- development of a program of technical and institutional measures to address the significant pressures at the identified water bodies at-risk;
- development of preliminary cost estimate for the proposed measures.

As part of these efforts, CEW Program obtained and reviewed climatic data (daily, monthly time-series for 1961-2012) from Armstatehydromet, including those on snow characteristics (depth and density), evaporation, atmospheric pressure, for application in hydrological and climate change analysis. Analysis of climate change trends for the observation stations available in the selected river basins, including for average, absolute maximum and minimum air temperatures, atmospheric precipitation, rainfall and snowfall, snow water equivalent (water content in snow), and absolute and relative humidity. Analysis of natural flow trends for the period of 1991-2011 was carried out in the existing hydrological posts of the river basins. The technical team also conducted regression modeling of the annual and seasonal natural river flow for 2040, 2070 and 2100 based on the climate change projections data for two IPCC emissions scenarios.

For the assessment of human impact and existing pressures, the team conducted hydro-chemical characterization and classification of surface water resources for the rivers of Vorotan, Meghri and Voghji basins (such as Karchevan, Geghi, Artsvanik, Tsav, Vachagan) based on surface water quality norms and by using water quality monitoring data from 2007-2013. The team also assessed their applicability for irrigation based on Irrigation water quality criteria (Salinity, Permeability Index, Sodium Absorption Ratio, Specific Ion Toxicity, etc.). These analyses also included assessment of climate change impact on the water quality in the river basins.

The RBMP was based on a participatory process with extensive involvement of stakeholders at the national and local levels into the basin management planning activities. Stakeholder participation was in fact perceived to be an important element of the RBMP process. Both interim and final results of the river basin planning work were regularly communicated to all potential stakeholders. The CEW Program team made sure that all concerned parties including state institutions, private and civil society organizations had the opportunity to equally participate in the consultations and contribute to the

dialog to have the full range of diversity of opinions represented. Feedback received from the stakeholders was taken into consideration during the preparation of all river basin plans. Numerous consultations were conducted locally in the region in the communities of Goris, Meghri and Kapan. Similarly consultations were held in Yerevan with the stakeholders from the national government, the ministries of Nature Protection, Agriculture, Health, Economy, Energy and Natural Resources, the WRMA, BMOs, regional governments and local municipalities, industries, and the civil sector. The draft version of the Vorotan RBMP was presented to the stakeholders in April 2014, the plans for Voghji and Meghri Rivers were similarly presented in December 2014 to obtain the comments from the key stakeholders and incorporate the comments into the final versions of the plans. The preparation of the Southern Basin Plan was initiated during Year 4 and formally presented to the GoA on August 7, 2015. CEW Program invited feedback, after which consultations with the Ministries of Nature Protection, Energy and Natural Resources, WRMA and other stakeholders were initiated. Prior to the presentation in Yerevan, the Draft Southern Basin Management Plan was presented to fifty (50) representatives of the main stakeholders in the Basin Management Area in May 2015. Their comments and recommendations were also included in the final draft of the document.

The CEW Program finalized the Draft Southern Basin Management Plan and submitted it formally to the Ministry of Nature Protection (MNP) via USAID in September 2015. The document incorporated comments and recommendations made by the key policy makers and other stakeholders during presentation of the draft management plan on August 7. The CEW Program technical team particularly considered the follow-up work with the key stakeholders on identifying priorities of measures and preliminary cost-estimates. The completed Draft Southern Basin Management Plan document fully meets requirements of national water legislation, and was ready to be entered into the formal procedure for review and approval by the Government.

Along with Armenian and English versions of the final draft of Southern BMP, drafts of the Vorotan, Voghji and Meghri River Basin Management Plans were also submitted. These documents contain analytical data and information that is designed to be used by the stakeholders to inform their activities on:

- Preparation of development plans and programs for sector ministries,
- Preparation of regional social-economic development programs and annual work plans,
- Planning investments, both public and private,
- Public oversight by concerned citizens, etc.

These documents could be also used the MNP as a template for developing similar management plans for Akhuryan, Ararat, Hrazdan, Sevan and Northern basin management areas of Armenia.



Bio-monitoring in Vorotan river basin.



Industrial wastes dumped into Karchevan river.

3.1.2 Decision Support System (DSS) to Improve Water Resource Management and Permitting Process

One of the objectives established by USAID for the CEW Program was to introduce technical tools and mechanisms for improved integrated management of the country's water resources. Achieving this task required a multi-phased approach. This approach included the development of clear mechanisms for the efficient use of water resources by various sectors with appropriate consideration of factors such as water availability (hydrological balance) and climate change impact on waters, short- and long-term water demand, and other considerations. To this end, the CEW Program designed the DSS to enhance the effectiveness of decision making by providing analytical information for integrated river basin management planning and water use permitting. In the light of increasing water use and anthropogenic pressures on environment and water eco-systems. The DSS provides the water sector in Armenia with a very useful instrument for better planning and management of Armenia's water resources.

The DSS, as a customized geographic information system (GIS)-based application, is capable of generating sophisticated hydrological, economic, and climate change models for threatened rivers and water basins throughout Armenia. Designed with extensive input of international consultants and field experts, the DSS consists of the following three models, with its sub-components:

- Hydrological Model (*includes water balance, water quality assessment and water supply and demand balance components, ecological flow calculation and hydropower potential assessment tools*)
- Climate Change Analysis Model (*historic trends and projections*)
- Economic Model (*cost-benefit analysis, optimization assessment of development scenarios*)

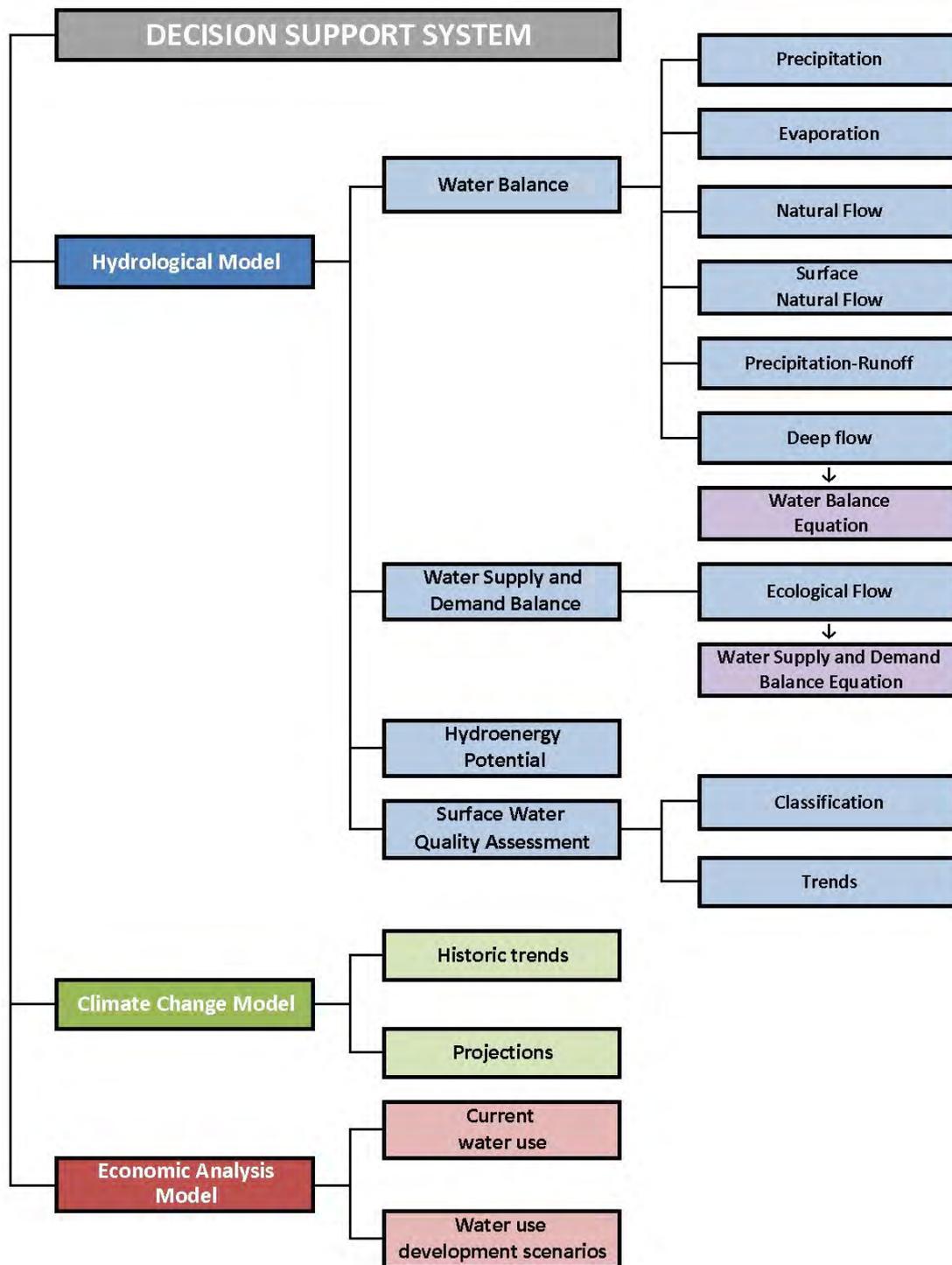
The Hydrological Model is a key part of the DSS. This model measures and assesses water resources qualitative and quantitative characteristics. With its components, the Hydrological Model may serve as a stand-alone element with procedures or modules which are aimed at calculating water balance in any given basin. The model is very useful in determining the water supply and demand balance, estimating flood-prone zones and hydropower potential of the river, as well as assessing the ecological status of surface waters.

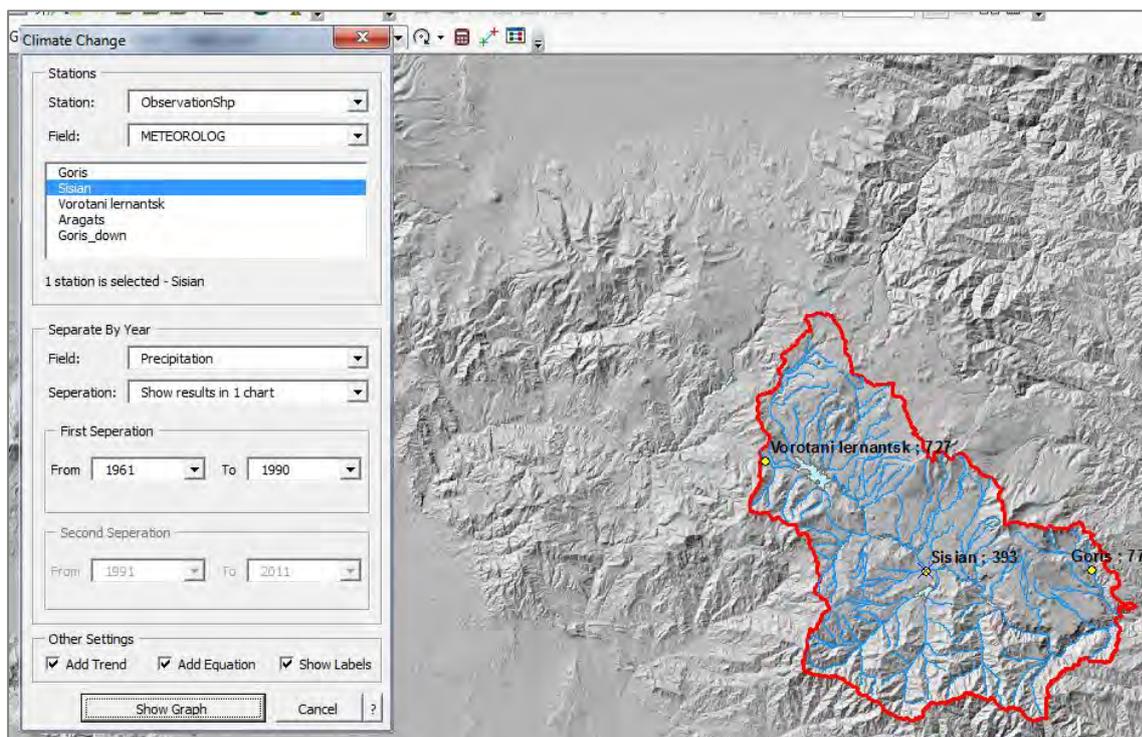
The Climate Change Model of the DSS assists the relevant decision makers of GoA in assessing long-term availability of water in the river basins of the Republic of Armenia under various climate change scenarios. This will be key in the future for informed decision making on water use permitting. The

Climate Change Model of the DSS provides the users with an integrated platform to access the climate data, assess the historic trends of climate change in the river basin. Based on the future trajectory of climate change, the model may be used to quantify the impact of projected climate change on the water resources of the river basin.

