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WATER MANAGEMENT IN ARMENIA

LA GESTIÓN DEL AGUA EN ARMENIA

A XESTIÓN DA AUGA EN ARMENIA

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SUMMARY

Relevance of the topic: Any country has a national water resources and natural wealth in every country there is a unique system of water resources and mechanisms derived from the difference between the management and protection of water resources. Water scarcity and uneven distribution of the world's most important task for all countries. Most of the water supply and drainage systems are in poor technical condition. Moreover, many areas still do not have water and wastewater infrastructure.

Moreover, if the water supply problems in many areas is somehow resolved, then the issues are not yet clarified wastewater and its individual steps are being taken towards the solution. Water services reforms are the most difficult tasks for any country and it is no accident that, unlike other areas of public service reforms began later, in the water sector. Creating effective system of water use and future regulatory issues are becoming paramount importance and relevance. Any country has a national water resources and natural wealth in every country there is a unique system of water resources and mechanisms derived from the difference between the management and protection of water resources.

Armenia's analysis of the current state of water supply and sanitation systems and improving ways of its choice post relevance.

Objectives of this work:

- Research system of the water cycle management in the European Water Framework Directive that will be used in Armenia
- How to organize it in Armenia by European standards
- Apply this knowledments in Armenian water management

RESUMEN

Relevancia del tema: Cualquier país tiene recursos hídricos nacionales y riquezas naturales. En cada país hay un sistema único de recursos hídricos y mecanismos derivados de la diferencia entre la gestión y protección de los recursos hídricos. La escasez de agua y su distribución desigual es la tarea más importante del mundo para todos los países. La mayoría de los sistemas de abastecimiento de agua y drenaje están en malas condiciones técnicas. Por otra parte, muchas áreas todavía no tienen agua e infraestructura de las aguas residuales.

Por otra parte, si los problemas de abastecimiento de agua en muchas áreas se resuelven de alguna manera, entonces las cuestiones sin aclarar sobre las aguas residuales y los pasos individuales que se están haciendo, nos llevarán a la solución. Las reformas de los servicios de agua son las tareas más difíciles para cualquier país y no es casualidad que, a diferencia de otras áreas de reformas del servicio público, hayan comenzado más tarde, en el sector del agua. La creación de un sistema eficaz de uso del agua y las futuras cuestiones reglamentarias se están convirtiendo en una importancia primordial. Cualquier país tiene recursos nacionales de agua y riqueza natural y en cada país hay un sistema único de recursos hídricos y mecanismos derivados de la diferencia entre la gestión y protección de los recursos hídricos.

El análisis del estado actual de los sistemas de abastecimiento de agua y saneamiento de Armenia y la mejora de las formas de su elección tiene relevancia.

Objetivos de este trabajo:

- Sistema de investigación de la gestión del ciclo del agua según la Directiva Marco Europea del Agua que se utilizará en Armenia
- Cómo organizarlo en Armenia según los estándares europeos
- Aplicar estos conocimientos en la gestión del agua en Armenia

RESUMO

Relevancia do tema: Calquera país ten recursos hídricos nacionais e riqueza natural. Cada país ten un sistema único de recursos hídricos e mecanismos derivados da diferenza entre a xestión e protección dos recursos hídricos. escaseza de auga e distribución desigual é a tarefa máis importante do mundo para todos os países. A maioría dos sistemas de abastecemento de auga e de saneamento están en mal estado técnico. Ademais, moitas áreas non teñen infraestrutura de auga e sumidoiros.

Por outra banda, se os problemas de abastecemento de auga en moitas áreas son resoltos de algunha maneira, a continuación, sen aclarar dúbidas sobre as augas residuais e os pasos individuais que están sendo feitas, lévanos á solución. As reformas dos servizos de auga son as tarefas máis difíciles para calquera país e non é casualidade que, ao contrario doutras áreas de reformas dos servizos públicos, comezaron máis tarde, no sector da auga. A creación dun sistema eficaz de uso da auga e cuestións regulatorias futuras están facendo primordial. Calquera país ten recursos hídricos nacionais e riqueza natural e cada país ten un sistema único de recursos hídricos e mecanismos derivados da diferenza entre a xestión e protección dos recursos hídricos.

A análise da situación actual dos sistemas de abastecemento de auga e saneamento en Armenia e mellorar as formas da súa elección é relevante.

Obxectivos deste traballo:

- Investigación do ciclo da auga segundo a Directiva Marco da Auga de xestión do sistema para ser usado en Armenia
- Como organizarse na Armenia por estándares europeos
- Aplicar ese coñecemento na xestión da auga en Armenia

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CHAPTER 1. INTRODUCTION

Human activity and natural forces are reducing available water resources. At least public comprehension of the need to better manage and protect water has grown, economic criteria and political considerations still tend to drive water policy at all levels. Water management related science and good scientific practice are rarely given adequate consideration. Tension on water resources is increasing, it is result of human activity, population growth, living standards growing, demand for water more and more. These are climate change and variations in natural conditions. Water quality is evaluated are coordinated with areas and borders. Water cycle management is integrated of water intake, groundwater, wastewater to support the environment, economy and community uses of catchments. Usually, main water supplies managed as separate systems. Water cycle management looks at the way we use key water resources and the effects this has on the quality of natural resources and waterways. It seeks to close the 'water cycly , by preventing irrational waste and pollution of water resources and promote re-use of water wherever possible. Water users have relied heavily on surface water supplies. Continuing to extract large volumes of water from surface, and groundwater systems, will place serious stress on ecosystems health. Perhaps the decrease in the health of rivers, is an fact that resources are already over-exploited. Available water supplies, wastewater and sewage water framework is out of date or rapidly ageing, and the replacement costs to the community are substantial. This is countered by the pressure of population growth and infill will have on the existing water resources network.