The Economic Model provides information for decision makers on water use by different sectors of economy; economic value of water used by different sectors; as well as forecasted water use needs by different sectors based on the projected economic development scenarios.

Graphical Structure of the DSS





Panel menu for selection of a particular meteorological station and a climatic element and the desired time period for assessing the historic trends of the selected element.

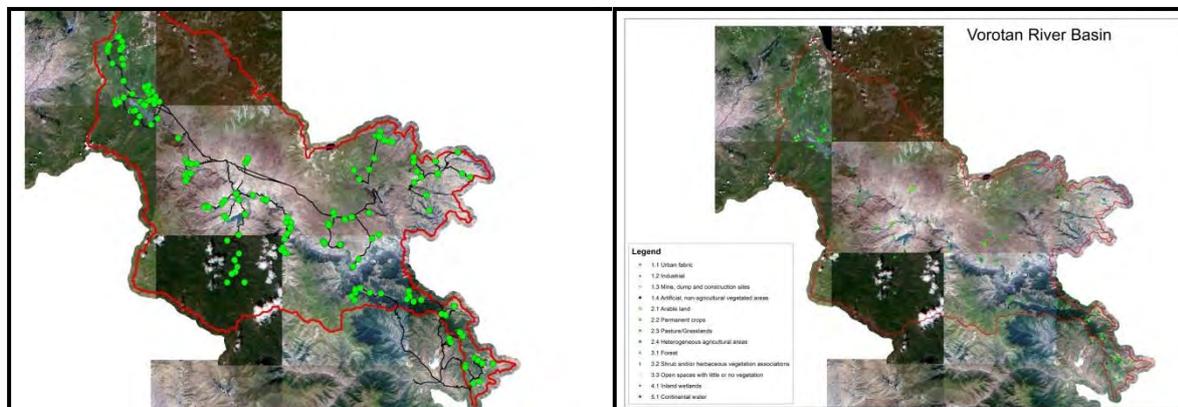
In 2013, CEW Program procured unique and highly useful **RapidEye** satellite imagery of the entire territory of Armenia.¹ 100 image tiles for Armenia were available, of which 16 image tiles for the southern basin area, with the resolution of 5 m, in five spectral bands. Remote sensing technologies were extensively utilized both in the process of the basin planning work and DSS design.

Satellite images were used to complete the classification of the land cover/use of the Southern Basin Management Area (BMA) by applying the European Environment Agency's CORINE (*Coordinated Information on the Environment*) system. The pre-processing of the raw satellite data resulted in a mosaic of images of the Southern BMA, during which, problematic areas which needed more clarification were identified. In August 2014, the DSS team successfully completed the ground-truthing activities (*field surveys*) in Vototan, Voghji and Meghriget river basins, by having GPS-ed the total of 540 waypoints/tracks in the basin, for which the land cover/land use type was classified based on the CORINE system. *The Southern BMA analysis is the first time in Armenia that satellite imagery of such high quality has been applied for mapping and ground-truthing activities. As such this represents a major technological advance in the use of information technology and GIS in Armenia.*

As a final product, a precise GIS layer on land use/cover for the Southern BMA was obtained, and used to create the maps with precise statistical information. The GIS maps were prepared to support the pressure-impact analysis in the Vototan, Voghji and Meghriget River Basins, including maps on: hydrogeology, industrial enterprises, hydro-power plants, fisheries, landfills, large agricultural farms,

¹The RapidEye satellite sensors are a system of 5 data collecting satellites, which have been orbiting the Earth since their launch into space in 2008. With the ability to record high resolution images in rapid succession, in multispectral bands, and with large-area coverage, the system has become extremely useful as a tool to help inform the strategic planning processes for Armenia's future.

land use patterns, and classification of water resources of the two basins by chemical status. Also the maps on delineation of water bodies in the river basins were constructed, including mapping of artificial, heavily modified and water bodies at risk. The assembled data helped to determine the precipitation/run-off curves of three river basins and catchment areas in the Southern BMA used in the Hydrological model of the DSS².



GPS-ed waypoints and tracks in Vorotan River basin during the ground-truthing activity

Clarified CORINE land cover/use class based on ground-truthing in in Vorotan River basin

The DSS was tested, debugged and validated with input data from the southern basin management area with possible application on other rivers. The DSS is conceived as an open source system and the code is available for further updating/upgrading. A DSS User Manual has been prepared and is available for users (See the Table of Annexes). The Manual contains descriptions of the functions of the separate components of the system. The Manual was provided to all initial users. The CEW Program team designed and conducted computer-based training of the potential users of the DSS, the staff of the WRMA, State Environmental Impact Monitoring Center, BMOs, and others, on August 24-28, 2015. In addition, user training on GIS has also been provided to other users at the CEW Program office on August 21-22, 2015.

The CEW Program utilized a participatory approach during the design of the DSS. The process was similar to the participatory approach used by the technical team during the basin management planning process. The Advisory Working Group was formed from the technical experts of the field. The Advisory group evaluated and provided technical recommendations concerning the DSS from the perspective of field practitioners and future users. The Advisory group participated in the whole process of the DSS design from the very beginning till the production of the final product. This stakeholder involvement helped to refine the components of the DSS and make it an efficient and practical decision making instrument. In addition, the inclusion of the working group in the process built a national support constituency

²The technical report on land cover/use classification of the Southern BMA, using RapidEye imagery was prepared and submitted to USAID in the second quarter of Year 4. The report contained description of the overall concept and step-by-step methodology used for classification process, including pre-processing of RapidEye images, field work and data post-processing, and preparation of the final results. The report also estimated the overall costing of the activity in terms of software and hardware requirements, man power used, as well as expenses made for desk work and field sampling. Technical instructions on implementation of separate steps were also presented.

through the involvement of respected national specialists throughout the development process. In addition, representatives of key government agencies and academia were provided with hands-on training on application of the DSS.

3.1.3 Support in the Establishment of the Water Center of Excellence

The CEW Program conducted an analysis of the concepts and potential business models, as well as experience of other CoEs worldwide. The objective of the analysis (which included a survey) was to secure insights and lessons learned that would assist in refining the strategy for supporting participatory design and establishment of a Water CoE in Armenia. Based on the analysis of the survey responses received by the CEW Program from stakeholder and partner organizations, representing the Government of Armenia, academic institutions, non-governmental organizations (NGOs), and the private sector regarding the potential of the establishment of the WCoE in Armenia, CEW Program recommended to USAID implementing a modified, more basic initial concept for the WCoE that would not require major investments. The survey results and CEW Program observations indicated that the WCoE was perceived by the majority of the sector players as a “donor driven” activity for which there was almost no perceived need among stakeholder organizations. The modified approach selected was also be more consistent with the limited budget envisaged for the WCoE institutional strengthening activities.

The CEW Program team initiated negotiations with representatives of the Acopian Center for the Environment at the American University of Armenia (AUA) and ICARE /Agribusiness Teaching Center of Armenia (ATC) at the Agrarian University of Armenia in June 2014 to discuss collaboration opportunities in establishing the knowledge center. Both organizations were perceived to have the potential to become legacy organizations in Armenia separately or jointly, providing the specific functions of the WCoE.

As part of these institutional strengthening efforts, the Acopian Center for the Environment and the Agribusiness Teaching Center of Armenia have actively participated in the DSS design process. They were invited to participate in the meetings of the DSS Advisory Group, which advanced their understanding on the DSS. Such participation also provided them with an opportunity to share their independent progress with the application of GIS technologies in Armenia. As part of the collaboration between the CEW Program and ICARE/ATC, the latter’s experts conducted the statistical analysis of the hydrological and meteorological datasets used by the CEW Program in the DSS through Simetar and STATA software.

3.1.4 Assessment of the Groundwater Resources of Ararat Valley

The CEW Program conducted a critically important assessment of the groundwater resources in Ararat Valley. This effort was primarily implemented by a competitively selected local consortium consisting of “*Hayjrnakhagits Institute*” and “*Mel-Hov*” LLC. The study assessed the current status and trends of groundwater use/condition in Ararat Valley. Based on the assessment the study provided recommendations for improving prospects for sustainable use of these resources in the context of current and planned water demand. The interim findings on ground water balance and groundwater use in the past (*prior to development of the current intensive level of aquaculture*) and present were delivered in September of 2013 to a broad spectrum of stakeholders. This included representative from

respective ministries and government agencies of Armenia including the Ministry of Territorial Administration (MTA), the MNP, the Ministry of Energy and Natural Resources (MENR), WRMA and USAID.

The final results were summarized and officially presented during a high-level, high profile conference in March 2014. The Conference was attended by Armenia Deputy Prime Minister, Minister of Territorial Administration of Armenia, Deputy Ministers of Agriculture, Energy and Natural Resources, Nature Protection and Agriculture, Governors of Ararat and Armavir Marzes, other representatives of the stakeholder ministries and institutions, and members of Armenian academia, about 60 participants in total. The event was followed by over 20 media representatives, who provided wide coverage of the event and main findings and recommendations of the Study in the national media. The Assessment Study actually highlighted alarming trends in the Ararat Valley, where uncontrolled use of groundwater resources and unchecked growth of the local fish farming industry have led to a negative water balance. The study voiced the strong need for political action on the part of the Armenian Government to address these issues through improved management and control mechanisms, including the introduction of water conservation measures. More specifically, recommendations within the study included provisions to temporarily close down or liquidate illegal or faulty groundwater wells and to introduce mandatory monitoring of the amount of water consumed by all fisheries. Due to the extensive coverage of the issue via TV and other resources, the Study stimulated very significant and widespread media and public attention to the very critical groundwater issues.

Policy Implications of Ararat Groundwater Resources Study: Backed by the findings and recommendations of the Ararat Groundwater Assessment Study, the Government has approved several critically important decisions to help curb decreasing water levels in the region. Following the presentation of the interim findings of the Study in September 2013, the Government introduced a fee for groundwater use in the Ararat Valley for fish farming purposes. Particularly, an amendment was enacted to the *Armenian Law on Environmental Fees and Charges for Natural Resource Use* on December 12, 2013. This amendment requires fish farmers using groundwater resources in the Ararat Valley to pay a fee equivalent to 24 cents for 50% of the total volume of groundwater abstracted or 0.12 cents per 1 m³ of abstracted water. Additionally, two new government decisions (equivalent of “executive orders”), also influenced by the Ararat Groundwater Assessment Study, and were approved in April and June 2014, respectively. These decisions aim at significantly improving the regulatory framework and water management practices in the region. The first decision established a system for issuing water permits for illegally operated and abandoned wells and/or liquidating such wells. The second decision defined the protocol for monitoring the amount of groundwater drawn by water users in the region via an automated system.

Based on the data shared by the Ministry of Nature Protection of Armenia through the end of October 2014, the operation of 200 deep wells have been thoroughly scrutinized at various fish farms during the previous three months. Of those, 12 wells have been closed and 47 conserved. Additionally, control valves have been installed on 49 wells for regulatory purposes. As a result of these conservation measures, 11,333 liters/second of water has been saved in this period which accounted for an annual saving of approximately 360 m³. The equivalent of more than \$15,600 US dollars have been imposed by

the MNP as penalties or fines for violations detected as of October 2014.³ In addition, the MNP also reported on the actions towards the conservation of a very large damaged deep well next to Sayat-Nova community in May 2015. The annual water saving due to the conservation of the well are estimated to 16 mln. m³.⁴



An unsustainably growing fish farming industry and unregulated use have led to increasingly lower levels of groundwater resources in the Ararat Valley, which are of vital strategic importance to Armenia.



From left: USAID Economic Growth Office Director Naren Chanmugam, Mission Director Karen Hilliard, Deputy Prime Minister Armen Gevorgyan, and Agricultural and Nature Protection Affairs Commission Chairman seated at the March 18 Ararat Groundwater Resources Study Event.

3.1.5 Technical Support to the MNP

The CEW Program has closely collaborated with the MNP and its subdivisions in the process of the river basin planning, design of the DSS and implementation of the Ararat Valley Groundwater Assessment Study. The staff of the Ministry was regularly involved in the all technical training and consultations provided by the CEW Program in the river basin planning (before and after completion of the plans). They have also been intimately involved with the development of the Decision Support System (DSS), the database management and the GIS applications as well as river basin management planning.

Following the meeting between the USAID Mission Director and the Minister of Nature Protection in October 2014, the CEW Program began working with the WRMA on improving data management on water resources to promote its availability and transparency which included:

- Assisting the WRMA in upgrading and re-activating the State Water Cadastre Information System and linking it to the Water Permitting database. For this purpose, the team installed the State Water Cadaster database on the WRMA server and made a conversion from the MS Access to the MS SQL format. In addition, CEW Program followed up on the testing process and converted the Water User Permitting database from the MS Access to the MS SQL to facilitate the further integration of the two databases.
- Design and launch of the WRMA website (www.wrma.am) based on the technical and information needs of the latter in terms of the structure and the content. The web site was transferred to the latter by the CEW Program in September 2015.

³ <http://www.mnp.am/?aid=3542>
⁴ <http://www.mnp.am/?aid=4090>

With the aim of strengthening the control mechanisms over the extensive exploitation of groundwater resources in the Ararat Valley, the CEW Program purchased the latest generation portable flow-meters as part of USAID’s technical support to the MNP. The flow-meters are to be used by the respective divisions of the Ministry for monitoring of the level of groundwater extraction by fisheries – currently the largest water consumers in the area. The CEW Program assisted the technical staff of the Hydrogeological Monitoring Center in testing the application of the flow-meters in various fish-farms.

Per request of the CEW Program repaired the equipment of the State Environmental Impact Monitoring Center of the MNP which measures the quantity of the heavy metals in water and soil and provided a substantial supply of reagents.



Testing of flow-meters in Masis Dzuk fish farm.



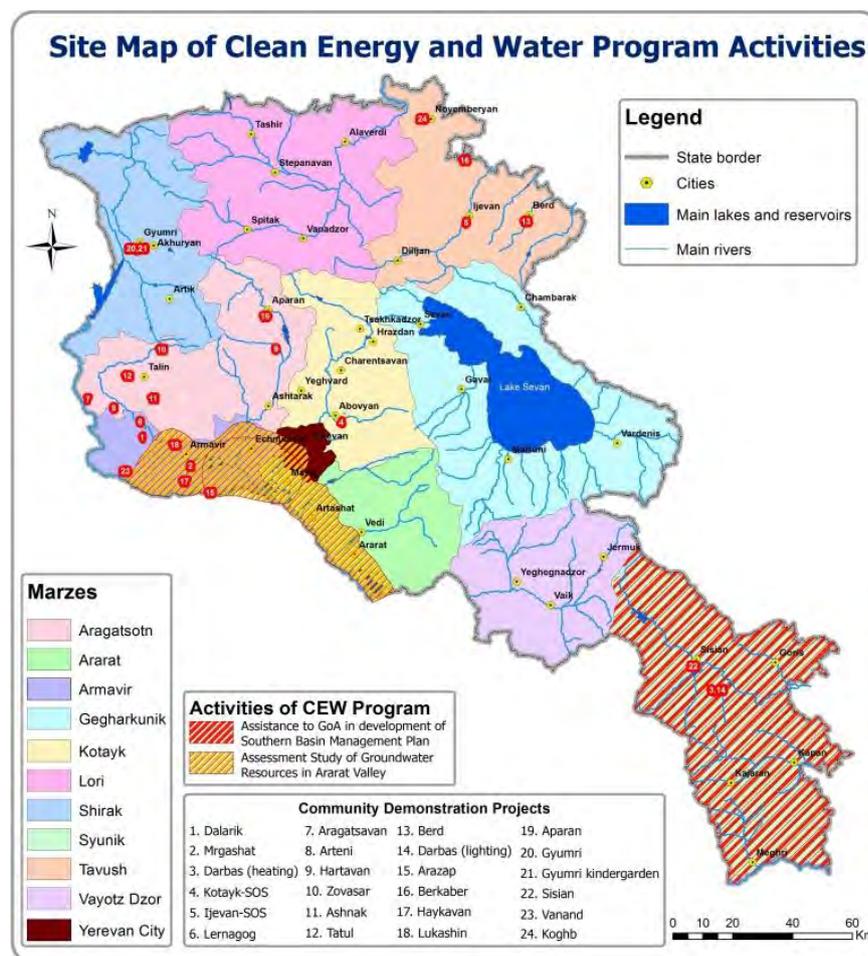
Deputy-Minister Papyyan receiving the flow-meters from Susan Fritz, USAID's Acting Assistant Administrator for the Europe and Eurasia Bureau at the hand-over ceremony in MasisDzuk Fish Farm.

3.2 Task 2: Improve Local Clean Energy, WASH & Water Management Development Practices (Demonstration Projects)

The purpose of the CEW Program demonstration projects is to improve energy and water services and infrastructures in selected rural communities of Armenia in accordance with the standards of best practice and efficiency. Over four years, the CEW Program completed 24 demonstration projects in the areas of delivery safe drinking water supply, street-lighting, solar water heating, solar air heating, improvement of energy efficiency of buildings via weatherization/insulation, efficient space heating, and energy efficient lighting. The overall impact of the CEW Program on the rural communities is as follows:

- **27,000 Armenians** from nine villages have improved and safe drinking water supply;
- **25,000 Armenians** benefit from the application of energy efficiency technologies
- Armenia saves **1,449,612 kWh** of energy and **1,193,459 m³** of water annually.
- Villages realized savings of about **103,000 USD** from improved and efficient use of energy and water
- **USD 782,186** amount of co-funding was leveraged from other donors for the implementation of the demonstration projects.

The geographic distribution of projects in the regions and communities is presented on the map below:



Summary of the CEW Program Demonstration Projects by Technologies/Measures and Locations

Technologies/Measures Implemented	Communities
<p>Rehabilitation of drinking water supply system</p>	<p>Dalarik, Mrgashat, Arazap, Arteni, Lukashin, Berkaber, Artsvaberd, Hartavan, Aragatsavan</p>
 <p>Installation of the water supply line in Arazap village.</p>	 <p>Residents of Arteni village finally have reliable and regular water supply. People demonstrated readiness to pay for water services.</p>
<p><i>Energy efficient street-lighting</i></p>	<p><i>Tatul, Ashnak, Zovasar, SOS Children' Orphanage in Ijevan, Darbas, Aparan</i></p>
 <p>Installation of street-lighting in Aparan.</p>	 <p>Newly installed lighting system in Darbas village.</p>

Solar air heating and solar hot water heating

Darbas, SOS Kotayk



Solar air heaters installed in the polyclinic of Darbas village.



Solar water heater installed in SOS Children's village in Kotayk.

Insulation, weatherization

Gyumri Meghvik Center and Kindergarten #27, Arts School in Koghb village, Sissian Kindergarten #4, Vanand Sports School



Insulation of the roof in Meghvik Center.



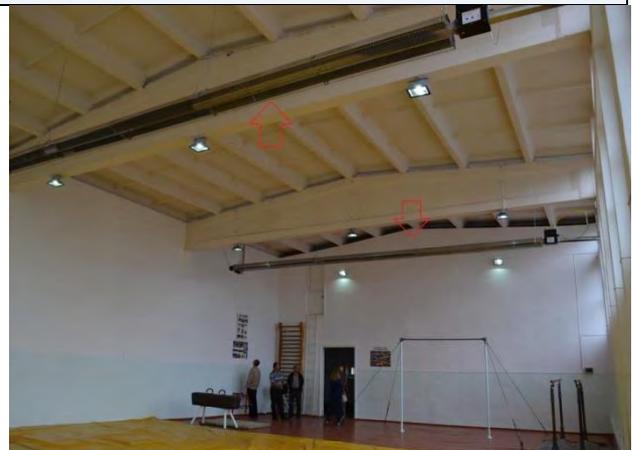
New ventilated façade technology (vinyl siding) used in Sissian and Gyumri kindergartens increase energy efficiency of the buildings.

Infrared heating

Berd Sports School, Vanand Sports School, Meghvik Center, Darbas Polyclinic



Infrared heater installed in Meghvik Center in Gyumri



Infrared heaters installed in the Berd Sports School.

Project Selection Criteria: CEW Program rationale for project selection was based on a number of factors, including:

- The potential energy and water savings resulting from the project. In the case of water projects, the CEW Program demonstrated an integrated approach to water and energy saving. It has been observed that there is needless high level of electricity consumption due to inefficient and excessive operation of pumps in many rural areas. Thus, replacement of the old pumps with modern and energy efficient pumps and replacement of the drinking water networks with durable, efficient polyethylene pipes resulted in substantial water and energy savings (the latter being due to reduced operation of pumps);
- Benefit for a particular community in terms of improved access to reliable safe drinking water source and improved rural infrastructures;
- Availability of an adequate matching cost-share by the community, other donor participation, or private sector;
- Sense of ownership in the community which was manifested in the following forms: participation of the community in the project design stage, adherence to commitments and ability to maintain and operate infrastructure upon completion of the project;
- Introduction of new technologies and/or innovative approaches;
- Project replicability potential.