As an example continued traditional urban development in Spain coastal cities will rapidly approach the limits of sustainability. New urban developments are increasing the pressure on the environment through the need to develop new drinkable water supplies and the discharge of polluted sewage water and treated wastewater into receiving waterways and the ocean. Unless integrated strategies to

manage the total water available from all sources is adopted, new urban developments in cities will rapidly become unsustainable. Inland cities which are dependent on inland waterways for water supply, disposal of sewage water and wastewater, and water based recreation, are also increasingly experiencing water quality problems which to a significant degree are due to the environmental pressure exerted by expanding urban development. The quantity of sewage water runoff from cities is about equal to the amount of drinkable water which is supplied, so there is a potential for expanded collection, storage and re-use of sewage water for non-drinking purposes. Similarly there is the potential to reduce the demand for drinkable water by up to 50% through the re-use of treated wastewater for non-drinking purposes. Likewise, the abstraction of water from Spain waterways for rural and agricultural use is increasingly impacting on the health of river systems. In recent years there has been an increased recognition that river systems have minimum critical (environmental) flows to maintain their health and that the needs of the environment require balancing with rural demands for water. The sustainable development of Spain will be governed in part by the ability to better manage the water cycle and to develop new resources in an ecologically sustainable manner. Water engineers have a key role in implementing water cycle management. It involves integrating water balance, water quality and water consumption into the land through planning, design and management of both urban and rural environments¹.

The past decade has witnessed a fundamental shift in public awareness of and concern about the threats to water resources and surrounding ecosystems. But when it comes to policy, little has changed. Most decisions about the management of water resources remain the product of economic criteria and politically charged reasoning—regardless of whether they concern a town, a region, a country or even several countries. Despite repeated calls from world experts, we are a long way from an approach to the management of water resources that reflects scientific understanding

and use of best available practice. Meanwhile, the pressure on our water resources is increasingly growing¹.

The main factors affecting water resources include the following:

- population growth, particularly in water-short regions,
- movement of large numbers of people from the countryside to towns and cities,
- demands for greater food security and higher living standards,
- increased competition between different uses of water resources, and
- pollution from factories, cities, and farmlands.

Climate change and natural variability in the distribution and occurrence of water further complicate the sustainable development of our water resources.

Still, some progress is being made. At the national and regional levels, officials are evaluating how much water of what quality is available, and coordinating efforts to manage its use. Increasingly these activities are being carried out by new organizations working across borders to address water resources shared by more than one country. For example, communities in flood-prone areas stand to benefit from recent international initiatives that take a joint approach to flood control¹.

REFERENCES

1. Facts on Health and the Environment
www.greenfacts.org/glossary/def/ecosystem.htm

CHAPTER 2. WATER RESOURCES MANAGEMENT IN ARMENIA

Armenian`s territory is notable by its developed but irregular hydrological system typical to mountainous countries. It accommodates around 9500 small and medium rivers, the total length of which is 25 thousand km. The average annual flow volume of water in the Republic of Armenia is about 6.2 billion m³, of which the average annual flow of groundwater is about 3 billion m³. About 96% of water used for drinking comes from groundwater resources².



Figure 1. Lake Sevan

The greatest lake of Armenia is lake Sevan-one of the largest high-mountain fresh-water lake. As a part of Armenia`s water ecosystems, Lake Sevan is of utmost importance with its water collection pond, preservation, sustainable use and management. It is the largest alpine freshwater lake in the South Caucasus and well-known for its unique fish species. The lake is fed by 28 rivers and streams. At present, the level of the lake is 1898 m, the surface area 1257 km², the volume 33.4 km³. Armenia also has another 100 small mountainous lakes, with a total volume of 0.8 km³. The total water abstraction in Armenia was 1735.5 million m³, most of which is for irrigation.³

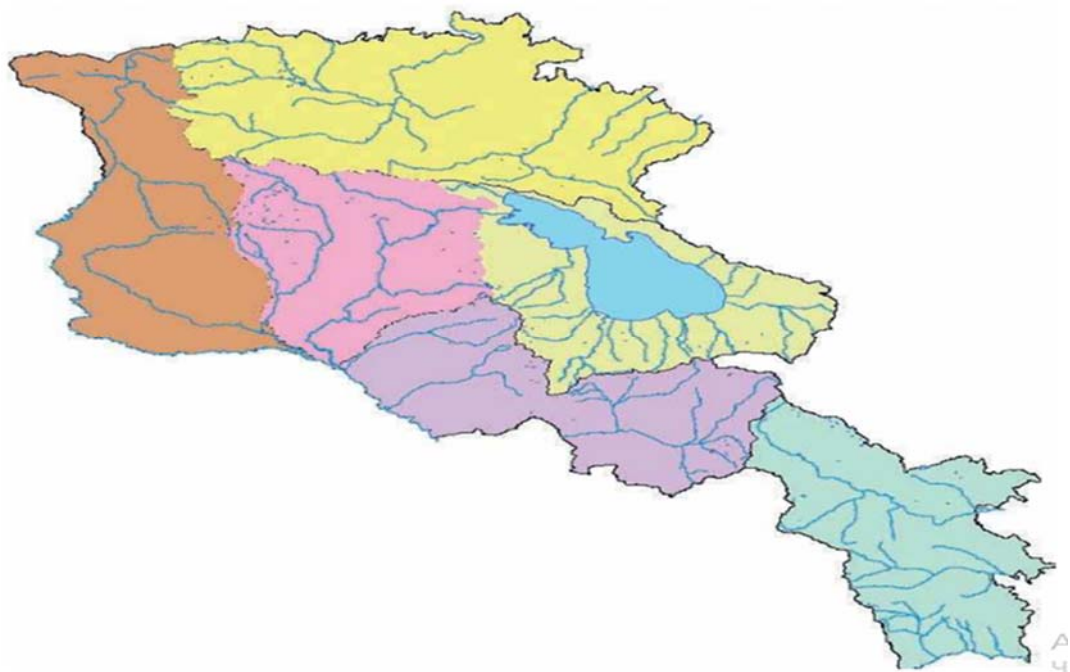


Figure 2. Map of Armenia with small rivers and lakes



Figure 3. River Hrazdan

REFERENCES

2. Ecology and nature conservation: Proc. the manual for universities.- Yerevan. Zangak-97, 2010.223 p.
3. Ecology Author: Samvel Shahinyan, Naira Tahmazya published in Yerevan 2003

CHAPTER 3. WATER REFORMS IN ARMENIA

3.1. Concept paper on water reforms 2001

Article contains provisions on water related lands, which among other things, can be used for public water supplies, as well as sanitary protection zones to prevent any impact from other sources on the health of the population.