Project Implementation: Implementation of the demonstration projects by the CEW Program included the following major steps:

- Identification of the projects based on the established selection criteria and negotiations with the communities and/or other project participants on the matching cost-share terms and level of effort;
- Signing of commitment letters by the parties;
- Development of a concept paper to assure that all the parties reached a common agreement on the technical aspects of the project;
- Development of an Environmental Monitoring and Mitigation Plan (EMMP) and concurrence by all the parties;
- Submission of the concept paper and EMMP to USAID and approval of the COR to start the project;
- Actual implementation involving procurement process, installation work, monitoring of the implementation by contractors and adherence to their commitments
- Signing of the act of acceptance upon completion of the work.

Early in the lifespan of the CEW Program, the technical team conducted significant field survey work to assess need and feasibility. The technical team met with community leaders, regional governments, NGOs, donor-funded projects, private sector representatives to assess the current needs of communities and project opportunities where potential for efficiency and replicability could be best demonstrated. These field survey efforts resulted into a long list of possible projects which were obviously beyond the scope and funding of the CEW Program. While the initial six start-up projects were selected from this list, the team later focused its efforts on implementing projects in partnership with other organizations. These included organizations such as the Children of Armenia Fund (COAF), World Vision or

UNDP/GEF. Such synergies allowed mobilizing greater amount of resources for the benefit of the beneficiary communities. In 2014, the CEW Program initiated implementation of four water supply projects in the communities of Armavir and Tavush regions based on a Memorandum of Understanding (MoU) signed between VivaCell MTS and USAID in March 2014. As stated in the MoU, the projects were sponsored by VivaCell and USAID while CEW Program and the Foundation for the Preservation of Wildlife and Cultural Assets (FPWC) shared the responsibility for their implementation. The USAID and private sector matching funds were invested into the rehabilitation of drinking water supply networks in Lukashin, Arazap, Berkaber and Artsvaberd villages.

A very important aspect of demonstration projects development was obtaining commitment letters from the partner organizations and municipalities. These letters were important to secure their interest and readiness to share the project costs. The letters defined ownership of the infrastructure rehabilitated and clear protocols to define the rights, roles and obligations among all partners participating in the project implementation. The CEW Program engineers were ultimately responsible for the supervision of the construction work, the adherence to the deadlines and the quality of workmanship. Upon completion of project implementation handover/completion acts were signed by the parties ensuring that the work was completed in timely and proper manner and the infrastructure rehabilitated was officially handed over to the communities. Furthermore, the project counterparts provided appropriate reference letters documenting the actual magnitude of their contribution into a particular project. These letters and acceptance acts were inserted into the respective project files and became an official part of the record for future reference.

The Program conducted feasibility studies for each demonstration projects. In each case the CEW Program submitted to USAID the project approval packages including the environmental review checklists and EMMPs. The USAID COR reviewed the project proposals prior to the approval, and provided valuable recommendations that the CEW Program integrated into final projects as developed. EMMPs were signed by all project parties, thereby assuring that communities were required to follow the safety rules and minimize and/or mitigate any potential environmental impacts. In general, due to the very small scale of the construction work, environmental impacts were few and limited and carefully mitigated. Most of the targeted facilities were already operational and were connected to the relevant utilities – avoiding the need for complex reviews and approval processes.

Procurement Process. The CEW Program did not directly carry out construction work, but contracted the services and supply of materials to properly licensed and qualified local companies. A transparent, publicly advertised and competitive procurement process was implemented to identify and select quality companies in accordance with the USAID procurement procedures. The CEW Program conducted separate solicitation/public procurement for each project. The notices for receiving bids for all projects were placed in the local media, the Program web site and the Facebook page. In addition to that, notifications have been sent through the existing mailing lists of companies. Bids were received in sealed folders and all applicants were properly notified about the date and time of the public bid opening. Contracts were awarded on the cost-value and best quality principle. All tender participants were required to provide evidences of the source and origin of the products and certificates of quality. Bidders who were not able to demonstrate such evidence were automatically disqualified. The contracts with the sub-contractors included provisions on the elimination of defects identified by the

CEW Program or the partners during construction monitoring site visits. There is also a required guarantee period for all installed equipment and materials.

Project Monitoring: Monitoring was a critically important element of project implementation. Such careful monitoring ensured that projects met the deadlines and required quality, safety and environmental compliance standards were observed. Monitoring also assured that each project party fulfilled its commitments properly and on schedule. Internal accountability was assured by having each Program engineer was responsible for specific project(s) starting from developing the concept till the project completion. The Project collected data and conducted monitoring and evaluation activities to record progress toward planned outcomes and to follow the process of projects' implementation. The projects were monitored regularly via planned site visits, phone calls, unannounced visits, inspection of supplied equipment and contractor's performance and the quality documentation of supplied equipment and materials. Monitoring also included ongoing observation of safety and environmental standards and compliance requirements.

The CEW Program demonstration projects team prepared and regularly updated the schedule of monitoring visits. In the event of delays or failure to meet obligations by project parties, a special high intensity monitoring plan was developed and implemented to keep projects on track. Weekly monitoring was scheduled to inspect the progress on each project and to ensure planned measures were properly implemented.

Training and Community Development: The CEW Program team believes that the community development is a process which mobilizes community members to come together, identify their own needs and find the best feasible solution for the prioritized community issues. In this respect, the CEW PROGRAM team has been engaged into community development efforts for the purposes of implementation of the demonstration projects. The CEW Program worked with the communities and their core groups to:

- (a) make sure that all members had shared understanding of the costs and benefits of a particular project and were supportive of the results;
- (b) explain best practices in water and energy efficiency;
- (c) amplify the visibility and dissemination of the successfully implemented projects and to support their broad replicability where ever possible.

As a part of the community development activities the CEW Program team worked with the communities for enhancing the sense of ownership by training them in operation and maintenance of the community owned infrastructure.

Water system improvement projects resulted in significant changes not only in terms of infrastructure improvement but also in practices and behaviors of people concerning water use. Consumption-based volumetric water metering has been a new practice introduced by the CEW Program in the communities in which the Program worked. Previously, the majority of the communities were accustomed to paying a fixed water fee of 200 drams charged per capita from each household. Therefore, people in rural areas had no incentives to control usage of drinking water which were flowing for hours from water taps in their gardens. This has frequently resulted in preventing water from reaching the upper parts of the village for extended periods. Historically in Armenia it was a

general perception that water is a free commodity. To begin to change this perception required a significant behavioral change. The Program worked with the leaders of municipalities and community core groups to make them understand the specifics of the municipal utility service. During the town hall meetings and workshops the message was clearly delivered to the communities that water was a shared and precious resource. In their turn, community leaders made efforts to convince residents that water supply networks required regular maintenance and they needed to pay reasonable, volumetric, cost based fees in order to have a reliable supply of clean drinking water in the long term.

The CEW Program-supported communities moved towards the volumetric billing for water services by installing individual water meters and signing service contracts with the residents. To assist communities with the management of their water supply service, the Program drafted typical water service contracts to be signed between the community and the residents and designed a special accounting software package for billing of water fees. The software was first installed and tested in Arteni village and then provided to other villages. The software can be downloaded from the CEW Program web site at www.cew.am

Significantly improved financial viability of Program-supported water systems was achieved in Arteni and Arazap villages very soon upon completion of the installations. The project in Arteni was completed in October 2014. In the period between October 2014 –July 2015, the community budget revenues on “other income” line item in Arteni village reportedly increased five times in comparison to pre-improvement collections for water service (AMD 3,049,600 for the second quarter of 2015 versus AMD 608,000 for the second quarter of 2013).

Water supply revenues has also increased by almost 60% (AMD 680,000 for the second quarter of 2015 versus AMD 420,000 for the second quarter of 2013) in Arazap village, where after installation of the water meters, the local municipality started charging residents for water fees based on the metering data. The project was completed in April 2015.

The Program trained its partner communities in a number of technical areas, such as:

- Energy efficient lighting and operation and maintenance
- Water efficiency and O&M of water infrastructure, billing and metering
- Energy efficiency, energy conservation and climate change adaptation

During the second year of the program, the CEW Program team prepared and published a series of brief handbooks in both, Armenian and English languages. These handbooks described best practices and appropriate technologies for small-scale community infrastructure projects. The brochures included the topic of solar water heating, energy efficient lighting, radiant heating, energy efficient buildings, water efficiency, and adaptation to climate change. Upon completion of the demonstration projects the Program conducted technical trainings/consultations to the technical staff of the municipalities to help assure better maintenance of the infrastructure that had been rehabilitated.



The local producer of LED lamps presents the technology to the community leaders in Armavir region of Armenia.



CEW PROGRAM engineer Hayk Petrosyan presenting LED lamps to the community leaders in Ijevan, Tavush region of Armenia.

Technical Assistance Projects: The CEW Program provided consultations to private enterprises, organizations and various communities interested in the development and implementation of energy and water efficiency projects. Consultations focused on feasibility analysis, design and estimates, technology development (*solar, wind turbine, geothermal pumps*) and application, business plan development, etc. The following achievements have been recorded by various organizations with the technical assistance of the Program engineers:

- Vani Ltd received a certificate as a licensed producer of LED lighting fixtures in Armenia;
- ArtProfectus LLC improved their model of solar air heaters with the help of the CEW Program engineers. The heaters work extremely well for small fruit drying/preservation facilities.
- The CEW Program prepared project designs for Dsegh and Chochkan villages to improve drinking water supply.
- The Program provided consultation to three private companies, Hosk LLC, Palmira LLC and AEG CJSC, for the development of wind power projects in Armenia. Technical assistance included assistance in the calculation of optimal parameters and feasibility assessment and financial/business plan development. The first two companies reportedly acquired land in Syunik region for the installation of a wind power plant and are looking for investment opportunities. The third company obtained equipment for measuring wind speed and the wind gauge.
- The Program provided consultation to Syunik, Ltd. on improving the efficiency of the SHPP owned by the company in Syunik region of Armenia. Recommendations were made to redesign and upgrade the equipment (*a loan application was filed with ACBA-Credit Agricole Bank*) and increase the volume of the water reservoir (*completed*).
- The Program provided consultation to Minas LLC regarding the construction of Jermuk-3 SHPP on the River Arpa, particularly, reviewing and providing comments on the hydrological, including hydro-energy potential component of the environmental assessment document.
- The Program provided technical assistance has been provided to ADRA and Tatul village on the design of an innovative irrigation project which was successfully completed in the community.

#	Project Name	CEW PROGRAM Contribution, \$	Partner Contribution, \$	Total Project Cost, \$	Partner	Beneficiary number		Households
						w	m	
1	Installation of outdoor lighting system in Ijevan SOS Children's Village/Tavush	2,166	205	2,371	SOS Children Villages, Armenia	46	24	14
2	Improvement of water supply in Mrgashat/Armavir	10,732	48,777	59,509	Mrgashat municipality Nor Akunk	2,838	2,516	1,853
3	Improvement of water supply in Dalarik/Armavir	22,160	56,381	78,541	Dalarik municipality Nor Akunk	1,897	1,682	980
4	Installation of Outdoor Lighting System in Lernagog/Armavir	7,317	27,118	34,435	COAF	1,120	1,034	515
5	Installation of Solar Water Heaters in Kotayk SOS Children's Village/Kotayk	28,732	9,561	38,293	SOS Children villages, Armenia	44	43	14
6	Installation of Solar and Radiant Heating Systems in Rural Clinic of Darbas/Syunik	4,708	976	5,684	WVI	1,177	1,060	640
7	Improvement of Water supply in Hartavan/Aragatsotn	40,748	10,078	50,826	Hartavan municipality	475	438	65
8	Improvement of Water supply in Arteni/Aragatsotn	84,612	34,265	118,877	Arteni municipality	1,818	1,774	225
9	Improvement of Water supply in Aragatsavan/Aragatsotn	45,425	55,427	100,852	Aragatsavan municipality	3,200	2,183	500
10	Installation of Outdoor Lighting System in Ashnak/Aragatsotn	3,585	5,407	8,992	Ashnak municipality, WVI	735	765	465

11	Installation of Outdoor Lighting System in Tatul/Aragatsotn	8,195	6,124	14,319	Tatul municipality, WVI	409	410	268
12	Installation of Outdoor Lighting System in Zovasar /Aragatsotn	4,507	6,124	10,631	Zovasar municipality, WVI	322	274	190
13	Upgrading of Outdoor Lighting System in Darbas/Syunik	5,429	4,756	10,185	Darbas municipality, WVI	1,177	1,060	640
15	Installation of a radiant heating system in the Berd sport school/Tavush	10,596	18,695	29,291	Berd municipality	3,828	3,652	0
16	Improvement of water supply in Arazap/Armavir	23,555	94,281	117,836	Arazap municipality, Viva Cell via FPWC	920	880	300
17	Improvement of water supply in Berkaber/Tavush	12,894	61,442	74,336	Berkaber municipality, Viva Cell via FPWC	530		185
19	Improvement of water supply in Lukashin/Armavir	34,124	210,140	244,264	Lukashin municipality, Viva Cell, FPWC	1230	1170	650
20	Improvement of water supply in Artsvaberd/Tavush	22,470	59,837	82,307	Artsvaberd municipality, Viva Cell	3,250		700
21	Rehabilitation of Street Lighting System in Aparan/Aragatsotn	4,447	7,102	11,549	Aparan municipality	3,700	3,600	1,800
22	Weatherization and Installation of Electric Infrared Heating System in Meghvik Center of Gyumri/Shirak	6,672	7,995	14,667	UNDP, Meghvik	153	147	
22	Building-envelope for Kindergarten No 27 of Gyumr/Shirak	62,719	5,263	67,982	Kindergarten #27	97	93	

23	Insulation and Efficient Heating of Art School in Koghb/Tavush	28,267	505	28,772	Koghb Art school	36	34	
24	Construction of Building-envelope for Kindergarten No 4 of Sissian/Syunik	33,517	1,726	35,243	Sisian Municipality	57	55	
25	Installation of a radiant heating system in the Vanand sport school/Armavir	16,600	53,200	69,800	COAF	69	81	
	TOTAL Values	524,177	782,186	1,306,363		29,128	22,975	10,004

3.3 Task 3: Improve Hydropower and Water Regulation

The CEW Program carried out activities for the improvement of the legal and regulatory framework of the water sector.

The CEW Program legal task team conducted a comprehensive comparative analysis of the legal framework regulating issuance of water use permits in Armenia. This review and analysis included international documents, the Republic of Armenia Water Code, the Laws on National Water Policy, National Water Program and 13 other resolutions and Government decisions on the BMOs and water permitting processes. As a result, the team produced the “*Towards Improved Integrated Water Resources Management in Armenia: Identification of key legal and regulatory issues with recommendations for improvement*”⁵ report. This report outlined major legislation gaps in the water permitting process, environmental liabilities, key issues and barriers for decentralization, efficiency of the agencies responsible for the water permitting process and their legal framework. The report also recommended a package of critical legal improvements consistent with international best practice, calling for increasing the efficiency and transparency of the water permitting process. The report was prepared in consultation with the WRMA. The final report was presented in August 2015. The report is enclosed in the table of annexes and is available on the Program web site at: <http://cew.am/en/water-regulation-improvement>

As part of the “roadmap of cooperation” agreed upon between the CEW Program and the WRMA in November 2014⁶, the CEW Program focused efforts on the development of the ecological flow (EF) calculation methodology. This methodology is recommended for application in Armenia as a critical prerequisite for efficient management of water resources. To this end, an expert group on ecological flow was formed in concurrence with the WRMA. The expert group worked on the development of the EF calculation methodology for Armenia. The newly developed Ecological Flow calculation method was pilot tested in Argichi River basin. This basin was selected since it’s one of the few rivers where monitoring has been conducted regularly and the river has a wide range of morphological characteristics. Hence, most needed data, particularly biological data, required for the pilot test was readily available. The expert group developed a map of the Argichi river basin with (*hydrological, quality and biological*) gauging stations and compiled all available data recorded in previous years. The following information was collected during field visits:

- Measurements were made of the water discharge, depth and velocity at 5 hydrological gauging stations;
- Morphological measurements at 3 non-operational hydrological gauging stations (*Qaradzi, Qarvansarah, Vaghashen*) were conducted;
- Spawning areas were identified;
- Water samples were collected.

⁵Submitted to USAID in March 2015.

⁶Technical assistance to the WRMA has been outlined in the Roadmap of Cooperation worked out collaboration with the Acting Head of the WRMA, David Grigoryan, and Head of the State Water Cadastre Information System, HrantZaqaryan. It planned activities aimed at supporting the Government in developing a methodology for calculation of ecological flows, increasing transparency in water management by improving the State Water Cadastre Information System and making it available through the re-established website of the WRMA. The Roadmap was shared with USAID.

A short video film on the field work in the Argichi river basin was prepared in English and Armenian languages. It's available on the CEW PROGRAM's Facebook page and can be accessed via <https://youtu.be/uOFxNTCOBKE>

As a result of the desk analysis and field work, the team of the international and local consultants prepared the “*Development of the Method for Estimation of Ecological Flow of the Rivers in Armenia*” report (enclosed in the table of annexes). This report was submitted to USAID in September 2015. The team designed a new, scientifically sound, ecological flow calculation methodology as a result of the testing on Argichi river basin. The new methodology was designed to be utilized on all rivers of Armenia. The methodology was presented to the WRMA staff on August 17, 2015 and was accompanied by detailed training. Based on the comments of the WRMA the model was modified and a detailed manual was prepared as a guidance for users. A follow-on training was conducted in September 2015 for the staff of the Ministry of Nature Protection including WRMA and other potential users of the method. The newly developed ecological flow method focuses on increasing the efficiency of the water resources management in Armenia. The new methodology takes into account seasonality factors, as well as hydrological, biological, morphological, biochemical and other important characteristics of Armenian rivers.

Along with the improved methodology the CEW Program also prepared a proposed draft of a “government decision” (equivalent of an executive order) for enactment of the improved methodology on the calculation of the ecological flow for the rivers in Armenia. The draft proposed a “government decision” has been submitted to the GoA.

In addition to the previously mentioned tasks, the CEW Program team also took the initiative to provide input on proposed amendments to the Water Code and National Water Program of Armenia. The CEW Program experts, as a part of their policy framework activities, compiled a package of recommendations for the aforementioned amendments. This package of proposed amendments was submitted to the Standing Committee on Agriculture and Environment of the Armenian National Assembly on May 26, 2014. In particular, the package included a set of technical concepts and terms and provisions for mainstreaming climate change analysis into water legislation. The CEW Program team shared the proposed amendments with USAID and the WRMA before submitting them to the National Assembly. The proposed amendments were included into the Parliament agenda on 23.02.2015 pending on the hearings in National Assembly.



3.4 Task 4: Donor Coordination and Communication

The CEW Program Communications and Coordination with other donors task objectives were to coordinate effectively with other donors' activities and to promote and increase the public visibility of the clean energy and water activities of CEW Program. This task supported the main project components and contributing to improved public awareness on clean energy and water issues. The communications efforts of the CEW Program have been highly successful in furthering the goals of the Program and increasing the visibility of its impact for various target audiences. These efforts were mainly built around the river basin management planning process, dissemination of the results of the highly successful energy and water demonstration projects and promoting coordination and collaboration with other donors and donor-led organizations.

The scope and objectives of the communications task was outlined in the *Outreach Strategy and Plan* submitted to, and approved by, USAID at the beginning of the CEW Program. In addition to the *Outreach Strategy and Plan*, the *Branding and Marking Plan* was developed to specifically assure compliance with the USAID branding/marketing standards. Over the past four years, the team accomplished the following :

- designed, created and regularly updated the program web site and Facebook pages . The program web site and Facebook pages equally covered the activities of all program tasks, presented the current project news, recent updates, photos and publications of all final reports.
- Developed a public relations and community outreach kit for the Program . The kit included the technology handbooks (*solar, EE buildings, radiant heating, water efficiency, climate change*), demo project fact sheets, program highlights, and success stories. The format of materials was compliant with all USAID standards and corresponded to the USAID branding and marking requirements.
- The CEW Program communications team supported the organization of stakeholder consultations and conferences, prepared information materials and press releases for dissemination via regional and local media outlets. The team also provided for USAID's clearance all the press/media materials, and ensured consistently extensive media coverage of the major events. These events included such matters as the Presentation of the River Basin Plans, the Southern Basin Plan and Ararat Valley Groundwater Resources Study. The Presentation on Ararat Valley Groundwater Resources was covered by more than 30 national media outlets. Several follow-on investigations and stories appeared in the national press after the publication of the study results.
- The team organized seventeen community outreach events , each upon completion of a successful demonstration project. The purpose of the events was to showcase the positive results of the projects, increase the visibility of the USAID's assistance to Armenia and stimulate their replication in other locations. The format of these events varied depending on the nature of the project:
 - CEW Program-supported workshops to present the results of the project (*e.g. technology used, its benefits, financial estimates, savings, etc.*) and other topics to the leaders of the neighboring

communities, the regional government, public institutions, and SMEs. Examples include the workshops conducted in Aparan, Darbas, Lernagog, Ijevan, with the aim of encouraging their replication. As another example, CEW Program organized a micro-exhibition of small-scale EE technologies (solar, street-lighting) in Tatul village of Aragatsotn region to demonstrate measures which can be potentially applied in the communities to generate savings. Among samples exhibited were LED lamps, locally produced solar air heaters, solar water and space heaters, some of which were innovative and thus far rarely applied in Armenia;

- Another format of events was community celebrations to mark completion of the projects, particularly completion of water improvement project. These events were organized with participation of USAID, partners, regional government and media. In the majority of cases due to the significant positive impact on the communities (*safe drinking water supply, new street-lighting, renovated school, kindergarten or polyclinic*), these events turned out to be real community festivals, with participation of the beneficiaries, local dance and music ensembles, displays artwork of local children, traditional food tasting.