3.2. Water code 2002

Among the main objectives of the Code are conservation and protection of water resources, prevention of any harmful impact on water, ensuring the supply of water to the population in the necessary quantity and quality, safe and smooth operation of the water supply and wastewater systems, and organization of the management, protection and development of water systems. Article 20 of the Code includes provisions on ensuring public participation and awareness raising in decision-making processes. Article 70 includes provisions on drinking water standards, and Article 120 deals with specific aspects of operation of drinking water supply and sanitation systems. Articles 101 and 103 of the Code include provisions on irrigating agricultural lands with wastewater⁴.

3.3. National Water Policy 2005

Article 1. purpose of the law The purpose of this law in the present and future human well-being, the country's socio-economic development, economic and ecological needs necessary to meet the quantity, quality and availability of water resources to ensure the regime.

Article 2. Scope of the Law This Law shall establish the requirements of Article 15 of the Water Code of the Republic of Armenia, from the National Water Policy in the following areas:

- 1) sustainable management of water resources.
- 2) priorities of use and protection of water resources.
- 3) inventory and assessment of water resources.
- 4) Development of supply and demand of water resources.
- 5) Relations pertaining to water management.⁵

3.4. National Water Program 2006

National Water Program 2006, including program of short, medium, and long-term measures. The National Water Program of the Republic of Armenia as well as the Water Code requires an adjustment of water resource management bases through a decentralization of water resource management functions. A prerequisite for the decentralization of water resource management functions would be the development of water basin management plans to become the primary document for the Territorial Departments of Water Basin Management. Comprehensive management of water resources at basin level would then be carried out in conformance with the developed plans.⁶

The European Union`s Water Initiative (EUWI) and its component for the countries in Eastern Europe, Caucasus and Central Asia (EECCA) were launched at the Johannesburg World Summit on Sustainable Development in 2002.

Armenia and European Union , in starting a process of the National Policy Dialogue(NPD) in the water sector in April 2006. The main purpose of that is to improve the use of water resources and provide for sustainable investment in implementing. Within the framework of the NPD it was envisaged to develop a financing process for rural water supply, taking into consideration the Millennium

Development Goals, the introduction of the integrated water resources management, according to the approach of the EU Water Framework Directive.⁶

The main objective of the EUWI is to support developing countries and transition economies actions to achieve the Millennium Development Goals (MDGs) on water supply and sanitation (WSS) and on integrated water resource management (IWRM)

REFERENCE

4. Water Code the Republic of Armenia 2002
5. National Water Policy the Republic of Armenia 2005
6. National Water Policy Dialogue 2006

CHAPTER 4. THE "FIRST GENERATION" REFORMS

In the sector of water resources management of the Republic of Armenia were initiated since 1999-2000, through the World Bank supported project "Integrated Water Resources Management" project. As a result of implementation of the project water resources of Armenia were assessed, structural reforms for water resources management were suggested, and outline of the management of water supply and demand was formulated. In addition to this, the idea of river basin management was proposed through introduction of annual and long-term planning mechanisms of water resources. Taking into consideration the recommendations of the "Integrated Water Resources Management" project the Government of the Republic of Armenia in 2001 initiated a targeted program for improving water sector in the country, revised the legal and institutional framework in the field. All this was incorporated in Resolution No. 92 on "Concept for Water Sector Reforms in the Republic of Armenia", adopted by the Government.⁷

4.1. Legal Reforms

One of the most important steps in water sector reforms is the adoption of the new Water Code of Armenia on June 4, 2002. The Code contains the idea of integrated river basin planning, promotes the allocation of water resources based on supply and not demand, creates a basis for establishment of the State Water Cadastre (SWC), obliges to issue water use permits based on available information, provides opportunities for employing economic mechanisms in the course of management of water resources. In order to ensure the proper application of the new Water Code of Armenia, since 2002 the Government has prepared over 120 regulations and by-laws, which relate to the procedures of issuing water use permits, river basin management, transparency and public participation in decision-making process, information accessibility, establishment of the SWC, formation of water resources monitoring, management of transboundary water resources and others. In 2005

Republic of Armenia Law on "Fundamental Provisions of the National Water Policy" was adopted, which presents a long-term development concept for strategic use and protection of water resources and water systems. Since 2005, the principles of river basin management have been applied in Armenia. In 2006 "Law on the National Water Program of the Republic of Armenia" was adopted. The overall goal of the law is development of measures aimed at satisfying the needs of the population and economy, ensuring of ecological sustainability, formation and use of the strategic water reserve, and protection of the national water reserve.⁸

The objectives of the law are as follows:

- Development of measures aimed at definition of the national water reserve, strategic water reserve, useable water resources and conservation and enhancement of the national water reserve, classification of water systems, development of criteria for defining the state significance water systems and definition of a list of those systems,
- Definition of maximal and minimal amounts of water use payments, including the definition of payment rates for water extraction and return and the rates of environmental fees,
- Assessment of water demand and supply,
- Development of a strategy for storage, distribution and use of water resources,
- Development of measures aimed at adoption and implementation of normative acts that would support the implementation of the National Water Program, enforcement of suggestions for emendation of those acts, and coordination of activity performed by the State government bodies,⁸