Very often (and by design) representatives from neighboring communities also participated in the public outreach events. In this manner they were introduced very effectively to the new water and energy technologies created by the community cooperation with the CEW PROGRAM team



Community event to mark completion of the insulation project in the arts school of Koghb village



USAID Mission Director Karen Hilliard tasting water in Arazap village after completion of the water improvement project.

- The team also conducted some activities to increase public awareness of water conservation and energy efficiency which included:
 - Organizing a youth education week in Arteni village school. This event was organized jointly with COAF in celebration of the World Water Day, which included series of learning and fun activities: movie watching on water conservation, lessons on climate change, environment and renewable energy, poster and essay contests on the topic and award ceremony of winners in the end;
 - The CEW Program team - in collaboration with the MNP - produced a short public service announcement To highlight the importance of water conservation.. Video materials were collected from Syunik, Armavir and Lori regions. An example of the PSAs is currently available on the CEW Program Facebook page and can be accessed via

https://www.youtube.com/watch?v=BCacXgjd_QQ.

- The CEW Program team participated actively in the World Environment Day event organized by the Ministry of Nature Protection in the Lovers Park in Yerevan in June 2015. The Program had a separate booth, where the program materials and videos were displayed to the public and other participants at the event – (*approximately 50 international and local environmental organizations*). The event was attended by the Deputy Prime Minister, Minister of Nature Protection and the members of the Parliament and Government.



Prizes awarded to the winners of the essay contest for the best essays around the theme of water conservation and active participation during presentations.



Children of the Kindergarten at SOS Children's village in Kotayk performing during an outreach event to mark completion of the solar water heating project in the village.

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Media on the CEW Program. Due to the active and creative work of the Program communications team, the program has consistently enjoyed very extensive and positive media coverage, including broadcast, print and electronic outlets. The media was invited to all major events organized under various tasks both in Yerevan and the regions, such as presentation of the river basin plans⁷, Ararat Valley Groundwater Resources Study⁸, community events, with only a small portion of links presented below⁹.

⁷<http://www.1tv.am/en/videos/2015/08/07/The-First-Informational-21-00/21443> (in Armenian)

https://www.youtube.com/watch?v=eDrTaB8CU_4 - Haylur news block (in Armenian)

<https://www.youtube.com/watch?v=IPIQjRaXdvQ> - AR TV AZDARAR (in Armenian)

<http://www.armeniatv.am/hy/news/57237> - New block on Armenia TV channel in Armenia

⁸<http://www.ecolor.org/hy/news/officials/existence-of-ararat-valley-communities-and-nuclear-power-plant-jeopardized/5950/>

<http://kentron.tv/index.php/am/news/item/3983-news-18032014.html>

<https://www.youtube.com/watch?v=dPiedPVzQs>

<http://limetv.am/yuyuf-news-180314-hhufuuuquu-pnnuuplquu.html>

<http://www.armtimes.com/hy/read/49513>

<http://www.ecolor.org/hy/news/water/what-we-have-due-to-poor-management-of-water-resources-in-armenia/5972/>

<http://168.am/2014/04/08/350627.html>

<http://armenpress.am/eng/multimedia/slideshows/53164/>

<http://www.armradio.am/en/2014/03/18/the-level-of-groundwater-resources-in-the-ararat-valley-has-significantly-dropped/>

<http://www.panarmenian.net/eng/photoset/all/5898>

<http://panorama.am/am/society/2014/03/18/hilard/>

<http://hetq.am/eng/news/53470/armenian-government-will-no-longer-provide-permits-for-fish-farming-in-ararat-valley.html>

⁹ https://www.youtube.com/watch?list=UUvhOxd4DL1kUZLOPJV-K-aA&v=xUzQP1txy_s

In addition to following up on the coverage of specific events organized by the CEW Program, the communications team also monitored articles in the press that cited the USAID Clean Energy and Water Program and its work in the water sector of the country. A particular example would be the findings of the Ararat Groundwater Study. This study was widely and extensively covered by the national media with a number of articles discussing the dramatic situation with the groundwater resources. The reporting frequently referred to the Ararat Groundwater Resources Study for details or highlighting recent developments in the Armenian Water Policy Sector that were influenced by the Study. In a significant article published on June 5, 2014, the Armenian news website “fintax” the media laid out the reasons behind the Ararat Valley’s depleted water resources, along with the recommendations of Ararat Groundwater Assessment Study in remedying the issue. The article highlighted USAID and CEW Program involvement and their support to the Armenian government on resolving the Ararat Valley’s water issues. The article, titled “*Why are our Water Resources Depleted?*” can be found at [link](#). A similar article was also published on the Armenian blog “Ecolur,” titled “[What Has the Government Done to Solve Ararat’s Water Problems](#),” that specifically mentioned the Ararat Groundwater Assessment Study and the CEW Program. A video was also released by “OneAM” which highlights the water issues in the Ararat Valley, especially focusing on the devastating effects of the unregulated fishing industry. While the [video](#) did not specifically mention USAID or the CEW Program, it cited verbatim results from the Ararat Groundwater Study.

Among the most recent program coverage, the article on the CEW Program was published in the SBAIC (*Small Business Association for International Companies – a forum established to promote the utilization of US small businesses at USAID*) news on April 16, 2015 as an achievement of one of its small business members.

Collaboration with other Organizations. The CEW Program built collaboration with the donor-related and other development organizations for communication, information sharing, and implementation of joint projects.. among the extremely successful examples of collaboration were the CEW Program efforts in building partnerships around the implementation of joint programs with World Vision, UNDP-GEF, COAF Counterpart International. One of the largest partnerships of the CEW Program was VivaCell-MTS/FPWC which through the MoU signed between USAID and VivaCell-MTS funded four projects, by providing 60 and 70 million Armenian drams respectively.

The CEW Program team participated in water and energy-related forums and conferences organized not only in Armenia but also regionally. The CEW Program participated in the meetings of the National Water Policy Dialogue on IWRM under the auspices of the Ministry of Nature Protection, WRMA which

<http://www.armradio.am/en/2015/06/17/usaid-improves-water-supply-in-hartavan-armenia/>
<http://www.lragir.am/index/eng/0/country/view/33929>
<http://www.panorama.am/en/society/2015/04/15/vivacell-mts/#>
<http://www.aysor.am/en/news/2015/04/15/Partnership-project-improves-water-supply-in-Arazap-village/935543>
<http://www.shanttv.com/am/news/political/16830/>
<http://www.armeniatv.am/hy/news/57152>
<http://www.itel.am/en/news/7307>
<http://www.kentron.tv/index.php/am/programs/informational-political/epikentron/item/7379-epik-240715.html> -from 30.24
<https://www.youtube.com/watch?v=YnpKPmD4wcQ>
<http://www.yerkirmedia.am/?lan=hy&act=news&id=28047>

includes the members of the state agencies, international organizations and science, educational institutions, NGOs and private sector. The CEW Program data on climate change adaptation/mitigation were provided to the UNDP Climate Change Program and reflected in the Third National Communication on Climate Change for Armenia. The CEW Program also collaborated with the USAID's Support to the Armenian National Assembly Program (SANAP) to present the recommendations on improvement to the Water Code and the National Water Program to the Standing Committee on Agriculture and Environment and participate in the committee's work on this matter.



Micro-exhibition of small-scale solar and lighting technologies organized by the CEW PROGRAM during the outreach event in Tatul village.



USAID Mission Director Karen Hilliard interviewed by the local media about four projects implemented in Tavush and Armavir regions with joint funding of USAID and VivaCell-MTS.

4. Summary of Performance Indicators

5. The CEW Program Performance Management Plan uses the following indicators to measure the progress toward meeting mission Intermediate Results (IRs); specifically to:
6. **IR 3.1** Improved access and quality of services for key infrastructure; and
7. **IR 3.2** Reduced pollution by improved environmental practices.

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
Expected Result 1: An integrated approach to sustainable energy and water management introduced.									
Outcome 1.1: Strengthened institutional capacity related to river basin management planning (RBMP)									
Outcome 1.1: Indicators									
1.1.1	Number of river /water basin management plans completed.	0	2 RBMP & 1 BMP	2 RBMP & 1 BMP	4 (3 RBMP & 1 BMP)	4 (3 RBMP & 1 BMP)	Draft Plans submitted to WRMA	Annually	Plans for Vorotan River Basin submitted during Y3. Plans for Voghji and Meghriget river basins and Southern basin management area completed by CEW Program and submitted to WRMA in Y4.
1.1.2	Number of institutions participating in RBMP process.	0	5	46	25	97	Participation records from consultations	Quarterly	The data was disaggregated by governmental, civil society, community entities participated in different levels of RBMP management process (planning, monitoring, input provision etc.)
Output 1.1: Technical assistance provided to GoA, BMO and other stakeholders.									
1.1.4	Number of ministry staff trained in RBMP, including environmental	0	4	17	14	34	Sign-up sheets, reports, photos	Quarterly	The CEW Program conducted several training sessions on RBMP and application of advanced tools such as GIS, DSS. The deviation from planned records is

¹⁰ CEW PROGRAM provided indicators for Year 4 separately given that accomplishments of Year 4 were described in this final report.

¹¹ All figures are cumulative for the life of the project

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
	compliance and application of advanced tools							accounted by an interest of the MNP and WRMA staff in these topics.	
1.1.5	Number of BMO staff trained in RBMP, including environmental compliance.	0	2	1	16	13	Training attendance records, report photos.	Quarterly	The Program provided extensive training to the BMO staff in various areas of RBMP. This figure is not cumulative as the same people participated in a variety of training programs.
1.1.6	Number of consultations with government counterparts, their regional affiliates, NGOs and civil society representatives.	0	2	4	18	19	Meeting notes, lists of participants	Quarterly	Formal consultations with various stakeholders in the process of developing river basin management plans and associated technical tools in Kapan, Goris, Meghri and Yerevan.
Outcome 1.2 Strengthened and improved water use permits decision process									
Outcome 1.2: Indicators									
1.2.1	Number of DSS completed and applied by the GOA	0	1	1	1	1	Handover act	End of the program	The DSS developed and transferred to the MNP as the principal user of the tool.
Output 1.2 indicators: Technical assistance provided to ministry staff									
1.2.3	Number of meetings DSS advisory group.	0	2	2	7	6 ¹²	Meeting notes, reports, photos, sign-	Quarterly	The Program conducted six meetings of the DSS Advisory Group during the development of the DSS. The Group provided their input and technical advice

¹² Based on the recommendation of the Program's international expert on Hydrology and hydrological modelling development of a tool within the DSS for determination of flood-prone zones was cancelled due to its major data gaps. Cancellation of this stand-alone component didn't impact the overall application of hydrological, climate change impact and economic analyses models of the DSS. Hence the target for the number of the DSS advisory group meetings was decreased from 7 to 6.