- Definition of measures aimed at development of water standards, adjustment of ecological flow volumes and maximum permissible quantities of water withdrawn for consumption, definition of specially protected basin areas or a list of a part of them and zones of ecological emergencies and ecological disasters, prevention of negative impact on water eco-systems, improvement of water resources monitoring and pollution prevention,

- Development of descriptions of measures envisaged by the National Water Program, their scopes, responsible bodies and time frames of implementation thereof,

- Definition of financial requirements and funding sources suggested for the implementation of the National Water Program, and

- Ensuring of public awareness. Short-term (until 2010), medium-term (2010-2015) and long-term (2015-2021) measures for implementation of the National Water Program objectives are defined in the law as well.⁸

4.2 Institutional Reforms

Resolution No. 92 on "Concept for Water Sector Reforms in the Republic of Armenia", adopted by the Government in February 2001 clearly presented the strategy of institutional reforms of the Armenian Government in the field of water resources. Institutional framework envisaged by the Water Code of Armenia almost entirely implies from the above-mentioned Concept. A new institutional system was introduced, according to which management of water sector is implemented by the following authorities:

1. Ministry of Nature Protection of the Republic of Armenia, and its Water Resources Management Agency, which implements management and protection of water resources⁹,

2. State Committee on Water Systems under the Ministry of Territorial Administration of Armenia, which implements the state management of water systems,

3. Public Services Regulatory Commission of Armenia, which implements tariff policy in water sector.⁹

Table 1: Main functions of the agencies involved in water sector management

	Management and Protection of Water Resources	Regulation of Tariffs	Management of Water Systems
Authorized Agency	Water Resources Management Agency	Public Services Regulatory Commission	State Committee on Water Systems
Main Functions	Monitoring and allocation of water resources, Strategic management and protection of water resources	Regulation of tariffs for noncompetitive water supply and discharge services in drinking, household and irrigation water sectors,	Management of water systems under the state ownership, Support to establishment of Water Users' Associations and Unions of Water Users, arrangement of tenders on management of water systems
Enforcement Tools	Protection of consumers' rights	Water system use permits	Management contract

In order to promote more efficient, targeted and decentralized management of water resources, 6 territorial divisions (Northern, Akhuryan, Araratian, Sevan, Hrazdan and Southern) have been established under the auspices of the Water Resources Management Agency.⁹

REFERENCES

7. Water Resources Management, 1999-2000
8. Water Code Republic of Armenia, June 4, 2002
9. Summary of results and lessons learned from the implementation of the Armenian NPD on IWRM
https://www.unece.org/fileadmin/DAM/env/documents/2011/wat/NPD/POLICY_BRIEF_English_November_20__2010.pdf

CHAPTER 5. GROUNDWATER

Since the 1950s, regular observations on groundwater wells and springs have been implemented by the Hydrogeological Expedition of the Geological Department. The last summary report was published in 1994, based on the 1990-1993 monitoring data. During the last 15 years, the status of Armenia's groundwater resources has not been monitored, despite the fact that groundwater resources provide 96% of the country's drinking water supply. The organization that conducted groundwater monitoring under the Soviet Union Government control, the Hydrogeological Expedition, was liquidated in 1993. The 2006 Law on NWP requires the re-establishment of a groundwater monitoring program within four years after the adoption of the law, as one of the priority measures¹⁰.

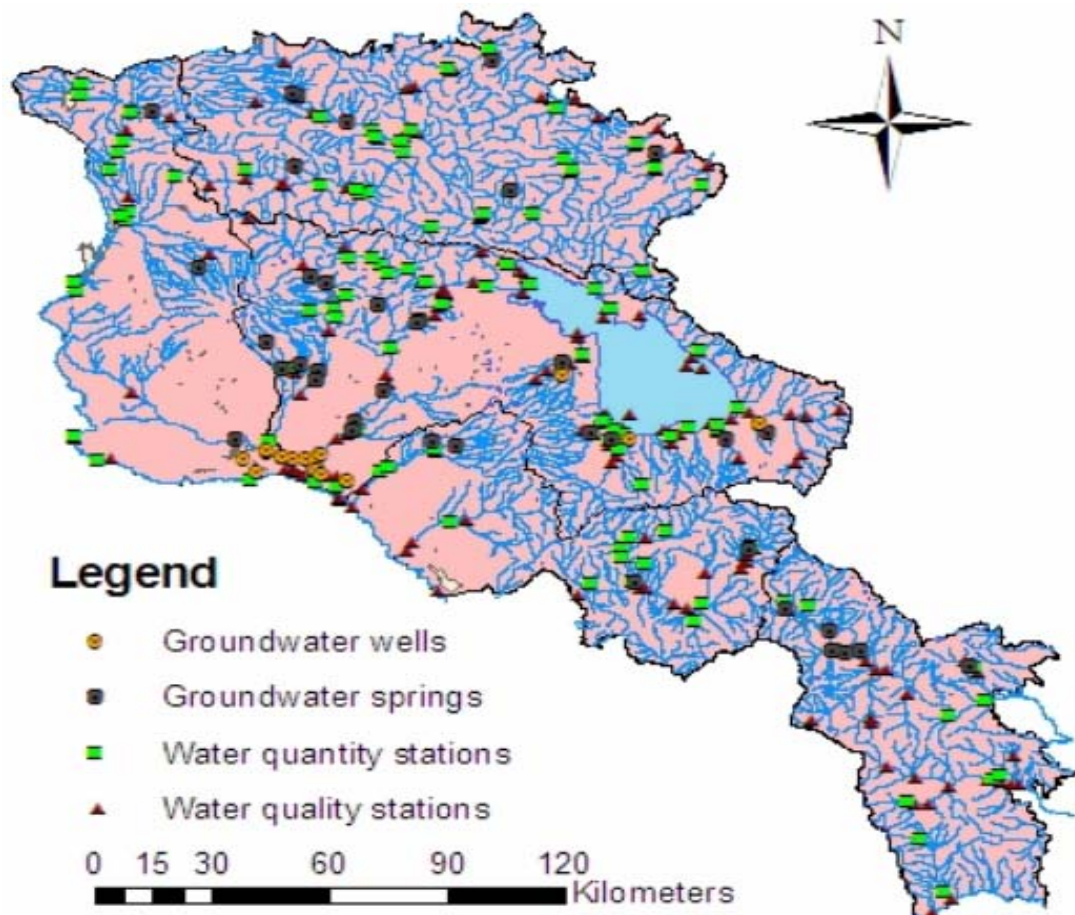


Figure 3. Surface and groundwater quantity and quality monitoring network

The law makes the MNP the responsible body for the establishment and operation of a national reference monitoring network, which comprises about 100 groundwater monitoring points. Such a network establishes a baseline (reference) situation to enable the determination of trends caused by human or natural impacts. With the support of USAID Water Program the assessment of the condition of previously used groundwater monitoring points started in February 2006. In parallel, the hydrogeology of Armenia was studied, described and mapped. Subsequently, an inventory was made of the various previously used monitoring networks and their monitoring points. For rehabilitation and use in the re-established national reference network, 73 monitoring points were recommended, comprised of 49 natural springs, 22 wells (boreholes), and 2 groundwater (sub-surface) wells. 69 out of 73 selected springs and wells were rehabilitated with the support of the USAID Water Program in 2007-2008 and handed over to HMC, to comprise the National Reference Groundwater Monitoring Network. However, since then the actual monitoring has not started since the procedures and mechanism for conducting the groundwater monitoring are still unclear¹⁰.

REFERENCES

10. European neighborhood policy instrument, shared environmental information systems Armenia country reports
https://issuu.com/zoienvironment/docs/enpi-seis_armenia_eng

CHAPTER 6. MONITORING

The performance of surface water quality monitoring has significantly improved during the last 5 years thanks to institutional and legal reforms, as well as strong support from the decision-making authorities. In the past surface water quality monitoring programs in Armenia provided policy and decision makers a large amount of raw data. However, relevant information was rather scarce. Nowadays, as water problems are growing bigger, knowledge is increasing rapidly and water issues become a higher priority on the political agenda, the time has come for a more coherent approach to developing surface water quality monitoring. It is clear, that a sufficient flow of adequate data and information must be created to support both policy and decision makers in their day-to-day activities. In the case of Armenia decision makers have to react to the changes and challenges in water management because of governance reforms, economic development, decentralization, environmental degradation, climate change, and other profound changes in society. However in many cases, there is a lack of communication between the policy and decision makers on the one side and surface water quality monitoring experts on the other one. One of the main reasons for this is that the surface water quality monitoring program in Armenia does not study water systems at a scale relevant to decision makers. It seems very reasonable to establish a better integration of policy, decision making and monitoring within the frame of broader management systems that would include an integrated language, understandable for both parties. As for surface water quantity monitoring, one of the major issues with ASH is lack of funding for rehabilitating field facilities and upgrading equipment at most of the observation points. With limited resources as indicated above, the following measurements and analyses have been curtailed¹¹:

- Water turbidity and solid substances,
- Snowpack,

- Flood forecast
- Reservoirs and lakes analysis (sediments, deformations, dam stability, etc.)

The majority of the hydrological and meteorological observation posts are poorly equipped. Data collection, entry, and transfer are being manually recorded in the registers. Several gauging stations have been modernized with computerized equipment in the Northern and Southern basins. In order to strengthen the surface monitoring activities, it is essential for the government to modernize the regional offices and field stations with appropriate modern equipment. For the short term, the ASH proposes the following:

- Repair water measuring devices,
- Install modern water equipment in the major rivers,
- Improve databases for storing and managing
- Modernize data/information exchange network to provide better data¹¹

REFERENCES

11. European neighborhood policy instrument, shared environmental information systems Armenia country reports
https://issuu.com/zoienvironment/docs/enpi-seis_armenia_eng

CHAPTER 7. NPD IN ARMENIA

As one of the EECCA country (Eastern Europe, Caucasus and Central Asia), Armenia is included in one of the four regional components of the EUWI. The regional working group for EECCA is:

- Open to representatives from member states, partner countries and other interested organizations,
- Responsible for implementing the EUWI mission objectives,
- Designs work plans and monitoring indicators.

Like in other countries of EECCA region, in Armenia EUWI works for the following:

- Stronger political commitment: “to reinforce political commitment towards action and innovation oriented partnership”¹².
- Better water governance: “to promote better water governance, capacity building and awareness”.
- Better water management: “to improve efficiency and effectiveness of water management through dialogue and coordination”.
- More cooperation on river basins: “to strengthen cooperation through promoting river basin approaches in national & transboundary waters”.
- More sustainable financing: “to identify additional financial resources and mechanisms to ensure sustainable financing”¹².

Thus, in April 2004 Armenia sent a letter to the European Union, stressing its interest in starting a process of the National Policy Dialogue (NPD) in water sector and asked the European Commission to support that initiative. The main purpose of

the dialogue is to improve the use of water resources and provide for sustainable investment in implementing the Millennium Development Goals. Particularly, within the framework of the NPD it was envisaged to develop a financing strategy for rural water supply and discharge, taking into consideration the Millennium Development Goals, as well as promote the introduction of the integrated water resources management principles, according to the approach of the EU Water Framework Directive. Thus, the NPD process in Armenia can be divided into two main directions:

- In 2006-2008 the focus was on financing rural water supply and sanitation,
- In 2008-2010 the focus has been on promoting introduction of IWRM principles in Armenia.¹²