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
							up sheets		as practitioners and future users of the software.
1.2.4	Number of MNP, WRMA and BMOs staff who received technical training.	0	11	12	23	25	Training attendance records	Quarterly	Technical training to use tools such as computer models, DSS, GIS, databases, etc. Assuming that the participants of the training are different people from the mentioned agencies.
1.2.2	Number of institutions with improved capacity to address climate change issues as a result of USG assistance	0	2	15	15	63	Training attendance records	Quarterly	Climate change training has been provided to the stakeholders during workshops on RMBP, DSS, and community workshops and youth education event organized by the Program. Events were attended by the ministry staff, BMOs, WRMA, regional and local communities, educational and science institutions, etc which accounts for a significant deviation from the planned indicator.
1.2.5	Person hours of training completed in climate change supported by USG assistance.	0	50	60.7	100	102	Training attendance records	Quarterly	Person hours refer to number of people participating (x) number of training hours.
		Expected Result 2: Improved the accessibility, reliability, quality, efficiency and affordability of energy and water services.							
		Outcome 2.1 Local capacities strengthened to introduce or implement energy and water best practices.							
		Outcome 2.1 indicators							
2.1.1	Number of people with improved energy	0	13,000	522	39,000	36,472	Monitoring reports	Quarterly	This refers to the beneficiaries of energy efficiency projects such as lighting, heating,

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
	services due to USG assistance.							building envelope, and the water projects which operates with pumping etc. There is a significant deviation from projected indicator for Y4. The Program implemented four EE projects in educational institutions. For example, for the insulation projects in the rural art school, sports school, or a kindergarten, the project impacts not only the direct beneficiaries – building occupants, but also the whole community which can be viewed as the secondary beneficiaries.	
2.1.2	Number of people in target area with access to improved water supply as a result of USG assistance.	0	6000	15,095	21,500	27,620	Monitoring progress reports and operation plans	Quarterly	Water improvement refers to measurable changes in daily hours of water supply to communities and the number of beneficiaries benefitting from improved water supply services.
		Output 2.1 Technical assistance provided in clean energy and water projects.							
		Output 2.1 indicators							
2.1.3	Number of workshops, meetings conducted on clean energy, water management and climate change best practices.	0	6	6	22	22	Training sign-up sheets, meeting notes, reports	Monthly	This indicator refers to the trainings, consultations and workshops in the communities after the project implementation as well as training with the community technical staff the management of the infrastructure rehabilitated, water service, billing mechanisms. The Program also conducted town hall meetings in the villages to present and explain the benefits

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
								of water metering system. Numerous consultations were provided in Aparan, Lernagog, Ijevan, Darbas, Arteni, Hartavan, Arazap, Aragatsavan, Tatul, Hayanist, Darbnik and Yerevan.	
Outcome 2.2. Improved understanding and increased application of sustainable clean energy and water practices in communities and enterprises within selected sub-basins.									
Outcome 2.2 indicators									
2.2.1	Number of private sector firms with improved management practices as a result of USG assistance.	0	1	3	5	11	Interviews and site visits with questionnaire	Quarterly	The Program provided technical consultations to private companies on the design and implementation of EE projects including feasibility analysis, energy audit, technology development, bankability analysis of EE investments.
Output 2.2 Increased public awareness on water and energy efficiency.									
Output 2.2 indicators									
2.2.2	Number of outreach materials printed and distributed.	0	5	9	20	45	Hard copies of outreach materials	Monthly	Documents produced, distributed during events and/or uploaded on the Program web site.
2.2.3	Person hours of training completed in technical energy fields supported by USG assistance.	0	50	23.5	150	200	Training attendance records, training schedule, presentations	Quarterly	Person hours refer to the number of people participating in the trainings, workshops, individual consultations where the presentations concerning the energy field are being made.

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
2.2.4	Person hours of training completed in water technologies and management practices.	0	5	24	35	54	Training attendance records	Quarterly	The Program made presentations on water systems management, water metering, billing and collection and new software to the communities where water improvement projects were implemented.
Outcome 2.3 indicators: Reduced greenhouse gas emission and water pollution.									
2.3.1	Clean energy generated (MWH annually).	0	15	49	80	147.5	Project records	Quarterly	This indicator refers to the annual clean energy generation by the two EE projects implemented by the Program, namely SOS Children's village in Kotayk and Solar air heating system project in Darbas village.
2.3.2	Total savings (in \$) from pollution mitigation and reduction	0	13,304	16,064	26,608	36,750	Project records	Quarterly	The indicator is set up based on the calculation of the cost of the CO2 per 1 ton in accordance to the existing cost in EU trade market. i.e tCO2=33.26 USD. The figure for Y4 is greater than the projected average due to added number of demonstration projects implemented in FY 2015.
2.3.3	Quantity of greenhouse gas emissions (in metric tons of CO2 reduced or sequestered) as a result of USG assistance	0	400	483	800	1,105	Project Records	Quarterly	This indicator shows the emission of greenhouse gas in the source of electrical energy taking into consideration the savings of the electrical energy at source.
2.3.4	Water saved(in 1000m ³ annually)	0	175,000	583,429	525,000	1,109,129	Project records	Quarterly	The indicator counted the annual water savings from projects in Mrgashat and Dalarik which provide recurrent savings and savings resulted from recently completed

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
								projects based on the date of their actual completion. For the recent projects figures were counted on the semi-annual or quarterly basis.	
Output 2.3 Increased understanding of communities on climate change issues.									
Output 2.3 indicators:									
2.3.5	Number of demonstration projects completed.	0	12	11	21	24	Official handover from CEW PROGRAM to community	Quarterly	The Program completed remaining water projects and the new four EE projects started during Y 4. Thus, the portfolio of energy and water projects was increased to 24 versus the planned 21. The additional number of projects was implemented from the savings generated in the project budget.
Expected Result 3: Improved and strengthened application of hydropower and water regulations.									
Outcome 3.1: Legislation and regulations improved to encourage development in sustainable small hydropower facilities.									
Outcome 3.1: Indicators									
3.1.1	Number of recommendations on water and hydropower regulations provided to GoA.	0	3	3	5	6	Transmittal documents to the GoA	Annually	The Program submitted the report “Towards Improved Integrated Water Resources Management in Armenia: Identification of Key Legal and Regulatory Issues with Recommendations for Improvement” and the Southern Basin Management Plan to the GOA for further adoption. In addition, the Program team recommended the new methodology of the calculation of the ecological flow of rivers and introduced the method to the MNP for further application.

#	Indicator	Baseline 2011 at the start of the program					Data source & collection method	Frequency of reporting	Notes: Descriptions/Comments/Assumptions
			Y4 target ¹⁰	Year 4 Actual	LOP ¹¹ target	Actual LOP result			
			2014-2015	2014-2015	2011-2015	2011-2015			
		Output 3.1 Improved understanding in GoA, stakeholders and affected public regarding best practices for requirements for sustainable hydropower facilities.							
		Output 3.1 indicators							
3.1.2	Number of training events on improving the legal framework on hydropower and water regulations.	0	3	3	5	8	Training attendance records	Quarterly	The indicator refers to the training events and workshops at which legal issues pertaining to the water sector were addressed.
		Expected Result 4: Collaboration with other local and international organizations for joint activities/projects established.							
		Output 4.1 Improved understanding in GoA, stakeholders and affected public regarding best practices for requirements for sustainable hydropower facilities.							
		Output 4.1 indicators							
4.1.1	Number of local and international organizations participating in donor coordination meetings.	0	5	4	13	13	Meeting notes	Quarterly	Although the Program team met with different organizations at different times of the project, organizations were counted only once.

8. Summary of Environmental Performance

To ensure compliance to USAID's environmental standards and requirements, the CEW Program Environmental Specialist worked closely with the related technical teams on verifying the environmental compliance of the Program activities according to the requirements of the CEW Program Environmental Scoping Statement and Environmental Assessment of the river basin management planning process. This involved the following:

- Ensuring environmental compliance of the entire RBMP process
- Monitoring environmental compliance of the demonstration projects

The CEW Program followed the requirements of the EMMP during the development of the basin management plans for Vorotan, Voghji and Meghri rivers and the comprehensive Southern basin plan. Particularly, data sets on water availability/supply, permitted and actual volumes of water use, social and economic datasets collected as a part of process of characterization of the river basin. In addition data on water use in the selected basins by various sectors, risks related to climate change were verified. For data verification, the CEW Program collaborated with the WRMA, State Environmental Inspectorate (SEI) of the MNP, NSS of Armenia, Ministry of Agriculture, Armenian Water Supply Company and respective Water Users Associations (WUAs), Southern BMO, Department on Agriculture and Environment at the Syunik regional administration (Marz), and regional offices of Armstatehydromet service and the NSS. During the process, the Program team also consulted with national and sectorial development plans and programs, such as the Armenia's Sustainable Development Program and Poverty Reduction Strategy Paper, Government of Armenia Program for 2012-2017, Syunik Marz Development Program, National Water Program, National Program on Energy Saving and Renewable Energy of Republic of Armenia, Sustainable Agriculture Development Program, etc. The results of other projects, studies, as well as internet resources were also considered and/or used. The Program conducted a number of stakeholder consultations in Goris, Meghri, Kapan, the inputs from which were used for the verification of the Program's findings on pressures and impacts analysis in the Vorotan, Voghji and Meghri river basins, including climate change-associated risks.

Environmental compliance requirements were carefully followed during the implementation of the demonstration projects by the CEW Program and its partners. In particular, environmental documentation, including environmental review checklists, environmental monitoring and mitigation plans (EMMPs) were prepared for all the demonstration projects and presented for approval to USAID. During the implementation of the demonstration projects, the Environmental Specialist regularly visited all the project sites to monitor compliance to environmental and safety requirements and made recommendations on corrective actions in the few cases when the sub-contractors and/or communities had initially failed to meet those requirements.

In addition, post-project water quality monitoring was conducted for the water improvement projects as a requirement of the Environmental Management and Monitoring Plan. Test results were shared with the respective communities and recommendations were provided on continuous maintenance and improvement of water quality at the source and water system.

9. Challenges

One of the major issues the team faced was data availability and accuracy required for the preparation of river basin management plans, the DSS and the study of the groundwater resources in Ararat Valley. In addition to data gaps, the CEW Program team also faced difficulty even with accessing the data. The assistance of USAID was required to facilitate the process of making data and information needed for the river basin management planning and assessment study of groundwater resource available to the CEW Program.

The WRMA, Southern BMO and the MNP staff, as well as representatives of other key ministries and agencies have been substantially involved in a number of the CEW Program activities, from river basin planning, DSS design, to legal and outreach activities. The collaboration of the CEW Program with the Ministry of Nature Protection and the WRMA improved significantly over the life of the project.

Nevertheless, the staff changes in the stakeholder agencies have, in some cases, been a challenge to the implementation of the program, particularly if the replacements are made of officials with the decision making status. The government agencies did not seem to effectively carry out the handover of information with respect to their international partners. Therefore, the team had to build relations anew with each newly appointed official - the Minister of MNP, the WRMA head, the heads of key departments. In a number of situations, such personnel changes in the GoA counterpart agencies very significantly caused delays in the accomplishment of project milestones and activities. The team had to exert more effort to recover the time lost and to maintain the project schedule.

Personnel turnover in the WRMA was another challenge. This has resulted in insufficient technical knowledge at the WRMA to use the new methodology of ecological flow calculation. This was further complicated when the WRMA person who had knowledge of GIS use in the Water permit department was no longer available. To address this significant challenge, the CEW Program conducted additional GIS training for three (3) additional staff members of WRMA

Another implementation challenge was the lack of sufficient technical and knowledge base in the Ministry and WRMA regarding the accumulated knowledge and vast pool of data. In response to this challenge, the Program made significant efforts to maximize the impact of its work through the intensive capacity building of the WRMA and BMOs staff in a number of technical areas. This included river basin planning, climate change, use of DSS, GIS tools, by developing user manuals on the DSS and the ecological flow methodology.