7.1. Water Supply and Sanitation

In 2006-2008 the National Policy Dialogue Activities in Armenia focused on financing rural water supply and sanitation. Thus, within the National Policy Dialogue on Financing Rural Water Supply and Sanitation (WSS) in Armenia a comprehensive policy document was prepared. It discussed possible Armenia-specific interpretations of the Millennium Development Goals (MDGs) for rural WSS, integrating the MDGs with so called “minimal water supply standard” which is under discussion, and might be eventually introduced in Armenia. The project was commissioned by the EC in support to the Working group of the EECCA component of the EUWI, and managed by EC jointly with the OECD/Environmental Action Program (EAP) Task Force. The project was executed in parallel with an OECD/EAP Task Force project to develop methodological guidelines for financing strategies for rural WSS. The State 31 Committee of Water System (SCWS) was the main beneficiary of the project, aiming at developing a financing strategy for rural WSS (supplementary to the financing strategy for urban WSS, developed a few years

ago). The project was executed in the period of January 2006-March 2008. The objective of the study was to help develop a financing strategy for rural WSS in Armenia by facilitating the NPD on that subject. The key challenges were to set up realistic targets and a policy package that covers both improvement of the rural WSS infrastructure (more reliable supply, renovation of supply, extensions of WSS systems, starting to develop sanitation standards for rural settlements) and the financing thereof (introducing user charges in places where they did not, allocating sufficient budgetary resources, acquiring international loans and grants, creating financial facilities for people that cannot afford to pay). The National Policy Dialogue on Financing Strategy for rural Water Supply and Sanitation was organized by a Steering Committee (SC) comprising of all key Armenian and international stakeholders and chaired by the SCWS. Regular and extended SC meetings provided a platform for the dialogue, while the OECD/EAP Task Force secretariat and the consultant selected by the EC provided analytical input and facilitated the dialogue. Armenia is aiming at achieving more ambitious targets than those set up by the official UN definitions of the MDGs on WSS. To establish such targets (more ambitious in all aspects), the SCWS suggested to develop a Minimal Water Supply Standard (MWSS). Several options for/definitions of the MWSS were suggested and simulated by the consultant. The preferred, technically and financially feasible definition of the MWSS, agreed upon by the SC was as follows: at least 50 liter/capita/day, at a distance from the tap to the dwelling of no more than 100 meters, regularity (for piped water supply – at least 8 hours per day) and water quality (biological, chemical, etc.). The overall conclusion was that although the financial challenges are large, and presently financial resources are short, there is sufficient potential in Armenia to implement one of the two policy scenarios, without much “pain” for the poorest part of the population or a too heavy burden on the public budget. With the safeguarded loans and budget for rural WSS, already a large part of the financing gap can be covered, the affordability analysis showed that even

under less favorable economic developments, the POLICY scenario would be affordable. So, overall, the implementation of the financing strategy based on the POLICY scenario would be more an institutional and organizational challenge than a financial challenge. It is clear from the report that the existing institutional set up of rural WSS does fit to implement the financing strategy for rural WSS. In rural settlements without WSS service, the water utility is a municipal department. In those cases, each municipality needs to take care of all aspects (technical, monitoring, billing, financing, etc.) of the water supply system. While their financial and human resource capacity is often far from to be sufficient to address the challenge. Especially in small rural settlements (with no nearby water source), where costs of supplying water may be two or more times higher than the average costs of rural water supply in Armenia. Such large cost differences also make it hard to address the affordability of water supply in smaller settlements. Also, the poor fiscal position of rural settlements is presently a concern. Larger water companies or public utilities would be able to apply cross subsidization, and will in general have better access to finance (assuming financial sustainability) and skilled labor needed to properly operate and maintain the systems. Also the scale of operation will create advantages (technical skills, monitoring, administration, fee collection) compared to small, municipal utilities. So an institutional reform seems inevitable, creating larger water utilities or companies. This will require also legislative action (to clearly define responsibilities of municipalities (to supply drinking water to the population); right of consumers (to have reliable supply of quality drinking water against timely payments); role and legal position of public companies, etc.). Obviously, these legal issues need to be addressed in a broader perspective (defining the role of municipalities in providing water supply to their population; establishing a sustainable framework for municipal finance). 32 Below the summarized lessons learned from the National Policy Dialogue on financing water supply and sanitation in Armenia are presented:¹²

- **Steering Committee** - It has proven to be important to have a strong leadership in the SC and that the SC Chair is supported by an efficient (local) secretariat. Involvement of the process of the NPD by an international (donor) organization is also essential in keeping a NPD on the “right track”.

- **Data Collection** - To achieve a successful NPD, it is needed to collect and interpret reliable relevant data on rural WSS. Such data often is not available at the beneficiary (in ROA: SWSC). The involvement of many stakeholders from different perspectives has proven to be an enormous help in defining what kind of data is relevant and what kind of data is available at what institution (often, different institutions do not know of the existence of information in other institutions).

- **Project implementation unit** - To monitor and steer the financing strategy implementation progress, it is highly recommended that a professional program and projects implementation unit is created to implement the financing strategy and coordinate various investment programs for WSS, typically supported by donors and international financing institutions (IFIs).

- **Administration** - A certain administrative flexibility would be needed, as the implementation of a financing strategy and related investment programs involves specific, high valued knowledge and expertise, while the remuneration of appropriate experts cannot be sustained through salaries paid in a 100% public body in a low income or a low-middle income country, as Armenia.

7.2. Integrated Water Resources Management

On January 12, 2007 a “Common Understanding of the State Water Committee and the Ministry of Nature Protection of Armenia on a National Policy Dialogue on water-related issues in Armenia”, was signed, according to which one of the objectives of the NPD in Armenia is to facilitate the implementation of the principles of IWRM in line with the EU Water Framework Directive and relevant

conventions and other international agreements with an emphasis on financial issues. The “Common Understanding” provided the objectives of the NPD related to the IWRM pillar of the National Policy Dialogue as well as the general composition of the Steering Committee on the entire NPD tasks (water supply and sanitation, integrated water resources management). At the meeting of the Steering Committee on 2 July 2007, proposals for a work plan 2007-2009 have been considered. Based on the outcome of the meeting, a representative of the UNECE secretariat has held consultations with major stakeholders during a mission to Yerevan on 22-24 July 2007 in order to further elaborate the work plan. It was recognized that despite the fact the Armenia largely had the necessary legislative basis and institutional framework for further introducing IWRM principles, particularly those laid down in the Water Framework Directive and the Water Convention, it could not be achieved in the short term, as the water management institutions were new bodies that still required a long period of capacity building to develop the necessary expertise and capabilities on IWRM. There was also a need for better coordination between key sectors, and the necessity of sharing information among major stakeholders (e.g. Ministry of Agriculture and Ministry of Nature Protection). The National Policy Dialogue, among other things, also aimed to contribute to developing these capacities. The NPD process in Armenia dealt with the following IWRM pillars:¹¹

- Policies and strategies as well as legal and regulatory frameworks to facilitate the implementation of the IWRM principles and compliance with obligations under bilateral and multilateral water agreements,
- Policy support for developing water management instruments needed for the implementation of the IWRM principles,
- Awareness-raising, stakeholder information and consultation, and capacity-building, and

- Financing aspects related to the above pillars of IWRM under the National Policy Dialogue.

REFERENCES

12. National policy dialogues(NPD) in Armenia 2004
<https://www.oecd.org/env/outreach/42984132.pdf>

CHAPTER 8. ANALYTICAL REPORTS OF MARMARIK RIVER BASIN



Figure 4. Location of Marmarik River Basin in Armenia

Marmarik River Basin is Located in the northern part of Kotayq region of the Republic of Armenia. Marmarik River Basin includes 12 settlements with more than 7,700 total population. 48% of total population is men, and 52% women.

In 2008-2010 the following comprehensive analytical reports and studies were prepared and conducted in Marmarik River basin, which support introduction of IWRM principles in the basin:

- Baseline conditions and pressures on for integrated water resources management in Marmarik River basin in Armenia
- Desired conditions for water uses and functions in the Marmarik River basin, and identification of measures to achieve the desired conditions,¹³

- Financial dimension of water resources management in the Marmarik River basin,

- Development scenarios in water resources management in Marmarik River basin.¹³

In addition, with the request of NPD Chairman the UNDP Armenia conducted a special study in Marmarik River basin on "Complex Assessment of Climate Change Impacts on Water Resources of Marmarik River Basin of Armenia". The findings of the study were taken into account while development of draft Marmarik River basin management plans in the context of forecasted decrease of water resources due to climate change. Below the summarized lessons learned from the National Policy Dialogue on integrated water resources management in Armenia are presented:¹⁴

- Adopted policy packages - Recommended practices on establishing baseline conditions, recommended practices on identification of desired conditions for water uses and functions in Marmarik River basin helped in development of draft river basin management plan for the basin, as well as adopt corresponding policy packages for the entire country with the intent to replicate it in other basins.

- Coordination - During the implementation of NPD in Armenia several water-related projects were being implemented in Armenia, including

- (a) the USAID program on management of transboundary waters in the Caucasus (Armenia, Georgia),

- (b) the USAID program on developing model guidelines (a set of tools based on the water Framework Directive) on integrated planning in the Meghriget River basin,¹⁴

(c) the EU TACIS project on transboundary river management for the Kura River,

(d) UNDP program on reducing transboundary degradation in the Kura-Araks basin,

(e) UNDP Climate Change Impact Assessment project, including assessment of vulnerability of water resources due to climate change in Marmarik River basin.

All these programs address, to a various level of detail (mainly due to the different size of the area covered) IWRM issues. NPD provided forum for coordination of the above mentioned projects and facilitated streamlining of activities of the international bodies involved in implementation of those projects, given that the national coordination of these activities rests with the Water Resources Management Agency, and more specifically its Deputy Head, who is at the same time Chairman of the Steering Committee on the NPD in Armenia.¹⁴

- Local dimension - One of the peculiarities of the process related to the fact that the National Policy Dialogue on IWRM introduced a “local dimension” with the requirement that the implementation of the principles of IWRM “could include pilot basin activities”. In particular, the Steering Committee, which was before composed of “national level” representatives, was adapted to the “local dimension”, and the composition of the Steering Committee was extended to put more emphasis on participation of local stakeholders. In this regard Marmarik River basin was selected as pilot river basin, where policy packages were developed to facilitate the implementation of the principles of IWRM in line with the EU WFD and relevant conventions and other international agreements with an emphasis on financial issues.

- Financing of IWRM - There is now an increasing recognition that many IWRM plans may not be financially sustainable because the implied costs exceed what countries’ public budgets, 34 farmers, industries and households can afford.

Thus, there is a need to work towards a more profound analysis of the costs of water resources management, the financing sources that are available to cover those costs and the benefits that adequate water resources management can generate. The NPD study carried out in Marmarik River Basin looked into some of the measures that can help to generate financial resources required to operate and maintain existing water infrastructure, implement new investments and cover governance costs. The work involved the financial-economic analysis (funding requirement vs. actual funding) and assessment of the financial affordability of measures for the basin. It has also identified the needs for further work and ideas for the type of assistance that would be needed to effectively support water authorities in overcoming this problem. The findings of the study can be replicated in other river basins of Armenia where corresponding plans are to be developed¹⁴.