Implementation of the majority of projects went very well and met the planned schedule of activities. However, as is typical, a minor percentage was problematic and provided quite a challenge for the Program team to identify and implement adequate measures to assure project completion.

Although the Program staff consistently performed due diligence to properly assess the needs of beneficiaries, to conduct community meetings and to sign corresponding commitment letters, some communities did not fully honor their commitments. The failure of the Program partners to comply with their project commitments remained one of the main reasons for missing demonstration project deadlines or partial deviation from original project objectives. In some cases the beneficiaries were candid and forthright enough to admit their inability to comply with their commitments and to withdraw before the start of respective projects (Ayrum and Haykavan projects). However, in other

cases the community either delayed the performance under certain components of the project (Aragatsavan, Hartavan or Artsvaber) or simply refused to comply with any of their commitments (Berkaber).

All of the above justified the need for an even more rigorous initial assessment of the needs and capabilities of potential beneficiaries. Moreover, the assessment should not rely only on oral or written statement of ‘willingness’ of the community or its leaders to implement the project, but also on realistic independent assessment of the financial potential of the local budget and on the commitments already taken by the community under other projects. However, such assessments will not completely address the various risks. Unfortunately, in grass roots community development there is no option that is completely risk free.

Another problem with implementation of innovative projects is the absence of local capacities for appropriate design and planning. For example, none of the local design companies had any experience with design of biogas water heaters or building energy efficiency projects that use vinyl siding and basalt fiber. In this situation the choice is either with selection of an international contractor or design and calculation of project costs by Program specialists. Both options imply certain risks with regards to potential delays and unforeseen costs. Small demo projects are not attractive for international design companies, and there is a risk that, even in case of an international tender, there will be no bid or the proposed price will be unaffordable for the project budget.

Overall, the success ratio and cost effectiveness of the Program demonstration project reached its goals, given the size of cost-share funding leveraged. The Program was highly successful in introducing and demonstrating a wide range of water and energy efficiency measures all across Armenia. The prospects for replication are very good with some replication already underway.

One of the challenges in coordination with other donors for activities pursued within the framework of the CEW Program had to do with incompatible rules, regulations, project and budget cycles between donors. Each of these other donor funded organizations had its own focus areas and projects, its own planning, project and budget cycle and its own laws, regulations, procurement standards. A particular problem was how to synchronize planning, project and budget cycles as lack of synchronization resulted in implementation issues including that requested/desired/or promised co-financing was not always available in a timely manner to match the CEW Program funds for demonstration projects.

10. Lessons Learned

There were a number of lessons learned by the team during the implementation of the tasks. These lessons were also gained in providing response actions to some of the challenges mentioned above.

- Very often, the MNP and the WRMA requested the Program via USAID to provide technical assistance in certain areas, such as design and launch of the web site, upgrade and operationalization of the databases of the SWCIS. This requested assistance has been provided to the Ministry in a timely manner and at a high level of quality. However, very frequently actual implementation was very slow on the Ministry side for various reasons. A lesson learned is that when accepting such requests a concise action plan needs to be worked out between USAID and the requesting government agency and its counterparts. Responsibilities of the parties and the

timing of actions should be clearly outlined and agreed upon to ensure ownership responsibility over the resources, technical assistance provided by the donor.

- Over the course of the implementation of the river basin planning and legal tasks, CEW team interacted frequently with the WRMA and MNP officials who participated in the stakeholder consultations and DSS Advisory Group work. During these interactions it appeared that mid-level specialists were not consistently involved in the communications and were not quite aware of the new developments in the water resources sector brought by the CEW Program team, such as the SBMP, DSS, and the improved calculation methodology for the ecological flow. Moreover, there was an apparent knowledge gap to allow the MNP staff to fully utilize the new tools and pool of information to be left by the CEW Program for the MNP as its legacy. The CEW Program initiated a series of training courses on GIS, data management, DSS, river basin planning for the staff of the MNP and WRMA, in particular. In the projects to come, it is important to make sure involvement of the mid-level staff of the stakeholder ministries into the project work from the very beginning.
- Data collection has always been reported as serious problem for the river basin planning team. The lesson learned is that the data provided by the state agencies usually needs additional verification and assurance not to undermine the quality and the validity of the work conducted by the Program.
- The problems met by the team during the implementation of the demonstration programs and failure of the communities to comply with their commitments justified the need for careful due diligence of communities in the future, including also sub-contractors. If the beneficiary is a community, the draft project should be prepared well in advance of the planned project implementation period. With adequate advance planning the local government will have sufficient time to make provisions in the local budget for respective costs and activities and to discuss those with the public in local budget hearings. Once the respective activities are budgeted for and approved by the local self-governance body, the risk for non-compliance with commitments will be significantly lower.
- Given the time that elapsed between the initial USAID program design and the actual contract award, a number of tasks in the legal component, particularly the improvement of the legislation on hydropower were already completed. Particularly, the validity period of water permits for hydropower was extended from three to 15 years. In recognition of this reality, the Program modified its approach and coordinated with the MNP and the WRMA to identify legal gaps that could be addressed via the Program. The lesson learned is that flexibility and adaptability should be part of the project design. In case of the CEW Program, the project personnel in close collaboration with USAID were able to identify an extremely productive mix of policy and legal objectives that advanced water resource management in Armenia. These included decentralization of water resource management and development of the new method of the calculation of ecological flow.
- Another lesson learned is that time constraints may affect the long term quality of the program outputs. An example would be the development of the new ecological flow methodology for Armenia. A very high quality and valid ecological flow calculation method was presented to the WRMA once it was tested and finalized. The expert team conducted a very thorough and sound scientific research and practical work. However, in the opinion of the WRMA and the MNP team, the model was too scientific and complicated which could hamper its practical application in the GoA setting. Although the methodology was developed and finalized by the end of the

Program, unfortunately, the time span of the CEW Program contract doesn't allow for a longer and more detailed training of the users of this method. To address this issue and the concerns of the WRMA, the ecological flow calculation method was simplified and a corresponding user manual was prepared.

- Although most organizations acknowledged the benefits of increased communication and coordination, each organization had its own challenges, deadlines to meet, and its own set of unique requirements and pressures. These factors combined, made cooperation much more complicated and difficult. Organizations had often competing priorities and significant scheduling constraints. Further, it was sometimes physically quite difficult to gather people at a particular time and day for implementation meetings. The lesson learned is that to reduce the need for having frequent coordination meetings, more efficient and innovative methods should be utilized to decrease the complicated logistics, scheduling problems and relatively high costs of physical meetings. One of the suggested options is that either the Government or another relevant agency takes the lead in this coordinating function and creates a donors' database where all donors can upload their information on projects, financing, future projects, reports, publications, research and case studies.

11. Recommendations

Based on the experience and lessons learned during the implementation of the CEW Program, the following recommendations can be made to the future project developers and implementing agencies working in the water resources management area. The recommendations are targeted towards further improvement of the technical, institutional and policy areas of the water resources sector.

- The Southern Basin Management Plan is a unique document in terms of its depth, coverage, quality of collected data and research work. Some of the techniques and methods were used for the first time in Armenia during the basin planning work on Vorotan, Voghji and Meghri rivers and the Southern basin, namely EIA, ESS, use of advanced remote sensing technologies.. It is, therefore, recommended that basin planners build up on the experience of the CEW Program team and the basin management plans with the same depth and quality be prepared for other basins of Armenia to help reveal the current situation with water resources and contribute to their more sound management in the longer run. In this respect, the SBMP can serve as a model plan.
- The study of groundwater resources in Ararat Valley revealed not only the shrinking situation with the resource, but also high potential for water conservation given the technical and policy measures are in place and properly enforced. After the mid-term and final findings of the research have been publicly shared, the Government has exercised some policy measures aimed at curbing the situation with the shrinking water balance. Yet a more consistent focus on the Ararat artesian basin is recommended ranging from the demonstration of the feasible options of water conservation, strengthening of the monitoring and control system, awareness building of water users of the critical situation with the groundwater resource, capacity building and technical assistance to the responsible government agencies and further strengthening of the policy measures.
- Institutional development of the water sector agencies on the one hand involves strengthening of the decentralization mechanisms for more effective management of water resources. It particularly entails strengthening of the functional responsibilities of the BMOs, vesting them

with more decision-making powers, capacity building and technical upgrade of the BMOs, institutionalization of a sound system of supervision and building capacities of the State Environmental Inspectorate for improved compliance assurance and enforcement.

- On the other hand, data availability and transparency present a serious problem for project implementers and was quite a challenge for the CEW Program team during the basin planning work. Technical assistance should be provided to the respective institutions for making the data on water resources open and accessible. The CEW Program put efforts to making available online the SWCIS, yet there are still other important datasets that need to be digitized and opened to the users.
- Another potential area for project developers is upgrade of existing data collection systems, e.g. gauging stations on rivers. Armenia lacks modern data collection systems which was particularly vivid during the development of the ecological flow calculation methodology. The rationale behind the selection of Argichi river basin was that it was one of the rare rivers for which the whole set of the hydrological, biological, morphological and chemical data was available. The application of the ecological flow calculation method can be hampered on other rivers because the needed data is either missing or incomplete.
- One of the important lessons learned from the CEW Program, particularly during the implementation of the legal component, and the subsequent recommendation for the future similar programs is that current trends and challenges in any sector should be thoroughly studied and taken into consideration during the design of the program. Flexibility and adaptability should be part of future programs' design to be able to adjust the task order to the current needs and priorities. To avoid overlaps, coordination with the Government of Armenia is highly recommended on identifying priority intervention areas, e.g. existing legislation and/or policy gaps that can be addressed with the donor support.
- CEW Program made a positive track record of the demonstration projects by presenting low to medium cost technologies for improving rural infrastructures, namely water systems, efficient street and indoor lighting, space and water heating, application of renewable energy. The implementation of the demonstration projects was rewarding not only because it critically improved the life of 52,000 rural residents but also triggered interest of the communities to the issues of water and energy efficiency. Several projects were replicated by the communities afterwards. Infrastructure rehabilitation projects present a vast potential for donor intervention in terms of the demonstration of innovative energy efficiency and renewable technologies, development of the local production business and workforce, and application of new financing schemes for energy saving projects, such as e.g. performance-based contracting.
- In order to increase effectiveness of USAID's further investments in Armenia, it is recommended to establish and enhance within the Mission a system on post-program evaluation of main results (such as adoption and application of policy, legal and regulatory documents). This will provide a foundation for US-Armenia Task Force Agenda.

12. Table of Annexes

N	Name	Status
1.	Executive Summary of the SBMP	
2.	DSS Manual	
3.	Study of the Groundwater Resources in Ararat Valley	
4.	Towards Improved Integrated Water Resources Management in Armenia: Identification of Key Legal and Regulatory Issues with Recommendations for Improvement	
5.	Ecological Flow Calculation Report	
6.	Environmental Monitoring Checklist (sample)	
7.	Success story (sample)	
8.	Fact sheet (sample)	