- Information sharing and public participation - Pilot studies in Marmarik River basin also significantly contributed to sharing experience on implementation of IWRM principles among the stakeholders, and particularly the stakeholders from Marmarik River basin. The recognition that there should be balance between setting water quantity and quality desired conditions and financial affordability has been largely accepted by the stakeholders. Shared information has also facilitated to more active public participation in the process of development of draft river basin management plan and discussion of various aspects and elements of the draft plan. The proactive work with the local communities, stakeholder consultations, as well as field surveys through questionnaire proved to be very efficient tool in promoting the feeling of ownership among local stakeholders of the basin.¹⁴

REFERENCES

13. Ecology and nature conservation, -2011

14. Summary of results and lessons learned from the implementation of the Armenian NPD on IWRM

https://www.unece.org/fileadmin/DAM/env/documents/2011/wat/NPD/POLICY_BRIEF_English_November_20__2010.pdf

CHAPTER 9. WATER POLICY IN SPAIN

A. The WFD (2000/60/EC)

The Water Program entails a redirection of the water policy in Spain, a new direction that occurs in the middle of the adjustment process to the WFD that implies a new management model. This is the most important regulation on water policy in the European Union countries. It establishes criteria for water protection, to prevent its pollution, to promote its sustainable use, to protect the environment, to lessen the effect of droughts or floods and to improve the status of aquatic ecosystems. The main goal of the WFD is the maintenance and improvement of the aquatic environment in the European Union, and compels the Member States to reach a good ecological and chemical status of all water bodies (groundwater, surface, coastal and transitional waters), as well as to take into consideration all the social and environmental costs of the use of the water in pre-established timelines. The WFD principles the Spanish water policy should be based on are:¹⁵

- (i) Sustainability;
- (ii) Subsidiary;
- (iii) Effectiveness and
- (iv) Participation. The sustainability Principle (no deterioration) is based on:
 - (i) to prevent damages;
 - (ii) to protect and improve the status of aquatic ecosystems and
 - (iii) the integrated management at the watershed level to improve the ecological status. Estuaries, deltas and coastal waters are included.

The Subsidiary Principle is based on the principle that decisions must be adopted as closet to the problem as possible. On the other hand, the Effectiveness Principle is based on:

- (i) to determinate sufficiently detailed and justified previsions of costs and prices;
- (ii) to apply combinations of measures with the best cost/effectiveness relationship and
- (iii) to estimate and recover real costs, including the environmental and shortage ones.

Finally, the Participation Principle is based on:

- (i) to ensure transparency in the information and decisions and
- (ii) to facilitate active participation of all the actors.

The key points of the WFD would be:

- (i) we will only have safe and healthy water supply if our aquatic ecosystems are also safe and healthy;
- (ii) the main goal of the water policy should be to improve the ecological status of aquatic ecosystems and
- (iii) the ecological status as four levels (physical-chemical condition- water quality, quantitative state- river lows and other water bodies, biological condition- fauna diversity, river lows and banks and finally morphodynamic processes- erosion, transport and sedimentation. In 2015, all water bodies in the European Union should be un a “good ecological status”. The transposition of the WFD to the Spanish regulation was made through the Law 62/2003 on administrative and social

measures, accompanying law to the Government's General Budget for 2004. The improvement in the exchange of information between States is one of the key actions. For this reason, a public access platform, WFD Circa, has been created with valuable information on the process, and regular meetings are organized to specify agreements such as the commitment for the sustainability of the Mediterranean, subscribed by Spain to defend the historic, cultural and climatic singularity of this zone in the elaboration of a common water policy.¹⁵

B. Reform of the Basin Organizations

Reform of the Basin Organizations the goals of the WFD, the new management policy of the Spanish Government has to implement a reform to the Basin Organizations. The objective is to change the traditional priorities and promotion measures of hydraulic works by the environmental management of hydrological ecosystems, which will demand a new approach that is multidisciplinary, more transparent and open to the citizenship. This reform is not only directed to a new water management model but it is also aimed a greater implication of the Regional Governments in the management of hydrological resources.¹⁵

C. Agriculture

Modernization of irrigation 80% percent of Spanish hydrological resources assigned to agriculture, where irrigation is a key piece: it contributes more than 50% of the inally agricultural production and uses up to 13% of the useful agricultural land. Currently, Spain has almost four million hectares of irrigated land. Due to the losses in conduction and distribution depend on great part on the state and characteristics of the infrastructures, it is convenient to rehabilitate and modernize the irrigation schemes. For this reason, the Spanish Government implemented emergency measures as the National Plan on Irrigation with the following

objectives: (i) to rationalize water consumption through efficient technology; (ii) to improve the landscape from a social and an environmental perspective and (iii) To increase productivity. These improvements imply the need for investment, capacity building and commitment of all the interested actors, that is, the Government and the farmers with water use rights. The expected results of the Modernization of the 2006-2007 Irrigation Plan, from the Ministries of Environment and Agriculture, Fishing and Food are; (i) to prevent the overexploitation of aquifers; (ii) to control spills and soil degradation; (iii) recover wetlands; (iv) desertification and (v) prevent migration through improving the quality of life of rural people.¹⁵

REFERENCES

15.The EU Water Framework Directive (2000/60/EC)

CHAPTER 10. CONCLUSION

The traditional water policy in Spain has been concentrated principally on the availability of the supply. Currently adaptation to the new European regulations, demand us adapt our hydrological resources to these requirements, developing a new policy based on planning and an environmental line of action. The management of water resources is an important issue for societal health, and population continues to grow. In order to address the changing state of water resource issues, managers must recognize they are dealing with problems with no clearly defined boundary, and an absence of a single satisfactory solution. In order to adequately deal with such problems, water resource managers must consider the concepts of geographic scale, assess the impact of mismatched geographic scales, and understand the specific characteristics of places in their management plans. Demand for these resources continues to increase. It is important to enhance the understanding of all elements of the water cycle and how human activities affect it, so that water resources can be protected and developed sustainably. The problem of surface water and the increasing water pollution and water diversions threaten to hamper or even disrupt social and economic development, as well as the health of ecosystems. Groundwater can help meet demand, but much of it is being withdrawn and some of it is being polluted. It is important to better control the use of water that will not be replenished. European practices showed us new techniques such as artificial recharge, desalination and re-use. In Republic of Armenia more support is needed, not only for innovative technical solutions to improve supplies, but also for the management of demand and the promotion of efficiency in water use. The Republic of Armenia needs some water management like European Water Cycle Management. Growing changes in the availability of water resources will require political support for the collection of information on water resources. That information will allow policy-makers to make better decisions about the management and use of water.